

Food Fortification in Asia: Improving Health and Building Economies

An Investors Primer, Summarizing Investment Plans
for Five Asian Countries

Developed by the Governments of Indonesia, Pakistan,
People's Republic of China, Thailand, and Viet Nam,
with Assistance from the
Asian Development Bank and
The Keystone Center

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THE ASIAN DEVELOPMENT BANK NUTRITION AND DEVELOPMENT SERIES

The ADB Nutrition and Development Series was started in 2001 by Dr Joseph Hunt and covers the impact of malnutrition in Asia and the Pacific on poverty and depressed human and economic development. The Series stresses three themes: targeting nutrition improvements at poor women and children, with benefits to families, communities, and nations throughout the life cycle; reviewing and applying scientific evidence about nutrition impact for policies, programs, and developmental assistance that will raise the quality of human resources; and, creating opportunities for public, private, and civil sector partnerships that can raise the dietary quality of the poor; and enhance the learning and earning capability of poor children. The Series is intended for ADB member countries, development partners, and scholars interested in applying science and technology to investment decisions.

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Foreword

Improvements in human health lie at the heart of the Millennium Development Goals, which chart progress in reducing poverty in the developing world. This book takes a novel approach to showing how health and mental development can be improved by strengthening the food industry in Asia.

Based on an Asian Development Bank (ADB) investment planning exercise, five Asian countries (Indonesia, Pakistan, People's Republic of China, Thailand, and Viet Nam) have identified foods consumed by the poor and estimated the benefits and costs of fortifying those foods with essential micronutrients (vitamins and minerals). The results are stunning. For example, in the five countries where iron deficiency anemia is a public health issue, a variety of food vehicles can deliver iron in a package of micronutrients to one billion persons at \$0.08 per person per year. The benefits include reduced maternal deaths among anemic women and normal brain development among young children whose capacity to learn in school and advance in workplace achievement would otherwise be compromised.

This book synthesizes the findings of the country studies with interesting conclusions, such as:

- delivering essential micronutrients through the food sector is good public health policy;

- fortification technology is proven, cheap, and effective;
- fortification is part of an integrated strategy to improve health but it definitely fills a niche;
- public-private partnerships create public goods for the poor but with efficiency gains arising from private sector competition;
- benefits to human health and productivity are impressive, at costs that match the best public health interventions;
- good food production technologies, supported by legislative, regulatory, and trade reforms raise human capital through the market, and thereby save public health resources that can be put to better use, and strengthen Asia's clout in global food trade; and
- governments, donors, and civil society are the components of an important alliance to make food fortification into a regional public good that protects human health and builds economies.

ADB is pleased to share the results of its regional work on food fortification with colleagues, and looks forward to further dialogue with partners on how to make applied food science and technology available to Asia's poor consumers. This marriage of industrial and health policy is promising.

Geert van der Linden
Vice President
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Preface

The opportunity exists now to save more than a quarter of a million lives over the next 10 years in Indonesia, Pakistan, People’s Republic of China, Thailand, and Viet Nam by fortifying basic foods with vitamins and minerals. Reducing micronutrient deficiencies via fortification will help to fuel economies by lowering health care costs and increasing worker productivity. Also, fortification will improve the cognitive development of children, which in turn will expand and sustain economic development for years to come.

Food fortification is one of several strategies that can lift the tremendous human and economic burden of micronutrient deficiencies and malnutrition in Asia. And it is one of the most promising. With sometimes half of a nation’s population suffering from vitamin and mineral deficiencies, the fortification of common processed foods is an intervention that can protect large populations using sustainable market channels. With food fortification strategies supported and maintained through the market system, government resources and public health systems are freed to target the very poor who will not be effectively reached and require different intervention strategies.

This Investors Primer contains summaries of Country Investment Plans (CIPs) for Indonesia, Pakistan, People’s Republic of China, Thailand, and Viet Nam. The CIP summaries outline proposed

fortification projects that, if implemented, would protect more than one billion people in these five countries, every day. The consequent reductions in micronutrient deficiencies are projected to unlock more than \$4.5 billion in national economic benefits. These vast health, social, and productivity improvements can be leveraged through pump-priming investments of approximately \$100 million over 10 years.

To develop the CIPs, the Asian Development Bank and The Keystone Center spent two years collaborating with multisectoral Country Teams in the five countries of interest. The members of the Country Teams conducted the relevant research and analysis, and the CIPs they developed offer concrete and realistic fortification projects and define needed investments to improve health and build economies. The most up-to-date CIPs are available in their entirety from the principal investigators for each Country Team, to assist in due diligence. (See Annex A.) This document provides an overview of the investment opportunities, describes the analysis and consensus on which the CIPs rest, and summarizes each CIP project. The Country Teams are now working to match their fortification projects with a wide variety of financial partners, including domestic and international corporations, industry associations, international aid agencies and bilateral donors, and private philanthropies.

Acknowledgment

The special relationships formed in the course of preparing the Country Investment Plans will influence future partnerships within the five Asian countries and with donor partners seeking to build upon the findings of the plans. The country teams have brought leaders in the public and private sectors together in a unique way, and all stakeholders are prepared to take the recommendations of their plans to full resolution. My appreciation for the country teams, as well as the contributions of The Keystone Center for its strong advisory role to the planning process, is considerable.

I wish to acknowledge the contributions of the country team leaders and principal investigators: Dr. Dipo Alam and Dr. Hardinsyah, Indonesia; Mr. Mohammad Ayub and Dr. Abdul Kemal, Pakistan; Professor Yu Xiaodong and Dr. Sun Xuegong, People's Republic of China; Dr. Sangsom Sinawat and Dr. Visith Chavisit, Thailand; and Dr. Nguyen Cong Khan and Dr. Nguyen Xuan Ninh, Viet Nam. Their patient deliberation and vision for a future free of micronutrient malnutrition are impressive.

The joint leadership of Tom Grumbly and Jack Bagriansky set the tone for the valuable contribution of The Keystone Center team, which brought a capacious intelligence and deep commitment to seeing the potential of food technology reach the needy in all the countries. Keystone's Brad Sperber provided the careful and consistent management that made the regional and country consultations effective fora for communications and decision-making. The following consultants provided an opportunity for the country teams to test state-of-the-art approaches to food technology, planning, regulation, and economic assessment with a broad range of professional experiences across the world: Bienvenido Alano, Peter Adler, Jack Fiedler, Quentin Johnson, Rose Nathan, George Purvis, Kevin Sullivan, Herbert Weinstein, and Abraham Varghese.

A new dialogue has opened in Asia, about the convergence of industrial and health policy to solve nutrition problems that hold back the region. I look forward to seeing the country plans being realized and then replicated throughout Asia in the future.

Joseph M. Hunt

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Executive Summary

The persistence of micronutrient deficiencies in Asia is alarming and is damaging to lives and economies. The Asian Development Bank (ADB) has assisted five Asian nations in identifying ways to eliminate these deficiencies. In Indonesia, Pakistan, People's Republic of China (PRC), Thailand, and Viet Nam, the lack of dietary micronutrients—including key vitamins and minerals such as iron and vitamin A—will take a toll of more than one million lives over the next 10 years. In addition to causing the loss of precious human life, these vitamin and mineral deficiencies depress cognitive and physical development in young children, stifling educational performance and depressing future productivity. In adults, iron deficiency anemia (IDA) causes a debilitating fatigue that lowers work output in the agriculture, construction, and other manual-labor and blue-collar sectors. Even greater losses are suffered from low cognitive development in early childhood that depresses schooling achievement and later professional wages as white-collar workers. In these five countries, the 10-year productivity loss associated with IDA alone is projected at more than \$25 billion.

An effective mix of low-cost food-based, pharmaceutical, behavioral, and public health interventions can offer substantial protection from vitamin and mineral deficiencies. Food fortification—the addition of minute quantities of vitamins and minerals to common processed foods—can protect large populations that are often beyond the reach of health systems. ADB and the World Bank have identified micronutrient interventions as among the most cost-effective of development investments.

From August 2001 through mid-2003, multisectoral Country Teams from Indonesia,

Pakistan, PRC, Thailand, and Viet Nam participated in ADB's Regional Initiative to Eliminate Micronutrient Malnutrition through Public-Private Partnership. The five participating countries each produced 10-year Country Investment Plans (CIPs), which propose national food fortification programs to reduce the high prevalence of micronutrient deficiencies.

Over the next 10 years, the 14 fortification projects proposed in the five CIPs are projected to save more than 280,000 lives and reduce the economic burden with estimated savings of more than \$4.5 billion. The total cost of these interventions is about three-quarters of \$1 billion, most of which is absorbed by the food market. International investments of approximately \$100 million are sought, mainly to provide incentives for initial investment in production and the building of critical public systems, including regulation, monitoring, and public education.

The CIPs were developed through a collaborative process of cross-sector information sharing, capacity building, advocacy, and financial and public health analysis. The plans are the result of two years work by the five Country Teams, with technical assistance from ADB, the US-based nonprofit The Keystone Center, and other national and regional institutions. The Country Teams, whose membership reflects the breadth of public, private, and civic society, undertook the actual analysis, identified priorities, and recommended investments. This national ownership positions the CIPs for successful implementation.

The CIPs are founded on a regional consensus regarding the need for regulatory and trade structures to support investment in fortification. In a series of workshops, Country Team participants developed consensus statements that encouraged the building

of regional institutional capacity in food quality assurance, nutrition monitoring, communications, and advocacy.¹ Participants in these multisectoral workshops also adopted regional guidelines for fortified flour, oil, and “complementary” foods.*

The specific fortification projects outlined in the CIPs were identified on the basis of a feasibility analysis assessing industrial capacity and commercial potential in each country, as well as the projected impact of fortification on the prevalence of micronutrient deficiencies. A benefit-cost analysis model, developed specifically for the project, provides country-specific information regarding:

- implementation needs, capital investments, and recurring costs;
- government costs for food control, public education, and monitoring systems;
- best estimates for the protection of low-income and at-risk consumers based on consumer intake, industry coverage, and other factors;
- projections for reductions in the national prevalence of IDA and vitamin A deficiency (VAD), and estimated impacts of the addition of dietary folic acid; and
- a financial summary reviewing benefits and costs on annual and 10-year bases.

All five CIPs include a recommendation for investment in wheat flour fortification. In Pakistan and the western provinces of the PRC, flour products are staple foods consumed throughout rural and low-income populations. Given the high flour consumption among the poor, fortification promises significant reductions in IDA and folic acid deficiency (FAD). However, upgrading the traditional marketplace, including older production facilities and multiple small producers, represents a challenge for public policy and implementation. In Southeast Asian countries, centralized and modern flour production means that fortification technologies can be implemented in a relatively straightforward manner. The benefit-cost ratios for the flour fortification projects proposed in the CIPs range from nearly 2:1 to more than 9:1, but

approach the higher estimate when subsidies of fortificant costs to the flour industry are eliminated.

While rice fortification in Asia presents a number of technical barriers, the recent development of technology to fortify fish sauce and soy sauce offers an alternative strategy to protect rice-eating populations against IDA, including rural and low-income people. The CIPs for PRC, Thailand, and Viet Nam propose fortification strategies with estimated reductions in the prevalence of IDA of up to one-third. The projected 10-year benefit-cost ratios range from 7:1 in Thailand to nearly 12:1 in Viet Nam. These new food fortification vehicles have already undergone a three-year process of technical development, product testing, consumer acceptance, and effectiveness trials.

Micronutrient deficiencies in children aged 6-24 months represent a grave threat and a critical need. Young children who are micronutrient deficient are likely to be underweight, have their growth stunted, perform poorly in school, and earn wages later in life well below their potential. They also often die prematurely.² The CIPs for Indonesia, PRC, Thailand, and Viet Nam offer distinct approaches to reaching this critical segment with fortified complementary foods for young children via new partnerships, new products, and new marketing systems. These foods will help to optimize child growth and mental development during life’s “window of opportunity,” i.e., the first 2 years. The approaches range from capitalizing on available but unused production capacity to the development of new rural food enterprises. Proposals for blended public-private distribution systems promise penetration into the most at-risk areas. Projected coverage ranges from 15% in rural Viet Nam to 50% in rural Indonesia and 100% of the most at-risk children in selected western provinces of the PRC. By targeting the most vulnerable populations in Asia at this critical time in their lives, the returns in lives saved will be considerable, and the savings in reduced sickness and future productivity will be enormous.

Finally, the fortification of cooking oils in Indonesia, Pakistan, and PRC with vitamin A promises significant benefits in the reduction of child

¹ The consensus statements are available in Appendix B, p. 101 ff.

* Complementary foods are semisolid foods fed to infants and very young children as a complement to breast-feeding or commercial or homemade formula.

² Underweight preschoolers are at highest risk of premature death. Complementary foods address underweight and micronutrient deficiencies simultaneously, thus reducing two critical risk factors for mortality.

mortality and health care costs. Public health programs have done a good job of distributing vitamin A capsules twice a year to children under the age of five, and the clinical form of VAD that leads to blindness has been reduced. But the absence of staple foods enriched with vitamin A leaves a third of Asian children with subclinical VAD, which is the principal risk factor in the mortality of young children with communicable diseases like diarrhea and measles. That is why fortified staples like oil are essential to achieving the United Nations' Millennium Development Goal (MDG) of reducing under-5 child mortality by two-thirds by 2015. Given the centralized nature of the vegetable oil industry, the projected expenses for industrial upgrades and government food control and regulation are relatively modest. However, a number of technical issues remain to be resolved. Based on positive feasibility assessments for national programs in the three countries, product development and testing are proposed.

This Investors Primer provides an overview of the investment opportunities widely available in Asia

to reach the poor through micronutrient enrichment of dietary staples. The table on the following page summarizes the 14 specific projects proposed in the CIPs, and each of these projects is discussed in more detail in Chapter 3. These food fortification initiatives can contribute to the MDGs for health, including reducing infant, under-5 child, and maternal mortality rates, reducing hunger, and helping to ensure that children complete their primary education (by raising their cognitive capacity).

The key to fortification is its flexibility in delivering benefits within current food patterns across the region. Fortification of a few food vehicles (such as flour and condiments) in just five countries, along with \$80 million in seed financing and almost \$700 million in domestic financing over 10 years, could deliver iron and folic acid to one billion people at a cost of about eight US cents per person and a benefit-cost ratio of about 6:1. A real bargain! The investment model for selected countries provides a compelling case for resource mobilization in the region.

Summary of Costs and Benefits for the 14 Fortification Projects Proposed in the CIPs (in \$ thousands and thousands of deaths averted)							
Country and Project	Projected 10-Year Costs**	Projected 10-Year Benefits	Health Impacts			Seed Financing Request	
			Deaths Averted	Health Care Cost Saved***	Productivity Gained****		
	(\$'000)	(\$'000)	(\$'000)	(\$'000)	(\$'000)	% of 10-year cost	Amount
Indonesia							
Wheat Flour	20,586	104,134	111	924	103,210	24%	4,852,770
Cooking Oil	60,372	666,377	44	555,802	\$110,575	22%	13,396,889
Comp. Foods	67,138					27%	17,928,440
Pakistan							
Wheat Flour	165,594	337,862	38	9,603	328,259	22%	37,006,536
Cooking Oil	35,833	138,260	42	18,234	120,026	22%	7,836,512
PRC							
Soy Sauce	240,238	2,250,238	0.5		2,250,056	1%	3,071,000
Wheat Flour	184,125	543,346	32	5,195	538,151	5%	8,702,000
Comp. Foods	14,323					36%	5,162,170
Thailand							
Fish Sauce	24,463	160,725	0.014		160,725	5%	1,221,952
Wheat Flour	2,759	13,404	5	384	13,019	18%	490,739
Comp. Foods	3,796					14%	525,614
Viet Nam							
Fish Sauce	21,740	257,825	0.8		257,825	19%	4,089,300
Wheat Flour	3,815	37,104	8	2,216	34,889	18%	669,926
Comp. Foods	43,637					15%	6,516,161
Totals	759,347*	4,509,275	281	592,358	3,916,735	13%	81,337*

* Totals are exclusive of complementary foods proposals. Sums in Table 7 include complementary foods proposals.

** Costs are broken down in more detail in Table 7.

*** Health Care Costs Saved through lower utilization of health care services by children and/or adults.

**** Gained Productivity from: (a) higher future productivity due to improved cognitive development in children; (b) higher current productivity in adults engaged in blue collar and heavy manual labor; and (c) discounted future lifetime earnings of children whose deaths were averted.