Plenary Session 6
MAJOR OPPORTUNITIES FOR WHEAT FLOUR FORTIFICATION

Overview

As wheat consumption continues to rise throughout Asia and the Pacific, fortified flour has the potential to deliver significant levels of micronutrients to wider populations. In countries like Fiji, Indonesia, Philippines, and Thailand with little domestic wheat production, the milling industry is relatively modern, sophisticated, and centralized. There are few technical barriers to fortification. In the PRC, India, and Kyrgyz Republic where there is a mix of new and traditional milling technologies and a range of small, medium, and large mills, the way forward is more complex.

In several countries of the region, flour is now being fortified. In some cases, the choice of nutrients is similar to those used for the past 50 years in Europe, and North and South America. In other cases, the choice of nutrient is related to specific deficiencies; newer formulations including zinc and vitamin A are being used. Four of twelve millers in the Philippines are voluntarily fortifying a significant portion of the nation's flour supply with vitamin A. With every portion of *pan de sal* bread, Filipino children receive 20 percent of the recommended daily allowance. In Indonesia, domestically milled flour is voluntarily fortified with iron, zinc, folic acid, niacin, thiamin, and riboflavin. Just 75 grams of fortified noodles daily will deliver 25 to 38 percent of all these micronutrients. In India, large milling companies are fortifying both refined and whole wheat *atta* flours with iron. However, this represents only a miniscule proportion of the nation's consumption. The Government of Fiji is considering a proposal for mandatory fortification with a fortification profile similar to that of Indonesian flour.

While increased awareness of micronutrient malnutrition and a renewed commitment to social responsibility have been the motivating factors in all cases, a different mixture of incentives leveraged this private-sector investment and involvement in each country. In the Philippines, the public sector supported product development and undertook a vigorous industry advocacy. The value of fortified flour is being raised by a social marketing campaign featuring basketball stars and the incremental cost lowered by a decreased tariff on imported vitamin A. In Indonesia, public-private sector collaboration resulted in product development and a bilateral donor provided temporary financing of premix for 12-18 months. Large Indian millers, enabled by the inclusion of iron and other minerals in national legislation dating from the 1950s, are fortifying with an eye toward increasing market share as well as an increased awareness of their responsibility for the nutritional well-being of their consumers.

For the time being, fortification in all countries of the region is voluntary. Fortified flour and unfortified flour are competing head-to-head. For Indonesian millers, competition comes from less expensive, unfortified imported flour which is gaining market share. Because of low consumer awareness of the importance of micronutrients and intense competition from this low-cost overseas competitor, industry margins are thin. While fortification represents only 0.67 percent of the cost of flour, distributors are typically earning less than 1 percent. In the Philippines, the pressures are domestic. Overcapacity in the milling sector has led to falling prices, profit pressure, and intense competition among millers. Consequently, in both countries, it has been difficult to pass the cost of fortification on to the consumer. In the Philippines, millers are temporarily taking the added cost of fortification directly off the miller's bottom line in the hope of ultimately gaining some market share from unfortified competitors. This has yet to be the case. In Indonesia, USAID temporarily foots the bill for the lion's share of fortification. This is not sustainable.

Various solutions were suggested at the Manila Forum, including redoubled efforts in social marketing to encourage consumers to prefer and ultimately pay a little more for fortified flour. Some financial incentives, such as further reductions in fortificant duties, could help but these are already low. Among millers, there was agreement that mandatory legislation is needed to "level the playing field" and thereby compel both domestic and international competitors to play by the same rules. Mandatory legislation, when supported by transparent enforcement, focuses competition on the quality of the fortification rather than whether or not the flour is fortified. In January 2000, a consensus proposal for a new Indonesian standard including fortification emerged from a meeting of the public and private sectors. In the Philippines, a bill for mandatory flour fortification is currently in its third legislative reading. Fiji, with a single mill supplying the island, projects mandatory legislation by the end of 2000.

Powerful studies, such as a recently completed trial showing a 10-percent impact of anemia on productivity in a Fijian garment factory, can be the basis of messages that resonate with industry, policymakers, and ultimately consumers. However, for nations with a range of large and small mills, mandatory legislation may be more difficult. If strictly enforced, small producers with less capital and less technical know-how are at a disadvantage. If loosely enforced, large millers who are more visible and monitored are put at a cost disadvantage relative to those smaller millers who may escape incurring the cost of fortification.

With the exception of South Asia, the dominant flour product in the region is a refined white flour offering good bioavailability for poorly absorbed minerals like iron. For the long term, countries like India where unrefined *atta* flours are dominant, may explore newly developed and more easily absorbed iron compounds. For the short term, however, efforts might focus on the 20 percent of national production that is refined—*maida* flour produced in the organized sector.

The Role of Flour Fortification in Reducing Iron Deficiency Anemia in Asia and the Pacific

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Successful advocacy for flour fortification with iron involves taking policymakers through a series of arguments that lead them to the conclusion that flour fortification is necessary, feasible, cost effective, safe, and efficacious. The first step is to show policymakers that IDA is widespread. In Asia, IDA prevalence is generally 40-50 percent in children under 2 years of age and in pregnant women, and 20-30 percent among school-age children and adult women. By all definitions, that constitutes an urgent public health problem, but policymakers need to understand the significance of these numbers. For the children, the figures mean reduced intellectual capacity in the order of 5-7 IQ points. If anemia is severe, the children may simply die. For pregnant women, IDA contributes to increased risk of death in childbirth as well as pre-term delivery, which means retardation of subsequent growth and development. In the adult population, iron deficiency means reduced muscle function and endurance, which is directly related to work capacity and output. This in turn affects personal income and productivity as well as national economic output. A 30-percent prevalence of IDA among women and a 10-15 percent reduction in their economic output translates into a 2-3 percent productivity decrease for the whole population.

Once policymakers are convinced that something *should* be done, the next step is demonstrating that it *can* be done. The technology of flour fortification is simple and proven by more than 50 years of experience in over 30 countries. The cost of a premix that can deliver between one quarter and one third of the RDA for iron, zinc, riboflavin, thiamin, and folic acid adds up to US$1.31 per tonne—less than 0.5 percent of the flour cost. For a consumer of 30 kg/year it represents US$0.04 per year. However, policymakers are conservative. Even if they are convinced that there is an important problem and a feasible solution, a number of objections may still arise. These must be answered one by one.

In Asia one often hears that wheat consumption is low. However, where consumption is as low as 15 kg/year, as is the case in Indonesia, fortification at a level of 60 mg/kg equals an additional intake of 900 mg of iron annually. This is the equivalent of two months of daily iron supplementation at 30 mg/day—a dose that has been shown effective in correcting IDA for women and children. In Venezuela, iron fortification at half that level reduced IDA from 37 percent to 16 percent in two years.

Some may object because wheat products often do not reach the poorest of the poor. However, when pregnant women and young children are iron deficient, the problem obviously extends far beyond the poorest of the poor. Moreover, fortification is not intended to be the single solution. Do we need a 100 percent solution before we act?

In some countries with many small mills, there may be the objection that it will be difficult to initiate and to control fortification. This can be answered by reference to the success of iodine fortification in countries with literally tens of thousands of salt producers.

Among those with some medical knowledge, there may be concern about too much iron. In fact, it is difficult to absorb too much iron. While deficient individuals may absorb up to 10-15 percent of iron intake, those in a nondeficient state will usually absorb only about 1 percent or less. It is true that specific diseases do cause iron overload, but these are not due to higher iron intake. The experience of countries with iron fortification for 50 years shows no evidence of harm to those with iron overload disease.

The ultimate policy argument is the cost-benefit analysis. Assume that flour fortification at a cost of US$0.05 per person per year can succeed in lowering the IDA rate among women from 25 to 12 percent. Further assume that the increase in work productivity of those women who are no longer anemic is 10 percent. In a nation with a GDP of US$500 per year, the increased productive output of those women who are no longer anemic adds up to an increased economic output of US$2.50. An investment of US$0.05 and a return of US$2.50 means a cost-benefit ratio of 50: a good investment. ❐

Flour Fortification with Iron in Indonesia

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Iron deficiency is a significant public health problem in Indonesia, affecting 64 percent of pregnant women and 56 percent of children under five years of age. Flour is a sensible vehicle to reduce IDA. The industry is concentrated in five mills with 80 percent of installed capacity in two mills. Fortification is therefore easy to monitor. All mills have invested in microfeeders. For modern Indonesian mills, fortification is technically feasible and the cost is relatively low. Flour consumption, while still significantly less than rice, grew about 50 percent, from about 10 to 15 kg per person per year, from 1992 to 1997. While consumption dropped about 20 percent during the recent financial and economic crisis, it is recovering and we predict that it will reach 16 kg per person by 2003. About 60 percent of all flour is used for noodles. About one third consists of wet noodles manufactured by many small decentralized producers.

We tested six variations of a premix that included iron, zinc, folic acid, and two B vitamins for product quality after storage; mineral and vitamin stability after storage; flour characteristics; and quality of the end products—noodles and bread. After 90-days storage, there was no change in the physical or chemical properties of the flour and no evidence of degradation of vitamins and minerals. There was no significant change in product characteristics such as dough quality, color, or enzyme activity. However, in the premixes with ferrous sulfate as an iron source and in a premix with 80 ppm reduced iron there was some change in taste, aroma, and texture in some noodles. However, premixes with 40 and 60 ppm reduced iron were completely acceptable.

In 1998, the Indonesian Government secured a grant of US$850,000 from USAID to purchase sufficient premix for 1 to 1.5 years of total production. This was distributed among Indonesia's mills according to their installed capacity. Fortification began in January 1999. However, this premix will be exhausted by May 2000 and options for the future must be explored.

Flour fortification remains voluntary. Since fortification began, imported flour, mainly subsidized flour from the European Union, has increased to 20 percent of the domestic market. It is difficult enough to compete with low-cost subsidized imports; if the domestic industry also has to bear the cost of fortification, we would lose even more market share. Fortification must be mandatory and apply to all flour traded in Indonesia, domestic and imported. In January 2000, a consensus meeting among flour millers, the food industry, and the Government agreed that a new Indonesian National Standard for wheat flour will include fortification with 60 ppm iron, 30 ppm zinc, 2.5 ppm thiamin, 4 ppm riboflavin, and 2 ppm folic acid. However, even with this mandatory regulation, price pressures from subsidized European flour will make it difficult to pass on the added cost of fortification to consumers or food processors. Although the cost of fortification is only 0.67 percent of the flour price, the profit margin of distributors is only 0.5-1.0 percent. The small cost of adding vitamins and minerals, if passed from the mill to these major customers, could wipe out their profit. Therefore, financing to cover the cost of fortification is still needed—at least on a temporary basis. This is a miniscule cost when compared to the enormous benefit. ❐

Flour Fortification in the Philippines

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The wheat kernel has a number of vitamins and minerals, but there is no vitamin A in the wheat kernel at all. In the Philippines, children urgently need vitamin A. Bread, especially *pan de sal*, can be an effective vehicle to deliver vitamin A to the population because it is affordable and consumed daily nationwide across all demographic classes. Per capita consumption of flour has increased from 16 kg/year in 1982 to more than 25 kg/year today. Almost half the flour is used in bread products, another 20 percent in biscuits and crackers, and 21 percent in noodles. Flour is distributed through about 20,000 bakeries, more than 90 percent of which are small establishments widely dispersed in the rural areas where VAD is most widespread. Many are already equipped with microfeeders so there would be no need for additional capital expenditure for fortification.

In 1995, the Philippine Department of Health and the Nutrition Center of the Philippines conducted retention tests on flour fortified with 490 RE of vitamin A per 100 grams. After one month of storage, 81 percent of the vitamin A was retained in the flour; 80 percent was subsequently retained after baking into bread. Based on these results, a 60-gram serving of bread will meet about 20 percent of the RDA of pre-school children. These results were presented to a 1996 multisectoral meeting that included government agencies, NGOs, and various Philippine flour millers' and bakers' associations. In 1998, Purefoods began fortification and today three other mills are also fortifying their products. Purefoods adds 490 RE/100 grams of flour to all hard flours at a cost of 3 pesos (US$0. 07) per 25 kg.

To date participation by flourmills is limited because current profit margins are extremely thin. The industry has 50-55 percent excess milling capacity and as a result there are frequent price wars. Over the last year alone, the price of bread flour dropped by 20 percent. Due to this extreme competition, the cost of fortification cannot be passed on to the baker or to the consumer. The mills doubt whether the increased cost can be recovered via increased sales.

How can the public sector increase and sustain miller participation? There are a number of strategies on the demand side. First, consider a proposal to sell bread by weight instead of by piece. This would link the price of flour to the price of bread so that when the price of flour goes down, the price of bread would follow and presumably consumption or sales would increase. Second, decrease subsidies on rice, which is the major product competition for bread. However, this is a sensitive political issue and unlikely to happen. Third, the use of flour in the home can be promoted as a new market for flour. Finally, there is a need to step up the Government's promotion campaigns to encourage choosing fortified bread rather than the unfortified option. On the supply side, there are a number of options to reduce the cost of fortification. The cost of the fortificant might be subsidized. Some relief could be obtained from removing the already low 3-percent tariff on the importation of fortificant. More significant, since it represents a major cost to the miller, would be removal of the 3-percent tariff on imported wheat. Finally, there is the legislative approach. In the Philippines, a bill to make flour fortification mandatory is currently in its third reading in the legislature. ❐

Flour Fortification with Iron in India

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While the southern Indian diet is primarily rice, the major staple in northern India is wheat, consumption of which averages 158 grams per day. The average iron intake from primarily fortified unrefined *atta* flours, is about 30 mg per day. However, inhibiting factors interfere with the absorption of this iron, including phytates in the unrefined *atta* flour; consumption of tannins in condiments and tea; and low consumption of absorption enhancers such as foods with vitamins A and C. Most *atta* flour is milled by small-scale *chakki* mills. There are a few large producers currently fortifying *atta* with iron; they are providing a branded *atta* in order to increase market share. This effort is a drop in the ocean. For the vast majority of *atta*-producing *chakki* mills, there is no currently available technology for fortification.

Of an estimated 75 million tonnes of wheat consumed annually in India, approximately 10 million tonnes is refined white flour milled by the organized industry. The initial phase of any flour fortification program should focus on this industry because the members are relatively large, sophisticated, and easier to monitor and control quality. Moreover, these millers produce *maida* flour that offers better iron bioavailability. It should be noted that the capacity utilization of the roller flour industry is about 50 percent. The spare capacity of 10 million tonnes is sufficient to supply the entire below-poverty-line population.

Initiating this process will require close interaction among the Prime Minister's Office and the ministries of public health, food processing, and public distribution and consumer affairs to consider a number of policy options. First, government purchasing systems should consider the following options for the Public Distribution System (PDS) targeting the poor: distribute fortified *atta* instead of raw grain in the PDS; specify a lower extraction and lower phytate flour; and either subsidize the fortificant or raise the cost to the consumer. Second, initiatives are required to create public awareness regarding fortified foods including developing nutrition education in school curricula, utilizing the mass media, and cooperating with NGOs. Third, the public sector should move to create an enabling environment for the roller flour industry by obliging the organized processing sector to purchase only fortified flour; mandating that all refined flour be fortified; allowing for a 3-5 year transition period when government bears the cost of fortificant; providing exemptions from duties and taxes; and creating a comprehensive food safety and regulatory system to ensure a transparent framework. The present policy of indifference has to give way to a policy of confidence and cooperation.

The industry must play its role to fulfill its social obligation. Entrepreneurs must be made aware of the micronutrient malnutrition problem as well as the simple technology and the low costs involved in reducing vitamin and mineral deficiencies. With a proper cost-benefit analysis, some industry leaders may take up fortification on a *suo motto* basis. Although this process will gradually achieve its ultimate objectives, it should begin immediately. ❐

Preparing for Flour Fortification in Fiji

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Fiji and most other islands in the Pacific have micronutrient deficiencies. The incidence of iodine deficiency in Fiji is estimated to be 45 percent (National Nutrition Survey, 1994). Fiji legislated mandatory iodization of salt in 1996 and a household survey conducted in 1999 showed that 79 percent of households had salt with more than 50 ppm iodate. There is no documentation of VAD although a prevalence survey is now underway. VAD has been found to be a public health problem in other Pacific Island nations. The prevalence of anemia is 35 -53 percent in under-five children and 52-62 percent in pregnant women.

Advocacy for fortification has come from a number of fronts. National Nutrition Survey findings included a recommendation for fortification as a strategy to control IDA. An annual meeting of reproductive health professionals highlighted the issue of anemia in pregnant women and children and also cited the relevant sections in the International Rights of the Child. A recent study by the Food and Nutrition Center at a garment factory confirmed a 10-percent loss of productivity due to anemia. Applied to a 25-percent national anemia rate, this means a waste of 3 percent of Fiji's GDP. A National Task Force on Iron Fortification was established in 1997. The 1998 Fiji Plan of Action on Nutrition, passed by the Cabinet, recommended iron fortification.

Last year, a feasibility study considered options for the right vehicle and fortificant mixture for Fiji and after also considering rice and milk, wheat flour was recommended. The reasons were that all ethnic groups in Fiji consume wheat flour daily with an average per capita consumption of 169 g per day; consumption is increasing 6-8 percent annually; and all wheat is imported and passes through a single mill that produces 99-percent refined white flour.

Two premixes were considered. An optimal mix has been accepted that includes iron, 60 mg/kg; zinc, 30 mg/kg; riboflavin, 2 mg/kg; thiamin, 6 mg/kg; folic acid, 1.5 mg/kg; and niacin, 55mg/kg. The additional 60 mg iron per kg will represent an intake of 63 percent of the RDI. The addition of this premix will cost 0.246 Fiji cents per kg representing an increase in the consumer price of 0.27 percent. The total funding requirement including the fortificant, two dosifiers, packaging, information, education, communication, and other expenses is US$120,000 per year. A less expensive premix option including only iron, folic acid, and zinc would cost less than half that amount.

In order to implement this fortification program, we will need to create consumer demand. In addition to the domestic market, we believe that fortified flour made in Fiji may find a market in other Pacific Islands. Advocacy to industry in order to raise awareness and commitment to public health will be needed. Legislation, based on our Pure Food Act as well as the Codex Alimentarius will also be necessary. Current legislation on flour standards will also be reviewed. It is expected that new mandatory fortification legislation will be put in place before the end of 2000. Some further technical assistance will be required to establish the iron fortification program. ❐