Micronutrient Initiative

Solutions for hidden hunger

Latin America and Caribbean Region Food Industry Assessment

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www.micronutrient.org

Acknowledgments

This report represents a substantial effort by a considerable number of people. Primary contributors to the body of work include Dr. Erick Boy (Chief Scientific Advisor, MI), Dr. Annie Wesley (Senior Program Specialist, MI), Zoe Boutilier (Program Officer, MI), Elizabeth Eitner (Consultant to the MI), Dr. Herb Weinstein (Consultant to the MI), and Dr. Agide Gorgatti Neto (Consultant to the MI). Special guidance and advice were provided by M.G. Venkatesh Mannar (President, MI) and Liz Whitehouse (Whitehouse and Associates, South Africa). Some of the data was graciously provided by industry contacts including, but not limited to, Richard Hanneman of Morton Salt and Hector Cori of DSM. Editorial comments were provided by Helene Touchette (Executive Assistant, MI).

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1. Executive Summary

Two billion men, women, and children, mostly in developing countries, suffer from "hidden hunger". In the developing world, more than 40% of women are anemic, nearly 20% of the population suffers from iodine deficiency disorders, and about 25% of children have subclinical Vitamin A deficiency. Micronutrient deficiencies are associated with a range of detrimental effects, from mild and reversible to severe and irreversible. Clinical outcomes of micronutrient deficiencies include impaired growth and cognitive development, poor birth outcomes, anemia, cretinism, and blindness.

In the Americas, micronutrient deficiencies have been under siege for decades. In terms of food fortification, it can be said that the "New World" is a world leader. North America was the first region in the world to begin massively fortifying foods for public health purposes. Today, Latin America is a leader in food fortification among the world's developing regions. And yet, despite all this leadership, there remain pockets of populations who have not benefited from food fortification. Even today, there are distinct groups of people in which the incidence of micronutrient malnutrition is unacceptably and disproportionately high. For the most part, these people are women and children. They are poor; they live in rural areas; and many are indigenous peoples.

Reaching the "hard to reach" with fortified food is not easy. But it is a moral obligation, especially in a hemisphere where so much wealth coexists side by side with instances of abject poverty.

Reaching the "hard to reach" in Latin America will require public private partnerships. It will require the cooperation of governments, technical and financial assistance agencies, non-governmental organizations, and industries. In this report, we have conducted an in-depth analysis of the food industry because we believe that ultimately, food fortification programs can only be sustained by free market forces. Thus, a thorough understanding of the production, import, export and consumption of a potential food vehicle must underpin all planning for fortification programs. This understanding of the food industry must be combined with an understanding of the epidemiology of micronutrient deficiencies in the region, in order to design effective and sustainable food fortification programs.

After systematically detailing the production, trade, and apparent consumption of the six food vehicles and the epidemiology of micronutrient deficiencies in the region, this report arrives at a number of recommendations for action.

1. The private sector (particularly wheat, sugar, and salt producers) should be publicly recognized for past contributions to public health, and should be motivated to seek further future opportunities.
2. Gaps in the epidemiological data must be filled as a prerequisite for food fortification planning and evaluation. Particularly, further data on Vitamin A, zinc, folate, and B12 nutrition status is needed.
3. International technical and financial assistance agencies should jointly encourage and support governments to pursue sub-regional food fortification initiatives adopting the model of the harmonized food fortification as a public good Central

America program. Harmonized food fortification regulations would benefit the Andean and CARICOM subregions particularly.

4. Operational research should be carried out to determine the cultural and financial feasibility of fortifying rice, sugar, and salt with iron, with the eventual goal of applying country-specific combinations. In countries with persistently high anemia prevalence, this may be the only way to ensure that women of child bearing age receive enough iron on a daily basis.

2. Introduction and Scope of Study

In March 2007 the Micronutrient Initiative (MI) was contracted by the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDRB) to conduct a situation assessment of the food industry in Latin American and Caribbean (LAC) countries, focusing on commodities that may be fortified with micronutrients. This situation analysis is part of ICDDRB's recently launched "Mainstreaming Nutrition Initiative" (MNI) supported by the World Bank.

Under the terms of said contract, MI has undertaken a situation assessment of the production, consumption and trade of **wheat flour, corn flour, sugar, salt, edible vegetable oils, rice, and vitamin and mineral (VM) premixes** in the Latin American and Caribbean (LAC) region. These foods have been selected because from a technical viewpoint these foods could be fortified with micronutrients. The feasibility of such fortification depends on volumes of production, trade, and consumption; and patterns of distribution in the region, among other factors.

The objective of this report is to analyze market-based food fortification opportunities in light of the epidemiology of vitamin and mineral deficiencies in the region; with the aim of identifying concrete opportunities for future investment. For each country and for each sub-region, this report contains an **industry mapping** in which the production and trade flows of six potential fortification vehicles (wheat flours, maize flours, rice, edible vegetable oils, sugar, and salt) are described. For each country and each sub-region, this report also contains a description of the **policy and regulatory environments** that apply to the fortification of the six potential vehicles (wheat flours, maize flours, rice, edible vegetable oils, sugar, and salt).

In the final sections of this report, **concrete recommendations for investment** are made based on the industry mapping and the examination of policy and regulatory environments. The recommendations represent a **regional plan** for addressing the most pressing micronutrient deficiencies of the Latin American and Caribbean region through food fortification.

3. Background

The Potential of Food Fortification as a Public Health Measure

There is no single solution to combat the 'hidden hunger' produced by the chronic dietary insufficiency of essential vitamins and minerals. However, years of program experience have identified several solutions which are not mutually exclusive but complement one another. The solutions include ingestion of oral supplements (tablets, capsules and syrups), public health measures, food fortification and other food based approaches. Micronutrient deficiencies can be effectively prevented and even eliminated if populations consume adequate quantities of the bio-available forms of required vitamins and minerals on a regular and ongoing basis.

Food fortification is a medium to long term solution to alleviate specific nutrient deficiencies in a population. It involves addition of measured amounts of a nutrient-rich "premix" containing the required vitamins and minerals to commonly eaten foods during processing.

Food fortification involves the identification of commonly eaten foods that are centrally processed so that fortification can be dovetailed into the food production and distribution systems. This also means that fortification within the existing food patterns does not change the dietary practices of the population and so does not require special individual compliance. Staple foods and condiments are the obvious choice for fortification given their consistent consumption by large sections of the population. In most developing countries the choice of vehicles is limited to a handful of staple foods and condiments: cereals, oils and fats, sugar, salt and sauces. The vitamins and minerals used for fortification typically include vitamins A, D, folic acid and other B-complex vitamins, iodine, iron and zinc.

The start-up cost for food fortification is relatively inexpensive for the food industry, and recurrent costs are rapidly passed on to the consumer when targeted and mass consumed foods are used. The benefits of fortification can extend over the entire life cycle of humans. It can thus be one of the most cost-effective means of overcoming micronutrient malnutrition. The economics of food fortification has played an important role in its implementation in public policy.

A well-planned food fortification program can provide meaningful quantities of essential micronutrients to large populations on a permanent and self sustaining basis. In most situations the enormous benefits of a carefully planned and implemented fortification program far outweigh any potential risks. Food fortification can thus be one of the most cost-effective means of overcoming micronutrient malnutrition. Food fortification efforts need to be integrated within the context of a country's public health and nutrition situation and a clearly defined component of an overall micronutrient strategy that uses a combination of interventions to address key deficiencies.

Food Fortification, Past and Present, in Latin America and the Caribbean

Over the past 20 years there has been significant progress across Latin America and the Caribbean, both in recognizing the importance of addressing vitamin and mineral deficiencies, and in implementing interventions to address them. In the region, food fortification is considered as an intervention of choice. Economic growth, regional trade, and the associated expansion of food markets and of public programs now offer new opportunities to expand the coverage and improve the quality of fortified staple foods and condiments being consumed by vulnerable groups.

Across the region, many staple foods are already being fortified. Flour fortification is mandatory or voluntary in 22 countries. Fortification of corn flour is expanding in the larger mills in Mexico and across Central America. Many Central American countries have successfully scaled up effective fortification of sugar with vitamin A and have shown evidence of impact on a sustained basis. Rice fortification with Vitamin A and B vitamins has been introduced on a trial basis in Colombia and Brazil, and legislation passed in Panama for its mandatory fortification. Elsewhere large pre-school and school feeding programs have used locally produced/available foods. These include milk, of which the fortification with iron has been successfully scaled up for specific target groups: pre-school children in Chile, Cuba and Argentina.

Notwithstanding these efforts, a recent World Bank strategy document[1] notes that: "in Latin America [some] countries [still] have a serious problem of undernutrition or micronutrient malnutrition." Guatemala, Haiti, and Honduras are cited as examples; and there are still also significant gaps in the coverage with micronutrients of poor populations and vulnerable groups in many countries.

A systematic understanding of viable market based opportunities to meet these gaps is needed to accelerate the fortification of staple foods and condiments through public-private-civic partnerships. Therefore the objective of this report is to analyze market-based food fortification opportunities in light of the epidemiology of vitamin and mineral deficiencies in the region; with the aim of identifying concrete opportunities for future investment.

[1] Repositioning Nutrition as Central to Development: A Strategy for Large-Scale Action. The World Bank (2005)

4. Methodology

Data Collection and Organization:
The data presented in this report was collected by a Project Team consisting of MI staff and consultants. For coordination and reporting purposes, data is grouped on a country basis as well as a sub-regional basis as follows:

1. Central America Sub-region: Mexico, Costa Rica, Belize, El Salvador, Guatemala, Honduras, Nicaragua, Panama
2. Southern Cone Sub-region: Argentina, Chile, Uruguay, Brazil, Paraguay
3. Andean Sub-region: Bolivia, Columbia, Ecuador, Peru, Venezuela
4. Caribbean Sub-region: Cuba, Puerto Rico, Dominican Republic, Antigua, Bahamas, Barbados, Bermuda, Curacao, Dominica, Grenada, Guadalupe, Guyana, Haiti, Jamaica, Neth. Antilles, St. Kitts, St.Lucia, St.Vincent, Suriname, and Trinidad & Tobago

All information included within this report was obtained via desk review (published documents, unpublished documents, internet, and industry reports) or via informal interviews (with government personnel and producers in the LAC region). Key data sources included:

Data on Micronutrient Deficiencies:

- Summarized data on undernutrition in the region (page 9) is based on the most recent available statistics (UNICEF 2003). Country by country data is based on slightly older data (UNICEF 2002).

Data on Food Production:

- Wheat flour, maize, and edible oil figures were taken from FAO statistics (FAOSTAT database, found at **http://faostat.fao.org/)**. Wherever possible, these figures were cross-checked with local sources on production.
- Salt production figures are derived from statistics compiled by MI and Iodine Network, based on inputs from organisations working with the salt sector.
- Sugar production figures are from local sugar authorities and international statistical websites.

Data on Trade:

- Import and Export trade figures were extracted from FAO statistics (FAOSTAT database, found at **http://faostat.fao.org/)** and cross-checked wherever possible with local industry statistics.

Data on Population and Demographics:

- Population figures are taken from the United Nations Population Division website (**http://esa.un.org/unpp).**

Data on Food Consumption:

- Consumption figures are calculated from the above figures using the formula (*local production + imports – exports = apparent consumption).*

Data on Industry and Industry Associations:

- The data on local producers were obtained from numerous sources including internal MI sources, published trade directories and in-country personal contacts of consultants with technical food fortification expertise as well as knowledge of the regional food industry.

Data on sub-regional situation assessments:

- Crop reports, production and distribution trends are taken from various sources including: the USDA GAIN reports (http://www.fas.usda.gov), FAO Statistics Division (http://faostat.fao.org), as well as industry and processor websites.
- Salt iodination statistics were obtained through UNICEF (http://www.childinfo.org) and productions statistics through USGS (http://minerals.usgs.gov).
- Regulatory standards and environments were obtained through industry sources, government representatives and websites, knowledge of regulatory services, Health in the Americas, 2002 Edition and PAHO report FCH/NU/49-24/04.
- Rice consumption data was based on the Rice Congress of the Americas 2007 held in Cancun, Mexico.
- Information on sub-regional trade and treaties was obtained from Mercosur (http://www.mercosur.int), ALADI (http://www.aladi.org), the Andean Community – CAN – (http://www.comunidadandina.org), CARICOM (http://www.caricom.org), and CAFTA-DR.

Data on country-by-country analysis:
In addition to the resources outlined in the sub-regional situation assessment, the following resources were also used:

- FAO's participation in the 5th WTO Ministerial Conference, Cancun, Mexico (10-14 September 2003) - Important commodities in agricultural trade: Sugar
- FAO Medium-term prospects for agricultural commodities PROJECTIONS TO THE YEAR 2010
- FAO Proceedings of the 20th Session of the International Rice Commission (Bangkok, Thailand, 23–26 July 2002)
- OMNI/USAID Rice Fortification For Developing Countries - August 1998
- Twenty-ninth FAO Regional Conference for Latin America and the Caribbean, Caracas, Venezuela, 24 to 28 April 2006
- Child malnutrition in Latin America and the Caribbean (UNICEF)
- Vitamin A deficiency in Latin America and the Caribbean: An overview: *Jose O. Mora, Miguel Gueri, and Olga L. Mora*
- Food Security Update for the USAID Mission in Honduras: *Bonnard, Patricia and Sandra Remancus. 2002.*
- Average Vegetable Oils Consumption based on FAO Food Balance Sheets 2001 Scenario for Vegetable Oil Fortification with Vitamin A in 75 Countries (GAIN)
- Hunger and Malnutrition in the Countries of the Association of Caribbean States (ACS)

Data Analysis:
The preliminary reports were submitted to the MI where they were reviewed internally. After this process, the integrated report was circulated among the regional consultants for further input.

5. Regional Analysis of Undernutrition and Micronutrient Deficiencies

The nutritional status of Latin American and Caribbean populations is an indicator of its social inequalities. It is a reflection of great income inequalities and insufficient relevance given to food and nutrition in the member countries' political agenda. Overall, food production triples the energy requirements of the population, 53 million people live without access to sufficient food, and 16% of children under 5 years survive in conditions of chronic malnutrition. The disability-adjusted life years (DALYs) lost to maternal and child undernourishment in the less developed countries, excluding the United States and Canada, have been estimated at 4,677,000, while the DALYs lost to non-communicable disease risk factors (high blood pressure and cholesterol levels, overweight, low intake of vegetables and fruits, and sedentary lifestyles) amount to 12,458,000 DALYs[2].

There are clear subregional, intercountry, and intracountry contrasts that reflect heterogeneous social inequalities and describe the typical situation in the region, which also permit a more pragmatic approach to identifying solutions for the hunger and malnutrition problem.

The prevalence of global undernutrition (or low weight-for-age) among children in the Caribbean basin shows positive improvements between the periods 1988-2001 and 2000-2002; however, as can be seen in the following table, current levels remain high in many of the countries, particularly in Guatemala, Saint Vincent and The Grenadines, Haiti, Honduras, Guyana, Surinam, and El Salvador, where global malnutrition affects between 10 and 24 percent of the children under five years of age. When analyzing the number of malnourished boys and girls under five years of age, ACS[3] countries with relatively low rates but significant population groups affected stand out. Thus, of the 2.4 million children with low weight, 838,000 are Mexicans, 451,000 are Guatemalans, 320,000 are Colombians, and 200,000 are Haitians.

In the case of chronic malnutrition or stunting (or low height-for-age), Guatemala stands out, since even though it has achieved significant progress it still presents the worst situation among all the Latin American and Caribbean countries. Together with Honduras, moreover, Guatemala presents a deficit that is over ten times greater than the expected average value (2.5 percent), followed by Haiti, El Salvador and Nicaragua. In absolute numbers, among the 4.9 million children showing stunted growth there are 1.98 million Mexicans, 865,000 Guatemalans, 646,000 Colombians, 354,000 and 286,000 Hondurans.

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[2] World Health Organization. The World Health Report 2002: reducing risks, promoting healthy life

[3] Association of Caribbean States (ACS): Antigua and Barbuda, Bahamas, Barbados, Belize, Colombia, Costa Rica, Cuba, Dominica, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Dominican Republic, Saint Kitts and Nevis, Saint Vincent and the Grenadines, Saint Lucia, Suriname, Trinidad and Tobago, and Venezuela.

Table 1: Anthropometric Indicators of Undernutrition in LAC children Under 5

Average Anthropometric indicators of undernutrition for children under 5 years of age in countries in Latin America and the Caribbean			
Country	% of U5 in 1995-2001 suffering from moderate and severe:		
	Stunting	Underweight	Wasting
Guatemala (ESMI 2002)	49.3	22.7	1.6
Honduras (DHS 2005)	24.7	11.4	1.1
Ecuador (ENDEMAIN 2004)	23.2	9.4	1.7
Bolivia (DHS 2003)	26.5	7.5	1.5
Nicaragua (SIVIN 2003-2005)	12.9	12.0	2.0
Peru (DHS 2004)	25	7.0	1.0
El Salvador (FESAL 2003)	18.9	10.3	1.4
Haiti (DHS 2006)	23	17.0	5.0
Mexico (ENSANUT 2006)	12.7	5.0	1.6
Colombia (DHS 2005)	12.0	7.0	1.3
Panama (Encuesta de Vida, MEF 2003)	20.6	6.8	1.3
Venezuela	14.0	5.0	3.0
Argentina	12.0	5.0	3.0
Brazil (DHS 1996)	10.5	5.7	2.3
Paraguay	11.0	5.0	1.0
Saint Lucia	11.0	14.0	6.0
Guyana	10.0	12.0	12.0
Uruguay	8.0	5.0	1.0
Antigua & Barbuda	7.0	10.0	10.0
Barbados	7.0	6.0	5.0
Costa Rica	6.0	5.0	2.0
Dominica	6.0	5.0	2.0
Dominican Republic (DHS 2002)	10.7	5.9	1.2
Cuba	5.0	4.0	2.0
Trinidad & Tobago	4.0	7.0	4.0
Jamaica	3.0	4.0	4.0
Chile	2.0	1.0	0.0
Belize		6.0	

Source: Adapted & updated from UNICEF (Table 2, 2003). "Moderate and severe" means below minus 2 SD from median (W/A for underweight; W/H for wasting; H/A for stunting) for reference population WHO/NCHS.

Significant progress has been achieved in decreasing hunger and undernutrition in some countries, like Mexico, where, according to the National Health & Nutrition Survey of 2006, national low weight-for-age, low height-for-age, and height-for-weight prevalence rates were only 5%, 12.7%, and 1.6%, respectively. The absolute numbers for children under five years were: 472,890 underweight children, 1,194,805 stunted children, and

153,000 wasted children. Improvement in these indicators is attributed to the combination of health interventions with high coverage that has taken place dynamically in the interim: vitamin A supplementation, immunizations, deworming, clean water, nutrition education and food/nutrition assistance programs.

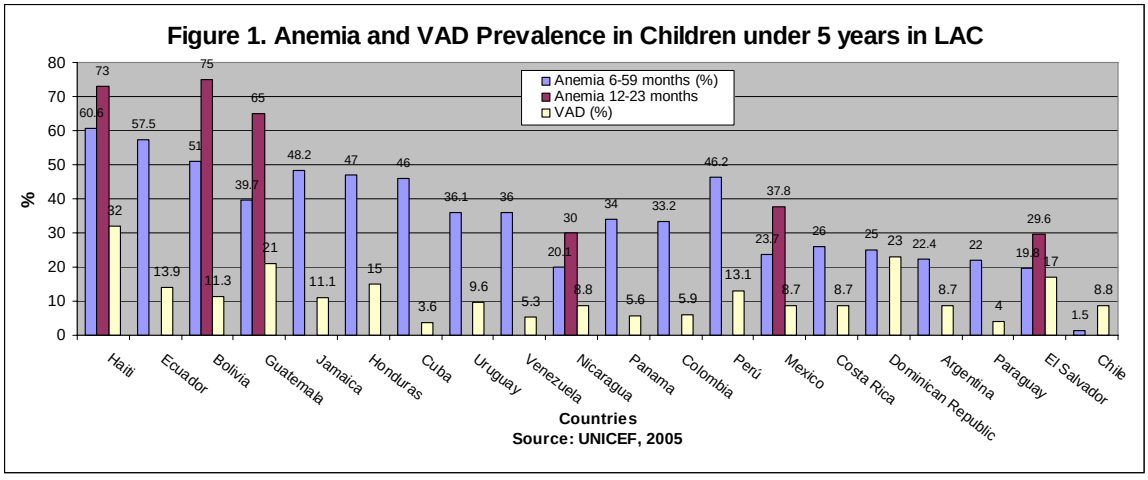
Vitamin and Mineral Deficiency:

Micronutrient deficiencies constitute a "hidden" form of malnutrition that has been under siege in Latin America for a long time, so much so that Iodine and Vitamin A deficiency disorders (IDD and VADD, respectively) are no longer considered serious public health problems in most countries in this region. IDD has been effectively controlled through universal salt iodization with few exceptions; namely, Guatemala (where enforcement and consistent compliance by salt producers has been historically erratic), and Haiti and the Dominican Republic (where salt production and consumption habits have made iodization a political, communications and technological challenge).

Severe vitamin A deficiency (VAD) was reported in sub-national surveys from Brasil in the 1980's (Sao Paulo, Minas Gerais, Belo Horizonte, Mato Grosso, Paraiba, and Bahía), Paraguay and Peru. There is no national level data available on the prevalence of VAD in these countries. On the other hand, VAD was a serious national public health problem ($\geq$ 20% prevalence of low serum retinol) in Nicaragua (31% in 1993) and El Salvador (36% in 1989). At present, the combined effects of vitamin A supplementation for children under 5 years of age and sugar fortification have resulted in VAD not being a public health problem (<5%) in either country since the late 1990's and early part of this decade. Significant reductions have also been documented in Guatemala and Honduras, where sugar is also fortified with vitamin A.

Anemia is the most frequent pathology related to micronutrient deficiencies in the LAC region, with greater prevalence among pregnant and breastfeeding women and in children under 2 years of age.

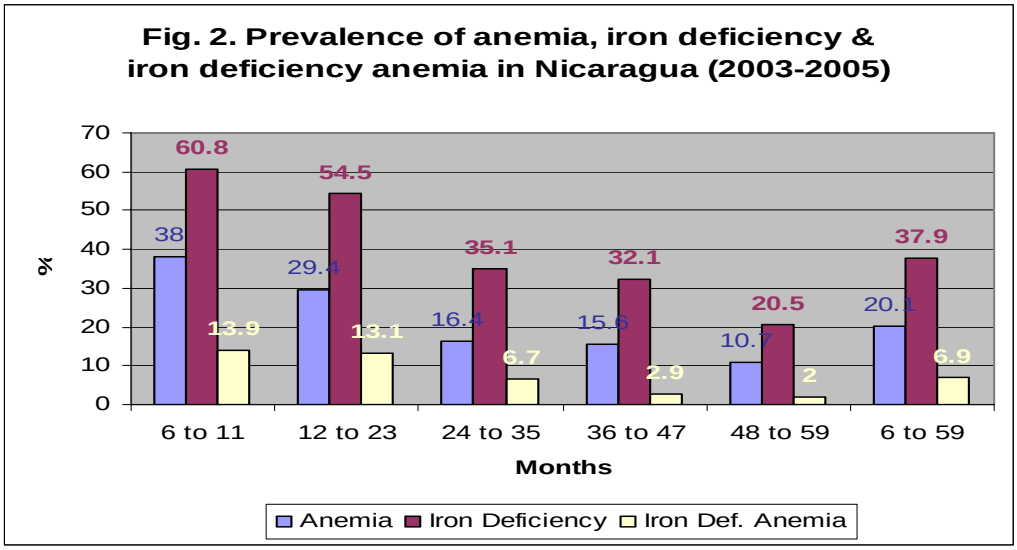
Figure 1: Anemia and VAD Prevalence in Children under 5 years in LAC



Iron deficiency is usually the most frequent cause of anemia but not always the only nutritional cause, since other micronutrients also contribute to the condition. In Costa Rica, of the 22.1 percent of breastfeeding mothers found to be anemic, the deficiencies were of 48.7 percent in iron, 84.2 percent in folic acid, 5.3 percent in vitamin B12, and 4.9 percent in vitamin A. Low socioeconomic level was the key factor explaining the deficiency[4]. By far, the most common micronutrient deficiency associated with anemia is iron deficiency, particularly during the first 2 years of life, diminishing with age thereafter.

In Nicaragua, for example, anemia prevalence among children 12-23 months old has decreased from 50% to 22% between 1993 and 2005. Iron deficiency accounts for one third of all cases of anemia, while there are almost 2 cases of iron deficiency for every case of anemia in the 6-59 months age group[5].

Figure 2: Prevalence of Anemia, Iron Deficiency, and Iron Deficiency Anemia in Nicaragua



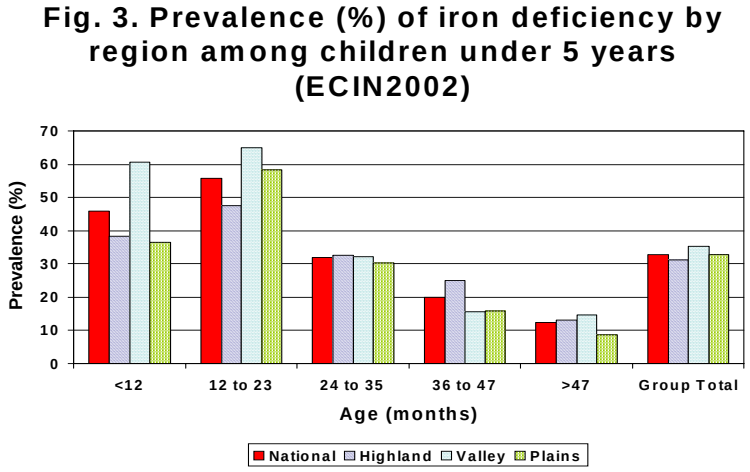
In Bolivia, 8 of each 10 children under 2 years of age has anemia. Approximately 50% of all cases of anemia are associated with iron deficiency in the 6 to 59 months group. Iron deficiency (with and without anemia) affects over 30% of all children 6 to 59 months of age; however, during the first 23 months of life approximately 50-60% of all children will have suffered from iron deficiency, particularly in the Plains ("Llano") (See Figure 3

[4] Blanco A, Rodríguez S, Cunningham L. Anemias nutricionales en mujeres lactantes de Costa Rica [Nutritional anemia in nursing women in Costa Rica]. Archivos Latinoamericanos de Nutrición, 2003, 53 :28-34.

[5] Ministerio de Salud de Nicaragua. Sistema Integrado de Vigilancia de Intervenciones Nutricionales (SIVIN). First (2002-2003) and second (2004) year reports. Managua, Nicaragua.

below). And iron deficiency explains only one third of all cases of anemia among Bolivian women of child bearing age[6].

Figure 3: Prevalence of Iron Deficiency by Region in Bolivia



There is very scant data on the national prevalence of folate deficiency in Latin America:

• **Chile (2000)**

— among the elderly, 33% of women and 50% of men showed low serum folate levels
— 20% of women and 10% of the men showed marginal folate levels
— 4% of the total sample had anemia and 1-2% showed macrocytosis (a presumptive sign of folate deficiency)
— 23% of women and 13% of men had folate consumption levels below the RDA

• **Venezuela (2005)**[7]

— Population samples from blue collar and low socioeconomic groups were studied as part of 3 different national surveys between 2001 and 2003 to determine the magnitude of folic acid and B12 deficiency in Venezuela. A total of 5,652 serum samples were processed to determine folic acid and vitamin B_{12} concentrations. The sample included infants, children, adolescents and pregnant women.
— Overall prevalence of folic acid deficiency was between 27.5 and 81.79%. Nationwide vitamin B_{12} deficiency affected 11.4% of the population, as inferred from a sample representative of the main Venezuelan cities. Prevalence of folic acid and vitamin B_{12} deficiencies in pregnant women from the Greater Caracas Area was 36% and 61%, respectively.

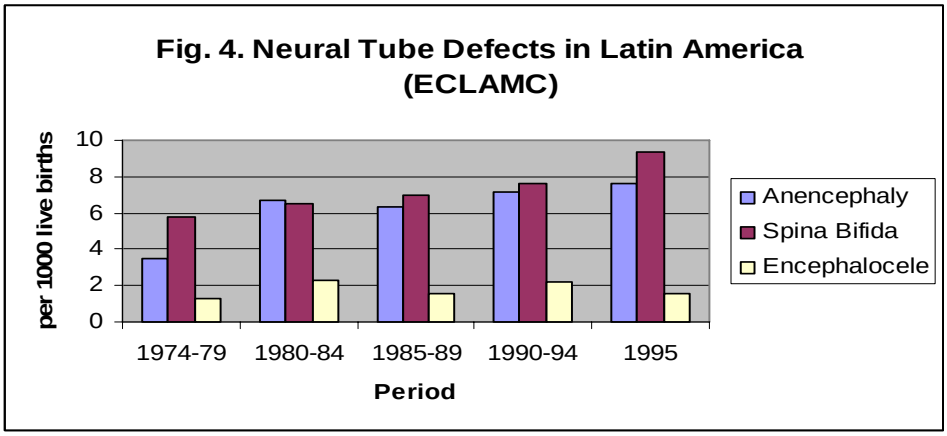
[6] PAHO/MI. Encuesta de Consumo e Impacto Nutricional (ECIN2002). La Paz, 2002 (unpublished report of a national survey on anemia, iron nutritional status and food/nutrient consumption).
[7] García-Casal MN, Landaeta- Jiménez M, Osorio C, Leets I, Matus P, Fazzino F, Marcos E. Folic acid and vitamin B_{12} in children, adolescents and pregnant women in VenezuelaAn Venez Nutr v.18 n.2, 2005

- **Costa Rica (1996)**[8]
  The report of the latest National Nutrition Survey informs about the prevalence of anemia, which was estimated from a total probabilistic sample of 884 women of reproductive age, representative of the metropolitan area (Capital), other urban areas, and the rural areas of Costa Rica. Anemia was present in 18,6% of the women. Severe to moderate iron deficiency (ferritin < 12 µg/L) and folate deficiency (serum folate < 6 ng/dl) were found in 43,2% and 24,7% of women respectively, with statistically significant differences by area of residence. In women of reproductive age, iron deficiency is the main cause of anemia, followed by deficiency of folate. Intestinal parasites were not a major cause of anemia in Costa Rica. In summary, despite the favorable health conditions present in Costa Rica, the prevalence of anemia and of iron deficiency were still similar to those of the other Latin American countries.

- **Mexico (1999)**[9]
  Data from the National Nutrition Survey in 1999 (ENN-99) was obtained from a probabilistic sample of 1,966 children and 920 women. Folic acid was measured in total blood by a microbiological method. Vitamin A deficiency (retinol <10 mg/dl) was infrequent in children and women. However, sub-clinical VAD (10 mg/dl <retinol<20 mg/dl) affected 25% of children. The prevalence of folate deficiency varied in children (2.3 to 11.2%), while in women it was 5%. Folate deficiency was less in children of higher socioeconomic level (OR=0.62, *p*=0.01), and in those with a higher vegetable intake (OR= 0.22, *p*=0.01).

Given this paucity of information on biochemical assessment of folate status in the region, the prevalence of neural tube closure defects (NTD) may be used as proxy for peri-conceptional folate deficiency.

Figure 4: Neural Tube Defects in Latin America



[8] Ministry of Health. Prevalence of nutritional anemia in women of reproductive age. Costa Rica. National Nutrition Survey, 1996

[9] Villalpando S, et al. Estado de las vitaminas A y C, y folato en niños menores de 12 años de edad y mujeres de entre 12 a 49 años de edad. Una encuesta probabilística nacional. Salud Publica Mex 2003;45 supl 4:S508-S519.

Information on neural tube closure defects in Latin America is scant. There are no population-based birth defect registries but there is a collaborative hospital-based registry, the Latin America Collaborative Study of Congenital Malformations (ECLAMC)[10]. ECLAMC was started in 1967 and includes hospitals distributed over all South American countries. It is part of the International Clearinghouse for Birth Defects Monitoring Systems. The registry covers 215,000 births per year, which is less than 1% of all births in the region.

More recently, the March of Dimes published estimates of birth defects for each country (see Table below).[11] Despite obvious limitations, such as the low percentage of births assisted by trained personnel in some countries, the stigma associated with reporting stillbirths or neonates with gross anatomic defects, etc, these estimates provide some guidance as to where the higher NTD rates and the largest absolute numbers of NTD cases occur. The greater numbers of babies with an NTD are born in Brazil, Mexico, Colombia, Argentina, Peru, Venezuela, and Guatemala.

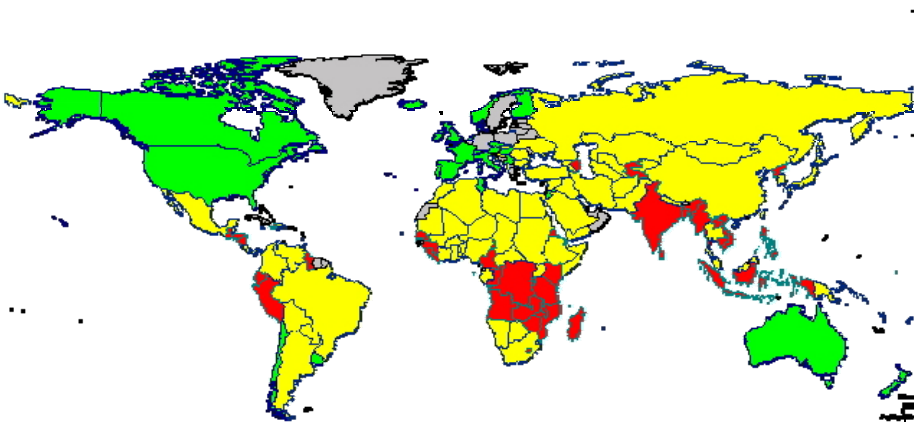
Table 2: Annual Number of Births in LAC Affected by Neural Tube Closure Defects

Country	NTD cases	Total births
Haiti	149	256000
Nicaragua	433	173000
Argentina	1520	724000
Barbados	5	3000
Belize	15	6000
Bolivia	534	267000
Brazil	6390	3363000
Chile	545	287000
Colombia	1958	979000
Costa Rica	46	92000
Cuba	241	134000
Dominican Republic	362	201000
Ecuador	616	308000
El Salvador	418	167000
Grenada	4	2000
Guatemala	1023	409000
Guyana	34	17000
Honduras	510	204000
Jamaica	97	54000
Mexico	5740	2296000
Panama	153	61000
Paraguay	340	170000
Peru	1212	606000
St. Lucia	5	3000
St. Vincent & Grenadines	4	2000
Trinidad & Tobago	31	17000
Uruguay	58	58000
Venezuela	1154	577000
Total	23,602	1143870

[10] Congenital Malformations Worldwide: A report from The International Clearinghouse for Birth Defects Monitoring Systems . International Centre for Birth Defects, Italy. 1997
[11] : March of Dimes: Global Report on Birth Defects. New York (2006).

Finally, the existent information indicates that zinc deficiency would represent significant nutrition problems in Guatemala, Honduras, Nicaragua, Haiti, Ecuador, Peru and Guyana, where the estimated risk of zinc deficiency based on the prevalence of childhood growth stunting and the percent of individuals at risk of inadequate zinc intake is high (countries highlighted in red in map below), according to the International Zinc Nutrition Consultative Group (IZiNCG)[12]. So far, the only country with a national Zinc deficiency survey is Mexico, where the risk of zinc deficiency is moderate.

Figure 5: Estimated National Risk of Dietary Zinc Deficiency



Estimated national risk of dietary zinc deficiency.
= High = Intermediate = Low
(Source: IZiNCG. Food & Nutr Bull 2004; 25(1):).

Taking the above into account, policy orientation should focus basically on lowering the incidence of anemia, tackling the cause of the greatest portion of anemia, namely iron deficiency, but without entirely neglecting the surveillance of the other deficiencies of epidemiologic importance to each country setting. Investigation of the magnitude of zinc deficiency in the high risk countries should also be pursued, as correction of this deficiency would be required to overcome the high levels of stunting that affect the children in these settings.

The most vulnerable groups in the region are rural women and children. Although there is insufficient information to support these affirmations exhaustively, the data indicate that the main poverty and malnutrition problems are found among children under five years of age and among women from ethnic minorities and poor households in rural areas. Consequently, "these characteristics, together with the risks derived from environmental problems that arise from the high frequency of natural disasters and from

[12] International Zinc Nutrition Consultative Group (IZiNCG) Technical document # 1. Assessment of the Risk of Zinc Deficiency in Populations and Options for Its Control. Christine Hotz and Kenneth Brown (editors). Food and Nutrition Bulletin. 2004; 25(1): S130-S162.

geopolitical factors ensuing from social and armed conflicts, become the key factors of nutritional vulnerability"[13]. Information derived from the Demographic & Health Surveys (DHS) and the Multiple Indicator Surveys (MICS) available for the region show that the prevalence of under nutrition in the rural areas is 1.5 to 2.5 times greater than in the urban areas. Of particular significance is the fact that the higher prevalence of malnutrition often occurs among indigenous populations.

For example, 35% of indigenous children and only 21% of non-indigenous children in Guatemala[14] had low weight-for-age. The corresponding prevalences of stunting are 67% and 34%. Conversely, in Trinidad & Tobago[15] it is people of Indian origin that comprise the most vulnerable ethic group. Global under nutrition affects 10% of the children in this group, compared to 4% for the rest of the population. A recent study by Imhoff-Kunsch et al., fortification of staples with iron and folic acid, such as what flour may not benefit the most vulnerable groups (rural poor) in a setting such that daily average consumption of the fortified food is infrequent and or minimal.[16] Additionally, Dary recently published a review of national food fortification with iron and concluded that unless average consumption of the fortified vehicle contributes >60% of the estimated average requirement (EAR) for iron among the target group, the program will not improve iron status significantly. In the same token, for a fortified food to improve the anemia situation in a given country its consumption by the target group must contribute close to 90% of the iron EAR[17].

Progress in reducing hunger and undernourishment in Latin America and the Caribbean region has been patchy. As in the case of extreme poverty, the evolution of progress in the battle against malnutrition has been heterogeneous at best. Only a few countries show progress similar to or greater than expected: Cuba, Guyana, Saint Vincent and The Grenadines, Belize, Costa Rica, Saint Lucia, and Bahamas. On the other hand, Dominica, Venezuela, Guatemala, Antigua and Barbuda, Panama, and Barbados seem to have had setbacks. The rest of the countries seem to have had less than sufficient progress in this regard, and, unless significant structural changes are put in place insofar as their production and commercialization systems, as well as significant decreases in food access inequality, such countries are highly unlikely to meet the hunger and malnutrition target.

In summary, the most important nutritional problems affecting infants and young children in the region are anemia, zinc deficiency, and iron deficiency. Vitamin A deficiency is still a moderate problem in some countries but its current magnitude has not been measured for the national level in most instances. Where VAD seems to persist, it most likely remains concentrated in particular population groups (infants and young children, in many instances indigenous) and socio-geographical locations (rural and poor areas).

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[13] World Food Program. Hunger and Malnutrition in the Countries of the Association of Caribbean States (ACS). DRAFT. Panama, May 2005.

[14] Guatemala: DHS, 1998/99 - Final Report (Spanish). **www.measuredhs.com**

[15] Trinidad and Tobago, MICS 2000. www.childinfo.org/MICS2/newreports/trinidad/trinidadtobago.PDF

[16] Am J Clin Nutr 2007;137 (4): 1017.

[17] O. Dary. The importance and limitations of food fortification for the management of nutritional anemias. Ch. 19. pp. 315-336. In: Nutritional Anemia. K. Kraemer & M. B. Zimmermann (editors). Sight & Life Press, Burger Druck, Germany. 2007.

Vitamin B-12 deficiency could be a widespread problem in Central America and Mexico. Recently, it was estimated that 38% of all school age children in Mexico have inadequate B-12 intake[18]. Unfortunately however, there is no information on regional estimates of this deficiency. Linear growth retardation in children less than 5 years of age (synonymous of chronic malnutrition) is another important and highly prevalent nutritional problem in the region. As just mentioned, anemia constitutes the most frequent nutritional disorder in this region, affecting approximately 25% of all women of child bearing age (with over 50% being due to iron deficiency). Finally, a rapidly growing nutritional problem in Latin America and the Caribbean is overweight/obesity. Based on body mass index measurements, it is estimated that 37% of women are overweight (BMI>25 kg /m2, and that a smaller proportion of the same group (7.5%) are obese (BMI>30 kg/m2)[19,20].

[18] Murphy SP, Allen LH. Nutritional importance of animal source foods. J Nutr 2003;133(11 Suppl 2):3932S-3935S.

[19] Mason AD, and H. Ribe. El Salvador Poverty Assessment - Strengthening Social Policy. Washington, D.C.: The World Bank; 2005.

[20] United Nations System Standing Committee on Nutrition. 5th report on the world nutrition situation: nutrition for improved development outcomes. Geneva: United Nations System Standing Committee on Nutrition; 2004.

6. Caribbean Food Industry Assessment

The structure of the food processing industry within the region can be categorized in five groupings: multinational firms, large-scale firms, medium-sized firms, small-scale firms, and micro-sized firms. The majority of the medium to large-scale food processors are located in the Dominican Republic, Cuba, Guyana, Jamaica, Suriname, Trinidad & Tobago and Barbados.

Due to the minimal amount of arable land and the seasonality of crops, processors within the region do not have a continuous ready supply of local agricultural products. Therefore, food processors rely heavily on imports of raw materials. Trading blocks, such as the Caribbean Community and Common Market (CARICOM) offer duty-free access to many of the eastern Caribbean islands for other member states. In general, the region is characterized by relatively liberalized import policies for regional production, on both raw materials and already processed commodities, which encourage regional trade. As well, there are established and efficient supply chain systems.

For those commodities not produced or processed in the region, there is a dependency on imports from developed nations.

6.1.a. Caribbean Wheat Flour Market

There is no production of wheat in the region and wheat and wheat flour are imported. With the exception of Guyana, Suriname and Haiti where rice consumption is highest, wheat flour and wheat products are the principal foodstuffs in the Caribbean.

Wheat and wheat flour are primarily imported from the United States, Canada, Australia and the EU. Some of the pre-ground wheat flour imported in the Caribbean is fortified with vitamins and iron.

The wheat flour industry includes countries that:

- Import, process and export: Barbados, St. Vincent, and Trinidad & Tobago
- Import and process: The Dominican Republic Cuba, Curacao, Grenada, Guyana, Haiti, Jamaica and Suriname.
- Import: Antigua, the Bahamas, Bermuda, Dominica, Guadalupe, the Netherlands Antilles, St. Kitts & Nevis and St. Lucia.

FAO trade statistics for this region indicate the major importing countries as shown in table 3 (below).

Table 3: Caribbean Countries with Greatest Imports 2004

Imports Y2004	Tonnes
Cuba	385,970
Jamaica	305,213
Dominican Republic	226,826
Haiti	144,656
Trinidad & Tobago	98,133
Guyana	36,056
Barbados	18,612
St. Vincent	14,809
Other	9,150
Total	**1,239,425**

Medium to large-scale grain mills producing wheat flour are present in Cuba, the Dominican Republic, Jamaica, Trinidad & Tobago, Guyana, Haiti and St. Vincent.

There are two multi-nationals operating and/or partnering with flour mills in the region: ADM in Barbados, Curacao, Grenada and Jamaica and Seaboard in Haiti and Guyana.

National Flour Mills of Trinidad exports to Jamaica, Barbados, Dominica, St. Lucia, Antigua, Grenada, St. Vincent, St. Kitts & Nevis, Guyana and Suriname. The Company's clientele include food manufacturers, bakeries, wholesalers and distributors.

The East Caribbean Group of Companies of St. Vincent, whose partnership involves a share structure of 40% Maple Leaf Mills of Canada, 20% Government and 40% private investors, owns East Caribbean Flour Mills which exports to Antigua, Barbados, Dominica, Grenada, Guyana, Jamaica, St. Kitts & Nevis, and St. Lucia.

In Jamaica, wheat is imported and ground at the Jamaica Flour Mills. Baking flour accounts for about 40% of the total consumption of wheat flour in the country. Counter flour (coarse flour), which makes up about 60% of the total flour consumed, is sometimes imported from other Caribbean nations and must be fortified with vitamins and iron as per Jamaican law. Counter flour is the main type consumed by the lower socio-economic class.

In Barbados there is a light manufacturing sector which is focused mainly on the local market although there is some export to other Caribbean countries.

Cuba is the largest importer of wheat and wheat products in the region. Cuba must import wheat for all its consumption needs and per capita consumptions is expected to continue to rise as consumers are introduced to an increasingly wide array of wheat-based foods. The Ministry in charge of the food industry operates all of Cuba's wheat flour mills.

Consumption figures for Y2004[21] indicate that wheat flour has surpassed rice (approx. 34.22 kg/capita versus approx. 30.27).

In summary, the flours mills located in the Caribbean are importing wheat and producing flour as well as importing wheat flour for domestic and regional demand. Those countries that do not have milling facilities must import all of their wheat flour requirements.

6.1.b. Caribbean Corn (Maize) Flour Market

Corn production in the Caribbean is limited and is grown predominantly in Cuba, Haiti and the Dominican Republic. The majority of the corn imported into the regions is primarily used for animal feed since corn oil and corn flour are not major consumption items as they are in Mexico or Central America. Nearly all corn imports are supplied by the U.S. and only a handful of corn flour mills exist in the region.

The several mills that do exist in the region process mainly for their own local market demand with a limited amount being exported to neighboring islands in the region.

In Jamaica the Seprod Group operates Jamaica Grain and Cereals Limited and processes approximately 12,000 – 15,000 metric tonnes of corn annually into cornmeal, grits, hominy, etc.

In the Dominican Republic, MercaSid is the leading processor of corn products, both oil and flour, and is known to export to Cuba, Haiti and Trinidad & Tobago.

6.1.c. Caribbean Sugar Market

Sugar is produced and processed in most of the region's countries however domestic consumption has increasingly been satisfied by imports rather than production. Several of the countries trade within the region due to safeguards within the Caribbean Common Market (CARICOM)[22].

The sugar industry includes countries that:

- Produce, process and export: Cuba and the Dominican Republic
- Produce, import and process: Jamaica
- Produce, import, process and export: Guyana, Trinidad & Tobago, Haiti and Barbados
- Import: Bahamas, Bermuda, Dominica, Grenada, Guadalupe, St. Lucia, St. Kitts & Nevis, Antigua, the Netherlands Antilles, St. Vincent and Suriname

[21] FAO Trade Statistics

[22] Under the Caricom Common Market, the Common External Tariff (CET) was established to protect certain products (including sugar) produced in the region. In the case of brown (raw) cane sugar, a 40% duty is imposed n brown sugar from extra regional sources. This duty is in effect, to allow sugar-producing countries that have surplus sugar available within the Common Market to assist with meeting the intra regional requirements at competitive prices.

Trade data[23] points to Cuba, Trinidad & Tobago, Guyana and the Dominican Republic as being the major exporters of sugar in the region.

Table 4: Principal Caribbean Exporters of Sugar 2004

EXPORTS Y2004	TONNES
Cuba	2,501
Trinidad & Tobago	333
Guyana	288
Dominican Republic	208

Jamaica has the largest volume of imports and consumption annually (0.11 kg/capita versus 0.04 kg/capita for the region). This is because of its large population and its confectionery industry. Jamaica fulfills its export quota obligations from domestic production while importing raw and refined sugar to satisfy domestic demands. In order to fulfill local demand, Jamaica imported 66,000 MT of refined sugar during 2005/06-crop year[24]. The marketing of raw sugar and the retail distribution of refined sugar in Jamaica are handled exclusively by the state-owned Jamaica Cane Product Sales (JCPS).

Generally, the sugar industry in the region is declining. Most of the sugar industries of the Caribbean are state-owned enterprises. Many Caribbean sugar producers are not profitable even at current preferential prices.

- In July 2005, the Government of St. Kitts & Nevis took the decision to close the sugar industry.
- In Cuba, a restructuring of the sugar industry in 2002 saw almost 50% of the sugar mills shut down. Production of sugar cane in 2005 was approximately 30% of 2002 levels.
- In Barbados, where sugar refining is one of the two main agro-industries only two operating factories remain. Built in 1980, Portvale is the newest factory, which started operations in 1982 but it cannot claim to have a "state of the art" plant and machinery since much of the installed equipment was bought second hand.
- In Haiti, where sugar has been a traditionally important agricultural commodity, the sugar industry has both been facing stiff competition from imports.
- In Jamaica, as recently as April 2007, the Minister of Agriculture and Lands has indicated that the strategy is still privatization of the industry.

On the other hand, several sugar producing countries have taken measures to meet the challenges of the sugar industry head on.

[23] FAO Trade Statistics
[24] USDA, GAIN Report Number: JM7006

- In the Dominican Republic where sugarcane is the principal crop and sugar is the prime product and export, the restructuring program initiated in 1999 involved the privatization of all sugar mills along with diversification of sugarcane lands and an emphasis on sugar byproducts and derivatives. The two largest private producers, Central Romana and the Vicini group continue to dominate the Dominican sugar market.
- In an effort to revitalize the industry the Guyana Sugar Company (GuySuCo) closed some factories, reduced acreage and signed an agreement with a management firm to assist in their restructuring and day-to-day activities. The industry has grown and Guyana has regained its reputation as a reliable supplier of high quality sugar to Europe, the US and CARICOM – exporting to Trinidad, Suriname, St. Lucia, Grenada, Antigua, Dominica, Barbados, St. Vincent and Jamaica.

6.1.d. Caribbean Salt Market

There are a very small number of salt producing countries in the region. These include the Bahamas, the Netherlands Antilles, Jamaica, Guadalupe and Cuba.

In Cuba, salt is produced almost entirely by the solar evaporation of sea water. The Bahamas and the Netherlands Antilles have recently emerged as large scale producers of sea salt.

In Cuba there are four processing and distribution facilities which produce sufficient volumes to meet the national demand.

In the Bahamas, the Morton Salt Company, produced 1.2 million tons of salt in 2005. A multi-national, the Morton Salt Company supplies locally and within the region.

In Bonair, the Netherlands Antilles, another multi-national (Cargill Salt) processes marine salt.

The Dominican Republic is a regional producer of salt. Production of rock salt was reported to be about 12,200 metric tonnes in 2001. The Dominican Republic's only rock salt mine is the Barahona Mine. The salt production is exported to the United States. Marine salt is produced in the Provinces of Baní, Barahona, and Monte Cristi.

In summary, the production of salt is limited in the region and most is sea salt. Otherwise, salt is imported by local packers and distributors and sold to the retail, industrial and manufacturing sectors. For example, due to their regulatory environment, Guyana imports from Trinidad, Jamaica and Cuba.

6.1.e. Caribbean Edible Oil Market

The production of vegetable oils (canola, corn, cottonseed, coconut, olive, palm, peanut, safflower, soybean and sunflower) is high throughout the world, and consumption is increasing, especially among the lower socioeconomic groups.

Production of vegetable oils in the Caribbean is limited due to the availability of locally produced raw materials – mainly palm and coconut. There is production in several countries from imported oilseeds – namely canola (a.k.a. rapeseed) and soybean.

In general, other than limited local production, the Caribbean region is a net importer of oils for consumption and industry. In addition to the oils identified below, it should be noted that canola oil is also being imported into the region and in large quantities in several countries.

Table 5: Imports of Oil into Caribbean Countries 2004

Imports (tonnes) Y2004[25]	Maize Oil	Soybean Oil	Palm Oil	Sunflower Oil	Other Vegetable Oils
Antigua & Barbuda		512	2		1
Bahamas	173	2,249	6	2	120
Barbados	417	1,286	1	51	163
Bermuda		12	464		
Dominica	5	671		1	3
Grenada	5	864		7	1
Guyana	16	347	1,875	2	278
Haiti	60	9,762	74,347	2,609	6,354
Jamaica	167	23,307	6,870		15
Netherlands Antillies	358	604	3,029	68	36
St. Kitts & Nevis	11	239			
St. Lucia	7	211		1	
Suriname	37	8,487	397	540	2
Trinidad & Tobago	1,276	8,464	2,655	953	324
Cuba		65,811		1,651	160
Dominican Republic	3,083	150,529	14,069	7,188	
Total Imports	5,615	273,355	103,715	13,073	7,457

The highest volume of imports is soybean oil followed, in much less significant quantities, by sunflower and canola oils – all mainly from North & South America as well as from the EU. Palm oil constitutes the second largest volume of vegetable oil imports and is mainly coming in from Malaysia while smaller quantities are produced and traded within the region.

[25] FAO Trade Statistics

The largest importer is the Dominican Republic, followed by Haiti, Cuba and Jamaica. Processors of vegetable oils are located in Cuba, the Dominican Republic, Guyana, Jamaica, Trinidad & Tobago and Barbados while other countries in the region import a range of vegetable oils to satisfy their requirements.

Production of edible oil in Jamaica is restricted to the refining of imported crude vegetable oil. Soybean oil accounts for approximately 80% of total vegetables oils that are refined and packaged in Jamaica each year. The main refining facility, SEPROD – Caribbean Products Co. Ltd., is currently operating at capacity. During 2004, the United States was the sole supplier of crude soybean oil to the Jamaican market. The United States, United Kingdom and Trinidad and Tobago were the major suppliers of refined soybean oil to Jamaica during 2004.

In the Dominican Republic, domestic vegetable oil production consists of crude palm oil plus a small volume of palm kernel oil. Local production of oil represents less than 10 percent of the total supply. During the 1980s, oilseeds were imported and crushed domestically to produce oil, however since the crushing facility was closed, vegetable oils are imported to satisfy local market requirements. The largest processor MERCASID controls approximately 71% of the market; LA FABRIL in Santiago has over 20% of the market and "Cesar Iglesias" the remaining eight percent. The estimated overall oil processing capacity exceeds 175,000 metric tons. Exports of Dominican edible oils to nearby islands are almost non-existent; however, small quantities of soybean oil have been exported to Haiti.

There is no indigenous oilseed production in Cuba, which leads to dependency on imports of vegetable oil. There is also no modern processing plant in Cuba, which limits potential for whole oilseed imports. As the Cuban economy begins to show growth, the demand for oilseeds and products (mainly soybean oil) is expected to increase. Soybean oil represents more than half of total vegetable oil consumed. Sunflower oil historically is the preferred oil in the country however soybean oil has captured market share in response to high prices for sunflower oil.

In Trinidad & Tobago, the Edible Oil Complex of National Flour Mills Ltd purchases and processes soybeans to produce oil in their extraction plant as well as purchasing crude soybean oil for refining. Other than supplying the local market, NFMs products can be found in Jamaica, Barbados, Dominica, St. Lucia, Antigua, Grenada, St. Vincent, St. Kitts, Guyana and Suriname.

In Barbados, the Roberts Manufacturing Co. Ltd, imports soybean oil for bottling and further processing into margarine for both the local and regional market. The have distributors located in several countries throughout the Caribbean including Antigua, Dominica, Grenada, St. Kitts & Nevis, St. Lucia and St. Vincent.

In addition to regional importers, producers and distributors some of the major multi-nationals in the Caribbean market include Cargill, ADM and the Bunge Group supplying

both crude and refined oils. There are also imports and distribution of pre-packaged vegetable oils that are being sold directly to wholesalers and retailers.

6.1.f. Caribbean Rice Market

Rice is produced in several of the regions countries; however, most countries in the Caribbean are net importers of rice, primarily milled rice.

The rice industry includes countries that:

- Produce, process and export: Guyana & Suriname
- Produce, import, process and export: Haiti, Jamaica, Trinidad and Tobago, Cuba and the Dominican Republic.
- Import, process and export: Barbados and St. Vincent
- Import: St. Lucia, Dominica, St. Kitts & Nevis, Antigua, Grenada, Guadalupe and the Netherlands Antilles

The Dominican Republic is the largest producer in the area however, with a smaller rice crop in 2005; imports of 45,000 metric tonnes were needed to meet normal market requirements. The other large producers[26] of rice in the region are Cuba, Guyana, Suriname and Haiti.

Table 6: Caribbean Production of Rice 2004

Production Y2004 (tonnes)	Rice, paddy	Rice, milled
Dominican Republic	576,621	392,102
Guyana	501,500	341,020
Cuba	488,900	332,452
Suriname	195,000	132,600
Haiti	102,000	69,360

The largest importers of milled rice are Haiti and the Dominican Republic however there are a host of Caribbean countries relying entirely on imports to satisfy national requirements. Most of these have very limited potential for rice production due to lack of suitable land and water resources. Although much of the milled rice is imported from the United States and other large rice producing nations, there is trade within the Caribbean region.

Table 7: Imports of Rice into the Caribbean 2004

Imports Y2004 (tonnes)	Rice, paddy	Rice, milled	Total
Haiti	18,130	257,433	275,563
Dominican Republic	10,943	78,045	88,988
Jamaica	24,742	10,444	35,186
Trinidad & Tobago	8	16,398	16,406
Cuba	4,742	8,420	13,162

[26] FAO Trade Statistics

Guyana, where rice is the second largest crop after sugar, exports throughout the Caribbean. Approximately seventy-five rice mills operate in the country, and most millers also produce part of the paddy they mill. Many millers are planning, or have begun, an upgrade of their facilities, including dryers that use rice husks as fuel. The smaller mills produce rice mainly for domestic consumption while the larger mills concentrate mainly on exports.

Suriname, where half of the cultivable land is devoted to rice production, is a major exporter to CARICOM nations. However, there are several constraints to sustainable rice production in Suriname: unfavorable government policy, especially on input supply, milling, price control, and taxation of exports; degradation of irrigation infrastructure; yield potential of current varieties has reached a plateau.

In Trinidad & Tobago all paddy produced locally is sold to the Rice Mill at Carlsen Field which is owned by the National Flour Mills. A negligible amount of milled rice is exported within the Caribbean community while a sizeable amount is still being imported and processed to meet local demand.

Cuba is a major importer of rice and in the last few years annual imports of milled rice have increased. Cuba's relatively poor economic standing renders it largely a rice-consuming population. Rice production in Cuba is limited due to water shortages and access to essential inputs and other technologies. Imports could soar if consumers had increased purchasing power. Overall production has been on the decline for several years with relatively low yields so recently the Cuban Government has permitted private production on formerly state-owned farms, but growers have limited access to essential inputs, such as fertilizer; consequently, yields remain low.

The Alesie Group of Companies, which consists of a network of rice-mills in the Caribbean, is the major multinational located in the region. The US Headquarters, Florida Grains in Miami, is the main marketing office for the US, Latin America and parts of the Caribbean. They own and/or operate several milling and production facilities:

- Trinidad Commodities, Ltd. is a milling facility
- Alesie Guyana Ltd is the main office for production/shipment/quality control.
- The Jamaica office services the market in Jamaica and neighboring Islands.
- SURINAME RAMRAGIJA NV is one of the main milling facilities.
- Grenada Rice Mills Ltd. is primarily serving the Island of Grenada and neighboring Islands.
- St. Kitts Rice Mills Ltd is serving the upper region of the Caribbean.
- BlackBush Rice Milling Company Ltd. is the largest rice processing plant of Guyana, it serves more than 40,000 farmers. Its production is mainly for export.
- Ruimzeight Rice Industries Ltd., in Georgetown, serves more than 20,000 farmers and is equipped with a state-of-the-art parboiling plant, which offers milling and storing capacity.

- Wakenaam Rice Industries Ltd serves the Guyanese farming community surrounding the island of "Wakenaam" in the middle of the enormous Essequibo River. The production of these facilities is mainly for export.

The East Caribbean Group of Companies of St. Vincent, whose partnership involves a share structure of 40% Maple Leaf Mills of Canada, 20% Government and 40% private investors, owns East Caribbean Rice Mills in St Vincent and CARICOM Rice Mill in Guyana and export to Antigua, Barbados, Dominica, Grenada, Jamaica, St. Kitts & Nevis, and St. Lucia.

6.1.g. Caribbean Vitamin and Mineral Premix Market

In the case of wheat flour, it appears that countries in the region are using traditional industrial premixes which contain thiamin, riboflavin, niacin and iron as well as folic acid in the Hispanic Caribbean.

Although only a handful of companies have offices and/or distribution facilities in the region, there are several which are currently doing business in the region and/or in South America who would be available to ship into the Caribbean. Some have also expressed their availability is assisting with formulations based on applications and nutritional level requirements.

Nealanders International Inc.,
6980, Creditview Road,
Mississauga, Ontario
L5N 8E2 – Canada
Tel: +1 905 812 7300
www.nealanders.com

Fortitech, Inc.
Riverside Technology Park
2105 Technology Drive
Schenectady, NY 12308
Tel: +1 518 372 5155
Fax: +1 518 372 5599
www.fortitech.com

Watson Inc.
301 Heffernan Drive
West Haven, CT 06516
Phone: +1 203 932 3000
Fax: +1 203 932 8266
www.watson-inc.com

BASF de Guatemala
Avenida Petapa 47-31 zona 12
Guatemala, 01012
Guatemala, C.A.
Phone: +502 2445 7600
Fax: +502 2477 4680
e-mail: food.fortification@basf-ag.de
www.basf.com

6.2. Caribbean Policy Environment

Salt: Although little information is available regarding salt fortification policies it is now estimated that iodized salt is at 86% consumption levels[27] in Latin America and the Caribbean. Several countries have voiced concern that, although it may be legislated that salt be iodized, salt not designated for human consumption may be purchased by consumers. It should also be noted that lymphatic filariasis is also being recognized and addressed by certain countries and that, in addition to iodine, there are also programmes for the addition of DEC and in educating the public on the drawbacks of washing salt. In Haiti, where the situation is very serious, funding for new salt plants was received, however, without additional funding and support the salt fortification initiative is stalled.

According to PAHO, in the region of the Americas, all countries at risk of iodine deficiency have implemented national salt iodization programs however the program in Cuba needs to be strengthened and the programs in the Dominican Republic and Haiti need to be greatly reinforced[28].

Wheat Flour: Annex 7 shows that the majority of countries in the Caribbean are currently fortifying wheat flour although it is not always clear whether the fortification is mandatory or voluntary. There are several reasons that explain why wheat flour fortification has been successful including being able to continue exporting within the region without restrictions based on fortification requirements. In addition, although there appear to be no legislation in certain countries (such as Antigua, St. Kitts & Nevis, etc.), these do not have any local production and depend on imports from countries where fortification is the norm.

Corn (Maize) Flour: There appears to be limited legislation on the fortification of corn flour however the consumption of corn flour in the Caribbean is not as predominant as it is in Central and South America and is not considered a food staple in the region

Rice: Although rice is a food staple in the region, no standards or programs have been identified in the region.

[27] Source: UNICEF, 2006
[28] Health in the Americas, 2002 Edition, Volume 1 - Promoting Health in the Americas – page 185

Sugar: Other than the Dominican Republic that is currently establishing a program and standards for the fortification of sugar there have been no other programs identified in the region.

Vegetable Oil: The have been no fortification programs identified for vegetable oil in the region. With limited crushing facilities in the region, some countries are importing crude degummed oil which is not fortified due to Vitamin A being destroyed during the refining, bleaching and deodorizing process or during industrial use. However, where countries are importing refined vegetable oils from developed countries these could be shipped fortified.

In summary, accurate and detailed information on food fortification programs in the Caribbean is not readily available and is difficult to obtain. However, PAHO has stated that most countries in the region fortify wheat or corn flour. Several also fortify margarine and sugar. In the developing world the LAC countries are leaders in food fortification due to their well-developed food industries; growing urbanization and the use of industrially processed foods; government and public acceptance of food fortification with micronutrients; and the pages of legislation to support fortification efforts[29].

6.3. Caribbean Regulatory Environment

As in all country initiatives a collaborative effort from all pertinent sectors of government and international organizations as well as a buy-in from private industry is the key to successful implementation of food fortification programs. Many issues must be discussed and addressed which include but are not limited to: feasibility; collaboration; development of standards and capability of adhesion to same; raw materials; supply chain; cost of implementation (both government and private); monitoring tools; cost effectiveness analysis; education at all levels and stages of implementation (producer, manufacturers, consumer); etc.

The following information addresses the administration of standards as it applies to food and the surveillance and enforcement mechanisms in place. Although these laws and/or regulations do not specifically apply to food fortification laws, they do apply to the administration and enforcement of standards in place for food. In general, it appears that tools are in place to monitor food fortification. In addition, the CARICOM Regional Organisation for Standards and Quality (CROSQ) has also included as its mandate to harmonize and implement standards in the Caribbean Community.

Some of the Standards Offices in the Caribbean have online access to their laws and the links to these follow hereunder as well as identification of the applicable sections.

Antigua and Barbuda**:** http://www.laws.gov.ag/acts/chapters/cap-353.pdf
Chapter 353 – The Public Health Act
Part VII – Food and Drugs

[29] Health in the Americas, 2002 Edition, Volume 1 - Promoting Health in the Americas - page 184

50. Restrictions on the addition of other substances to any food or drug.
51. Restrictions on the abstraction from any food of any constituent.
52. Examination of food and seizure of unsound food.

Bahamas: http://laws.bahamas.gov.bs/statutes/List_ChapterAll.html
Food (Ch. 236)
Part II – General Provisions as to Food
5. Standards of food
Part IV – Regulations
Part V – Administration and Enforcement
13. Appointment and duties of authorized officers
14. Appointment of director of laboratory
15. Powers of authorized officer

Bermuda: http://www.bermudalaws.bm/
Food and Environment Protection (Designated Person) Order 1989
Based on the Food and Environment Protection Act 1985 of the Parliament of the United Kingdom (as modified, adapted and extended to Bermuda.

Guyana**:** http://www.gina.gov.gy/gina_pub/laws/tableofcontents.pdf
Food and Drugs (Cap. 34:03)
Part II – Food – Maintenance of Food Standards
Part VI – Administration and Enforcement

Jamaica: http://www.moj.gov.jm/law/search?lawSearch=+food
The Food and Drugs Act
http://www.moj.gov.jm/laws/statutes/The%20Food%20and%20Drugs%20Act.pdf
Part II – Food
6. Food to be correctly labeled…
Part III - Administration and Enforcement
17. Designation of officers.
19. Powers and duties of inspectors and analysts.
21. Power of Minister to make regulations.
22. Procedure with respect to regulations.
23. Power of Minister to require information.
The Standards Act
http://www.moj.gov.jm/laws/statutes/Standards%20Act.pdf
6. Function of Bureau of Standards
7. Standard specifications and compulsory standard specifications.

Trinidad and Tobago**:** http://rgd.legalaffairs.gov.tt/Laws/contents.html
Public Health and Medical (Chap. 28-31)
Food and Drugs (Chap. 30:01)
Food
7. Maintenance of Food Standards
Administration and Enforcement

20. Appointment of analysts and inspectors
21. Power of inspectors to enter, examine, take samples, make copies of documents, demand information and seize articles.
25. Regulations
26. Food Advisory Committee
27, 28, etc. Prosecution

The citations for the legislation in the other countries are as follows however not accessible online for further details.

Barbados: Food and Drugs Adulteration Act (Cap 327)
Dominica: Food and Nutrition Council Act (Chap. 38:02)
Grenada: Food and Drugs Act (Cap. 110)
Saint Lucia: Public Health Act (Cap. 11:01), Section 15 - Foods Regulations
St. Vincent and the Grenadines: Standards Act 1992.

The following lists government agencies, however, the citations for legislation are not identified.

Cuba: Oficina Nacional de Normalizacion
Dominican Republic: Dirección General de Normas y Sistemas de Calidad (DIGENOR)
Haiti : Direction Normalisation Et Controle de Qualité
St. Kitts & Nevis: Bureau of Standards, Ministry of Trade and Industry
Suriname: International Economic Affairs Division, Ministry of Trade and Industry

The following countries fall under EU standards:
Curacao and the Netherlands Antilles
Guadalupe

6.4. Existing Food Fortification Programs

Identified below are several of the current food fortification initiatives in the region.

- Cuba and Russia have signed an agreement to produce 662 tonnes enriched crackers and cereals which will supply cereals to children under the age of five and biscuits to elementary school students up to November 2007.
  The World Food Program (WPF) is now preparing a new project for 2008-2012 which is also aimed at nutritional needs in Cuba's eastern provinces.
  ANA MARGARITA GONZALEZ - April 20, 2007 – nacional@trabaja.cip.cu

- In Haiti, with a grant to University of Notre Dame (UND) from the Bill & Melinda Gates Foundation, a salt fortification plant has been constructed. Salt, co-fortified with DEC and Iodine is being produced and will be distributed starting in four communities and will be sold at a lower price than regular salt.
  http://www.ops-oms.org/English/AD/DPC/CD/PMM3c-CntryPres3of5.pdf

- Guyana launched the national filariasis programme in 2003 in keeping with the 2015 deadline for the Americas for the disease to be fully eradicated. DEC salt is to replace ordinary iodised cooking salt in local households. http://www.gina.gov.gy/gov't%20services/decsalt.html

- The Dominican Republic launches national food fortification program for flour and sugar. February 2007. http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/LACEXT/DOMINICANEXTN/0,,contentMDK:21221370~menuPK:337775~pagePK:2865066~piPK:2865079~theSitePK:337769,00.html

- Proposal of a surveillance system for the production, distribution and consumption of iodized salt in Cuba. Jan-Apr 2006. http://scielo.sld.cu/scielo.php?script=sci_abstract&pid=S1561-30032006000100006&lng=en&nrm=iso&tlng=en

7. Mexico and Central America Food Industry Assessment

Central America is struggling with the need to increase food production and seems destined to be caught in the productivity/employment dilemma that has troubled every emerging economy.

Agriculture looms large in the lives of Central Americans. More than one-half of the people continue to live in the countryside, however, modernization has meant the emergence of a new class of farmers who are better educated and better equipped than traditional farmers.

Although there are several developed industries in the region, grains, oilseeds, edible oils and rice are being imported to meet demand. Some are being imported in the raw or crude state for further processing while others are being imported processed or milled.

Recent investment in the region has seen some growth and development in the processing sector and processed foods are being traded within the region.

In contrast, Mexico is emerging as a developed country and, although it still imports large quantities of commodities needed to accommodate the food chain, the processing sector is more highly developed than that of Central America's.

Relative to fortification, this part of the world can be very proud of having "shown the way" to other under developed areas of the world. Guatemala, Honduras, El Salvador and Nicaragua have actively participated in many projects for salt iodization and wheat flour fortification with iron and other vitamins. Guatemala was the first country to fortify sugar with vitamin A; today most of these countries are doing the same.

Together with Costa Rica and Panama, the region continues to be very active in fortification activity; maize flour (nixtamilized masa) and rice fortification are being experimented with and there are instances of test marketing of these mass consumed commodities.

As in most regions/countries of Latin America, the government's role still has to be seen as the most important contributor to the sustainability of fortification programs. The activity of food control, inspection and surveillance, as well as assessment of the epidemiological conditions before and after the establishment of the programs is essential to evaluate the effectiveness and success of fortification. Once this is demonstrated it is easier to convince the private sector of the benefits and economical advantage that fortification of these commodities has added-value.

7.1.a. Mexican and Central American Wheat Flour Markets

In the Americas, the flour millers are well-developed and organized. Many of the wheat flour millers participate in the Latin American Association of Industrial Millers (Asociación Latinoamericana de Industrias Molineros, ALIM). In 1997, at the ALIM General Assembly held in Lima, Peru, all of the association millers agreed to support the mandatory fortification of wheat flour, thereby committing to promote national legislations for mandatory fortification and work jointly with the health authorities to develop them[30].

In addition to the indispensable role of individual flour millers in the national food fortification programs and given their commitment and support of food fortification as a public health measure, the associations of industrial millers in Latin America and the Caribbean hold an important role in promoting and enabling effective flour fortification throughout the Region, particularly by tapping expertise and resources in technology transfer, business development, fair trade and marketing in support of food fortification.

Table 8: Wheat Imports into Central America and Mexico 2002 – 2005

WHEAT IMPORTS				
(tonnes)	**2002**	**2003**	**2004**	**2005**
Belize	23,087	24,109	22,556	29,394
Costa Rica	239,079	264,966	250,495	235,209
El Salvador	250,307	329,835	319,836	263,699
Guatemala	523,743	514,053	508,085	586,161
Honduras	258,845	235,397	253,425	278,524
Mexico	3,431,722	3,734,276	3,854,649	4,066,515
Nicaragua	144,825	164,065	162,358	190,443
Panama	115,631	155,735	159,908	144,009

Overall Central America and Mexico are net importers of wheat and wheat flour. Although Mexican wheat production[31] for MY 2007/08 is forecast at 3.26 million tonnes with bread wheat being produced in the states of the central plateau, the demand for wheat and wheat flour far outweighs the local production.

Wheat flour mills operate throughout the region and trade exists among the regions countries, however, imports from large wheat producing countries supplement local capacity where needed.

In Mexico, Grupo Gruma, one of the largest producers of corn flour, entered the wheat milling market in Mexico in 1996 by acquiring a 60% ownership interest in Archer-Daniels-Midland's wheat flour operation, Molinera de Mexico. During the year ended

[30] PAHO Report FCH/NU/49-24/04
[31] USDA GAIN Report – MX7024

December 31, 2005, approximately 90% of Molinera's wheat flour production was sold in bulk and 10% was sold for the retail segment. Most of the bulk sales are made to thousands of bakeries and, to a lesser extent, to cookie and pasta manufacturers. Most of the retail sales are made to large supermarkets and wholesalers throughout Mexico.

Other major players in the Mexican market are Grupo Minsa, S.A. de C.V., Munsa, Trimex, Tablex, La Espiga and Elizondo.

Table 9: Consumption of Wheat Flour per Capita in Central America and Mexico

Country	Wheat Flour Consumption
	kg/capita
Belize	53.2
Costa Rica	46.1
Mexico	38.8
Honduras	35.7
Panama	35.2
El Salvador	33.7
Guatemala	27.1
Nicaragua	15.7

Corn flour is a major food staple in the region and, by far, exceeds the consumption of wheat flour. However, with the recent worldwide increases in corn prices, which reflect in higher corn flour prices, there has been more movement toward higher consumption of wheat flour and products manufactured from wheat flour. This will probably continue to be an ongoing trend as farmers in Mexico and America replace edible corn crops with industrial corn that could then be processed into biofuels, leading to a decrease in the amount of corn available on the open market.

7.1.b. Mexican and Central American Corn (Maize) Markets

Corn production and imports to the region are predominantly for human consumption since corn is the staple that makes tortillas and is the main source of calorific sustenance in an otherwise nutritionally sparse diet among the regions poor population.

The region’s farmers continue to concentrate on producing maize and beans, the basic dietary staples, although rice and sorghum are also grown. However, domestic production does not come close to meeting the needs of this dietary food staple.

In Mexico where corn production for MY 2007/08 (Oct-Sep) is forecast at 23.2 million tonnes, imports are still needed to meet demand. Domestically produced corn is predominately white corn varieties and is used for human consumption. It is a very important crop to the country, as tortillas are a staple of the Mexican diet, with an annual

per capita consumption of 65 kilograms - the highest per capita consumption of corn in the world.

Corn flour mills are located throughout most of the region; however, production does not always meet local demand and is supplemented through imports.

Although the corn tortilla market is divided between the traditional nixtamalized masa[32] artisanal producers and industrialized corn flour producers, many artisanal producers are now mixing up to 60% corn flour to their fresh masa to improve their products.

Table 10: Corn Trade Statistics, Mexico and Central America 2004

	Corn	
(tonnes)	Regional (including Mexico)	Mexico
Produce	24,413,075	21,670,200
Export	255,172	246,937
Import	7,613,509	5,518,757

In Mexico, one of major players in the industrialized corn flour market is Grupo Gruma that controls approx. 70% of the market share.

Gruma, S.A. is engaged in the production and distribution of tortilla, corn and wheat flour. Gruma are also present in the Costa Rican market and they have expanded their operations into Guatemala, Honduras, El Salvador, Nicaragua, and Ecuador. Gruma Centroamerica produces corn flour, and to a lesser extent tortillas and snacks. It also cultivates and sells hearts of palm and process and sells rice.

Grupo Minsa is the second-largest corn flour producer in Mexico. It owns and operates six plants in Mexico, two in the US, and one in Guatemala.

It is important to note that recently there's been a huge increase in the demand for industrial corn for the production of ethanol which inevitably pushes up the price of food stuffs. This could be devastating to the poor who will pay the price as the developed world uses vital food stuffs to replace its fuel oil supplies.

7.1.c. Mexican and Central American Sugar Markets

More than 100 countries produce sugar, 74% of which is made from sugar cane grown primarily in the tropical and sub-tropical zones of the southern hemisphere, and the balance from sugar beet which is grown mainly in the temperate zones of the northern

[32] ***Masa nixtamalera*** is nixtamalized maize dough, made from corn boiled with lime and ground in a *molino* (a mill dedicated to that purpose) or on a *metate* (flat grinding stone). Thus, it is made from wet hominy, reduced to a dough by grinding, and not from corn flour.

hemisphere. Generally, the costs of producing sugar from sugar cane are lower than those of processing sugar beets. Currently 69% of the world's sugar is consumed in the country of origin while the balance is traded on world markets. Global sugar consumption continues to increase by about 2% per annum.

Table 11: Top Ten Sugarcane Producers Worldwide 2005

Top 10 Sugarcane Producers - 2005	
Country	(1000 tonnes)
Brazil	422,926
India	232,300
China	87,768
Pakistan	47,244
Mexico	45,195
Thailand	43,665
Colombia	39,849
Australia	37,822
Indonesia	29,505
USA	25,307
World Total	1,011,581

Source:
UN Food & Agriculture Organisation (FAO)

Being the largest sugar producer in the region, Mexico's sugar production for MY 2007/08 is expected reach 5.61 million[33] metric tons (MMT) raw value (RV). Imports are forecast to be about 308,000 MTRV for MY 2007/08 and exports are estimated at 200,000 MT. Production and imports of high fructose corn syrup (HFCS) are not expected to grow as much for CY 2007 as they did in CY2006.

The sugar cane industry has a socioeconomic effect on 12 million people. La Unión Nacional de Cañeros participa participates in 43% of the total cane production. There are currently 58 sugar mills spread across 15 of Mexico's 32 states. Overall, there are 11 private sugar groups with more than one mill, the government group with 13 mills, and 8 mills that are working independently.

Cargill entered the Mexican sugar market in 2000 in addition to its other sugar operations worldwide.

Per capital consumption of sugar in Mexico is estimated at 53 kilos annually, however, HFCS is also consumed in Mexico as in most developed countries where it is added as a sweetener into many processed foods and soft drinks.

Guatemala's sugar production in 2007 is expected to reach 2.3 million tonees, an 8% increase compared to 2006 production[34]. Local demand has increased by 12% from 2006

[33] USDA GAIN Report - MX7031
[34] USDA GAIN Report - GT7006

to 2007 possibly due to improvements in the economy following strengthening in international coffee prices as coffee production represents the only available income in some of the poorest areas. Consumption is expected to grow at 5% per year, at least, keeping pace with population growth.

Guatemala exports around 70% of its total production and is the world's sixth largest exporter and Latin America's second largest, accounting for around 4% of net world exports and three quarters of its total production. ASAZGUA, the Guatemalan Sugar Association, expects that around 84% of total exports will be raw sugar.

There are 13 active sugar mills in the country and there are already 3 sugar mills currently producing alcoho. By mid 2007, Pantaleon, the biggest mill, will open Bio-Etanol Co., with an initial capacity of 150,000 Lts./day of ethanol. Other mills are adding alcohol refineries, and the industry hopes to increase ethanol production for use as motor fuel. Guatemala is interested on supplying locally produced alcohol from domestic sugar cane, as the sugar producers are highly committed to generate local employment.

Comercializadora de Guatemala (COMETRO) maintains a legal oligopoly on the domestic wholesale and retail markets, established by decree in 1997 and distributes to retailers through 38 warehouses strategically located throughout the country.

Pantaleon and Concepcion are two leading cane sugar factories operating in Guatemala since the late 1800s and early 1900s, respectively; they are now part of the Pantaleon group. Pantaleon is an agro-industrial company dedicated to the processing of sugar cane for the production of sugar, and electricity. Currently, Pantaleon is the largest sugar producer in the Central American region, and is positioned among the ten major groups in Latin America.

Nicaragua's total sugar production for the 2006/2007 season is estimated at 518,792 MT, 14.2% higher than the 2005/2006 season. The 2007/2008 forecast for sugar production is 540,000 MT[35]. Sugar continues to lead the list of Nicaraguan exports with key destinations in 2006 including the United States, Russia, Canada, Haiti, England, Jamaica, Mexico and Peru.

National consumption increased to 3.6 percent during the 2006/2007 season and is forecast to increase by 5 percent during the 2007/2008 season. The increment increase in national consumption after the 2005/2006 season has resulted from industrial use.

The private sector buys and sells all sugar. There are approx. 650 sugar producers located primarily in the following regions: Chichigalpa, El Viejo, Belén, Potosí, and San Rafael del Sur. The national market is supplied by a network of approx. 40 distributors, who work in coordination with Central Azucarera de Nicaragua.

Based on preliminary data from the Costa Rican Sugar League (LAICA) Costa Rica's cane and sugar production is expected to increase in the 2006/2007 crop year to 4 million

[35] USDAGAIN Report - NU7005

tonnes and 415,576 tonnes respectively. Sugar production is forecast to increase in 2007/2008, as the trend towards higher area planted to sugar cane is expected to continue[36].

Per capita sugar consumption was roughly 55 kilos in 2006/2007. Costa Rica's per capita sugar consumption is one of the highest in the region, although it has declined from a record 59.2 kg in 1997-1998. Of total sugar consumption, about 53% is used for direct consumption and 47% is for industrial use.

El Salvador's sugar cane harvest is expected to reach 4.49 million MT for 2006/07. Sugar production is estimated to reach 516,000 MT in 2006/07. The Sugar Association expects no refined exports for 2006/07 although there are several refiners/millers for the domestic market.

Most of the countries in this region have mandatory fortification of sugar with Vitamin A. However, although Mexico has one of the regions highest per capital consumption levels of sugar (approx. 53 kilos) as well as a large portion of the population living in poverty, is has not yet initiated a sugar fortification program.

It is important to note that it is expected that more sugarcane is being diverted toward ethanol production as a consequence of expected higher demand for the product worldwide. In addition, sugar prices have not been as attractive as they were a year ago. In fact, the International Sugar Organization does not foresee a rebound in prices during the coming year due to a projected world surplus for MY 2006/07 of 6.5 million tonnes.

7.1.d. Mexican and Central American Salt Markets

The three dominant salt producing nations in Latin America - Brazil, Chile and Mexico - produce 85%-95% of the salt in the region. Most of it is produced by solar evaporation, though rock salt production is not uncommon. Demographic and economic analyses give strong clues about salt markets. Lesser-developed economies use salt primarily to feed people and animals; more developed economies use salt more for industrial production.

Table 12: Salt Production in Latin America and the Caribbean 2001 - 2005

SALT PRODUCTION, BY COUNTRY

(,000 tonnes)	2001	2002	2003	2004[e]	2005[e]
Costa Rica, marine salt	37	37	37	37	37
El Salvador, marine salt	32	32	31	31	31
Guatemala[e]	50	50	60 [r]	60 [r]	60
Honduras[e]	25	25	26 [r]	26 [r]	26
Mexico	8,501	7,802	7,547	8,566 [r]	9,242
Nicaragua, marine salt	18	30	31	31	31

[36] USDA GAIN Report - CS7005

Panama, marine salt[e]	23	23	23	23	23

[e]Estimated. [p]Preliminary. [r]Revised.

Table includes data available through July 5, 2006.

Source: http://minerals.usgs.gov/minerals/pubs/commodity/salt/

First of all, it is necessary to make the distinction between the producers of crude salt and the processors of salt - the latter processes crude salt for distribution and sale to the wholesaler or to the final consumer. In Latin America there are over 1,000 medium and small scale producers. Their facilities range from a single pond producing 2 to 5 ton per year to well-organized facilities of up to 25,000 hectares. This size producer is mainly found in the Central America, on the Pacific coast, where the tradition of salt making is centuries old. All small production, in the countries of Central America, utilizes their natural climatic advantage and produce by means of solar evaporation.

Table 13: Size and Number of Salt Processors in Central America

	Number of Salt Processors		
	Large scale > 100K ton/yr	Med scale 100 to 20K ton/yr	Small scale < 20K ton/yr
Costa Rica	0	2	0
Guatemala	0	0	150
Honduras	0	0	250
Nicaragua	0	0	300
Panama	0	1	55

Salt is produced in most countries in the region and quantities are usually sufficient to meet local demand. Where not produced or where sufficient quantities are not produced, trade within the region is usually the norm.

Mexico produces mainly marine salt and, although it is one of the three largest producers in Latin America, it exports primarily out of LAC.

Asoprosalh in Honduras is currently undergoing an upgrade and expansion. The acquisition and installation of a salt processing plant in San Lorenzo (mill, washer, dryer, sifter and an iodine and fluoride dispenser) in order to produce a higher quality salt and supply at competitive prices in Honduran market with exportation potential to El Salvador and Nicaragua. The company is made up of 10 partners who are salt producers, therefore, they could supply raw material that will be required by the company.

7.1.e. Mexican and Central American Edible Oils Markets

Oil production in the region is led by palm oil with the largest production being based in Costa Rica, Honduras and Guatemala. Mexico and Central America are net importers of edible oils.

Table 14: Imports of Edible Oil into Central America and Mexico 2004

Edible Oil Imports Y2004 - FAO Statistics

(tonnes)	Costa Rica	Guatemala	El Salvador	Honduras	Nicaragua	Panama	Mexico
Maize Oil		757	1,435	171	172	543	24,826
Sesame Oil		20	3		2	8	621
Soybean Oil		18	17,296	1,049	19,123	16,951	91,826
Palm oil	1,974	14,822	60,038	2,658	43,780	2,018	287,746
Sunflower oil	6,606	20,546	6,967	939	1,937	8,889	96,115

There are no refining facilities in Costa Rica and all crude palm oil is exported. Grupo Numa, which owns Palma Tica, is one of several companies working in the area of cultivation, processing and production of oil palm products. It owns thousands of hectares of oil palm plantations (*Elaeis guineensis*) in the Central Pacific Region (Quepos Division) and in the Southern Region (Coto Division).

In Guatemala, palm oil and palm kernel oil account for 93% of the country's production, and provide 76,300 tonnes of oil for the food processing industry. The final 7% corresponds to soybean oil, which only covers 8% of the local demand, almost all of which is imported from the U.S. Guatemala exports of palm oil are mainly to Mexico and El Salvador. Total imports of soybean oil are domestically consumed.

Crude sunflower seed oil is mostly imported from the U.S. and the refined oil is re-exported to the rest of the Central American countries. El Salvador is the major importer for Guatemala's sunflower oil. Guatemala's vegetable oil production continues to increase as local consumption of vegetable oil, shortening, and margarine increases. Exports of finished oils and margarines to neighboring countries are experiencing a similar increase.

Total per capita oil consumption in Guatemala is 18 kg, compared to Mexican oil consumption of 35 kg.

The extraction of palm oil is the primary source of business of the Palcasa cooperative in Honduras and is undergoing expansion to increase production.

The oilseed crushing industry in Mexico is a major importer of oilseeds to offset the deficit between its vegetable oil consumption and its domestic production. As population and income continue to grow in Mexico, demand for oilseeds is expected to continue to expand. Although the Mexican market utilizes many different types of oilseeds including

peanuts, sunflower seed, cotton seed and canola, it continues to be dominated by soybeans.

The Mexican crushing industry is expected to expand as smaller, inefficient crushers are replaced by larger crushers. Two multinationals are currently positioned in Mexico: Cargill and Bunge which exports soybean oil to Nicarauga, Panama, Guatemala, Honduras, Costa Rica and El Salvador.

7.1.f . Mexican and Central American Rice Markets

In Central America and Mexico rice production is less than half the level of rice consumption.

Table 15: Rice Production, Central America and Mexico 2004

Rice Production Y2004 - FAO Statistics								
(tonnes)	Costa Rica	Guatemala	El Salvador	Belize	Honduras	Nicaragua	Panama	Mexico
Rice, Paddy		34,926	26,519	10,680	22,409	232,624	243,378	278,500
Rice, milled	167,872	23,750	18,033	7,262	15,238	158,184	165,497	189,380

Table 16: Rice Imports, Central America and Mexico 2004

Rice Imports Y2004 - FAO Statistics								
(tonnes)	Costa Rica	Guatemala	El Salvador	Belize	Honduras	Nicaragua	Panama	Mexico
Rice, paddy		76,795	69,080	36	140,935	975	8,979	616,286
Rice, milled	21	882	238	10	5,585	1,802	3,150	58,418

Central American countries are the second largest importer of rice from the United States, importing a combined total of about 550 000 tonnes per year. The DR-CAFTA treaty imposes a complex mixture of tariff rate quotas (TRQs).

Mexico's rice production for MY 2007/08 is at 181,000 tonnes (milled basis). MY 2007/2008 imports are expected to be roughly six percent greater than previous year because of insufficient domestic production relative to consumer demand.

The decline in rice production in Mexico has been significantly affected by the introduction of the North American Free Trade Agreement (NAFTA). Inefficient production in government-managed irrigation schemes has been unable to compete with imported rice and other cheaper food products. Some of the rice area has been converted to more lucrative vegetable production.

Nicaragua and Panama are also large rice producers in the region however also have to import to supplement their domestic supply.

In Nicaragua AGRICORP operates four mills and processes more than 50% of thenations rice.

A listing of rice mills in Panama can be found on Asociación Nacional de Molineros de Arroz website - http://www.analmo.org/directorio.htm

In Guatemala, la asociación Guatemalteca del Arroz -ARROZGUA- reports that domestic production supplies 59 mills around the country with most located in the capital city as well as in Jutiapa.

In the smaller countries of Central America the private sector is often dominated by smaller regional companies.

In Central America rice consumption is low (18 kg/capita) compared to the Caribbean (48 kg/capita) and South American countries (39 kg/capita).

Table 17: Rice Consumption Per Capita in Central America and Mexico

COUNTRY	CONSUMPTION KG/CAPITA[37]
Panama	72[38]
Costa Rica	53
Nicarauga	30
Honduras	18
El Salvador	10
Mexico	6
Guatemala	5

7.1.g. Mexican and Central American Vitamin and Mineral Premix Markets

There are companies that have premix plants, offices and/or distribution facilities in the region. There are others listed below that work in the region and have also expressed their availability is assisting with formulations based on applications and nutritional level requirements.

Nealanders International Inc.,
6980, Creditview Road,
Mississauga, Ontario
L5N 8E2 – Canada
Tel: 1 905 812 7300

[37] Rice Congress of the Americas 2007 – Cancun, Mexico
[38] The consumption per capita can be attributed to the Asian immigrants who contribute largely to this number.

www.nealanders.com

Fortitech, Inc.
Riverside Technology Park
2105 Technology Drive
Schenectady, NY 12308
Tel: +1.518.372.5155
Fax: +1.518.372.5599
www.fortitech.com

Watson Inc.
301 Heffernan Drive
West Haven, CT 06516
Phone: 203-932-3000
Fax: 203-932-8266
www.watson-inc.com

7.2. Mexican and Central American Policy Environments

Salt: It is now estimated that iodized salt is at 86% consumption levels[39] in Latin America and the Caribbean.

Table 18: Household Access to Iodized Salt in Central America and Mexico

Country	% of households consuming iodized salt	Reference Year
Belize	90	1994
Costa Rica	97	1996
El Salvador	91	1995
Guatemala	67	2002
Honduras	80	1998
Mexico	90	1999
Nicaragua	97	2003
Panama	95	1998
Source: UNICEF, August 2004		

[39] Source: UNICEF, 2006

Wheat Flour: All countries in the region have regulations making wheat flour fortification mandatory. This also applies to Belize which falls under CARICOM regulations.

In Central America[40], the lack of or weak quality control, supervision, and surveillance were identified as major obstacles to the effectiveness and sustainability of programs. In the effort to overcome these limitations, plans and procedures were designed and tested to carry out these activities. As a result, current information on the coverage and quality of fortified food at the household level is available in Costa Rica, Guatemala, Honduras, El Salvador, Nicaragua and Panama. In all of the countries, more than 80% of wheat flour is currently fortified with iron, folic acid and other complex B vitamins. The other areas of weakness in the programs are continually trying to be addressed. However, a highly important factor of success in the region was noted as being the commitment of a convinced pro-active private sector and the active participation of the organized consumer sector.

Corn (Maize) Flour: There is legislation in several countries requiring the mandatory fortification with iron, folic acid, thiamin, riboflavin and niacin. Others, like Guatemala, fortification is voluntary or non-existent.

Relative to fortification efforts in Mexico, it is expected that maize (nixtamilized masa) and wheat flour be fortified with iron or an iron compound, folic acid and vitamins of the B group. Many efforts are being done in reaching these goals especially with tortilla flour. Both products are widely consumed and manufactured in centralized factories.

Rice:
The appears to be no overall strategy for the region however Guatemala has plans for voluntary fortification of parboiled rice in 2009 and Nicaragua is considering fortification for rice.

In Costa Rica the minimum levels (considering the intrinsic content of rice) are selenium-105 µg/kg, folic acid-1.8 mg/kg; vitamin B12-10 µg/kg, zinc-19 mg/kg; niacina-50 mg/kg; tiamina-6.0 mg/kg; vitamin E-15 IU/kg.

Oryza.com reported on April 3, 2007 that "Rice 'reinforcement' increases cereal's price: Rice reinforcement in Panama – the addition of iron, vitamins A and B complex – could couple the cereal price to the consumer." Therefore, it appears that measures are being introduced in Panama for the fortification of rice.

In Mexico, there is not much information from the mills as to their plans relative to fortification. But, rice is widely consumed and in quantities which could be useful – if fortified – to help with the fight against micronutrients.

Sugar:

[40] PAHO Report FCH/NU/49-24/04

It appears that mandatory fortification of sugar with vitamin A is quite predominant in the region and can be confirmed for Costa Rica, El Salvador, Guatemala, Honduras, Nicarauga.

In Mexico efforts by the government to fortify sugar with vitamin A have been made in the past, but political motivation as well as price disputes and negative attitudes towards the need for the additional vitamin A in the diet by some health officials have made these intentions futile. The industrial machine is old and not well maintained; sugar had been subsidized and many of the mills belong to the government.

Vegetable Oil:
There appears to be no legislation in the region regarding the fortification of edible oils.

In Mexico, the technology is well known and the industry is ready to fortify edible oil. It is a relatively easy process and the large processors command the market. However, the position of some health officials has not promoted this intention. These positions not only include health related concerns, but also, labeling and what will be allowed in health claims.

In summary, PAHO has stated that in the developing world the LAC countries are leaders in food fortification due to their well-developed food industries; growing urbanization and the use of industrially processed foods; government and public acceptance of food fortification with micronutrients; and the passage of legislation to support fortification efforts[41].

7.3. Mexican and Central American Regulatory Environments

As in all country initiatives a collaborative effort from all pertinent sectors of government and international organizations as well as a buy-in from private industry is the key to successful implementation of food fortification programs. Many issues must be discussed and addressed which include but are not limited to: feasibility; collaboration; development of standards and capability of adhesion to same; raw materials; supply chain; cost of implementation (both government and private); monitoring tools; cost effectiveness analysis; education at all levels and stages of implementation (producer, manufacturers, consumer); etc.

Mexico is on its way to becoming a developed country, and the industry (including basic commodities) is well organized as well as the distribution channels making it ideal for fortification efforts. The government lacks somewhat in food control, even though efforts and improvements are evident. Self monitored quality control and assurance is being done by large and medium industries and small ones are following the trend. Food safety and HACCP are an integral part of food science and technology training and the closeness with USA markets, which Mexico is a very important supplier, has forced the

[41] Health in the Americas, 2002 Edition, Volume 1 - Promoting Health in the Americas - page 184

country to adapt Good Agricultural Practices (GAP) as well as Good Manufacturing Practices (GMP) which now includes frequent government inspections.

Although there appears to be no clear path for monitoring food fortification program in some of the countries, the following provides some details per country.

Belize:
Belize Bureau of Standards
Helen Reynolds
53 Regent Street. Belize City, Belize C.A.
TEL: (501) 227-2314; FAX: (501) 227-0711

Costa Rica:
Sanitary and phytosanitary requirements and approval processes in Costa Rica can often be cumbersome and lengthy.

Currently, all foods, pharmaceuticals, agricultural goods, and chemicals and cosmetics for human and animal consumption, locally produced or imported, must be tested and registered by the Ministry of Health before they are allowed to be sold. A system of standards exists, but lack of adequate laboratory testing equipment and funds prevents effective controls on local products from being implemented. Costa Rica requires that all imported products be certified safe and allowed for sale in the country of origin in order to be registered. Food traders have expressed concern regarding the length of time it takes to register a product, which can be months.

Dirección de Investigación y Desarrollo Tecnológico en Salud
Ministerio de Salud
Dr. Luis Tacsan
Calle 16, Ave. 6-8. San José, Costa Rica
TEL: (506) 257-3118; FAX: (506) 256-6645

El Salvador:
Coordinadora del Programa de Fortificación de Alimentos Ministerio de Salud
Licda. Haydée Rodríguez de Orellana
Calle Arce No. 827 San Salvador, El Salvador
TEL: (503) 2222-8590

Under the Sugar Law, Salvadoran Sugar Council (CONSAA) is in charge of regulating the sector. CONSAA has a board of directors that includes members from the government, sugar producers and sugar mills.

Guatemala:
Unidad de Regulación y Control de Alimentos

Ing. Gladys Arriola. Jefe de Control de Alimentos
3a. Calle final 2-10, zona 15. Valles de Vista Hermosa. Guatemala.

TEL: (502) 2369-8784;

Ing. Manuel Lezana, Director de Regulacion, Vigilancia y Control de Servicios de Salud
3a. Av. 3-45, zona 11, Ciudad de Guatemala
TEL: (502) 2475-2147

Honduras:
Coordinadora de Fortificación de Alimentos
Departamento de Regulación Sanitaria, Secretaría de Salud
Dra. Vilma Estrada
TEL: (504) 237-9404

Nicaragua:
Control de Alimentos
Lic. Edgardo Pérez
Complejo Nacional de Salud "Dra. Concepción Palacios"
Costado Oeste colonia Primero de Mayo.
Sector Postal 15AB, Apto. Postal: 107 Managua, Nicaragua
TEL: (505) 289-4700

Mexico:
The Health authorities in Mexico have been working on different fortification initiatives to help increase micronutrient intake in Mexico.

These initiatives have led to the regulation for the fortification of wheat flour and salt (addition of Fluor and Iodine) through the official Mexican Norms NOM-147-SSA1-1996 and NOM-040-SSA1-1993, respectively.

In addition, there is a new proposal for regulation of fortification of flours from other cereals, including nixtamalized corn through the project -NOM-000-SSA1-2005. However this proposed regulation has not been approved due to diverse issues. One of the issues affecting fortification is the fact that large corn industrialization companies do not support mandatory fortification unless these same criteria is applied to the small artisanal nixtamalized masa mills. In addition, voluntary fortification is not usual due to the lack of regulation regarding specific health claims. Due to the mandatory fortification of wheat flour, the bakery market will be analyzed in this report.

8. Andean Sub-Region Food Industry Assessment

The agricultural sectors of the Andean countries have similar characteristics and some of them limit the sector's development. These include the existence of productivity levels that are lower than in other parts of the world; predominance of small; failure to take advantage of potentials to ensure a better domestic supply of agricultural and food products; weak presence of the State in the rural area; sizeable population sectors living in poverty; limited access to external markets; little private investment and insufficient services, among others.

As members of CAN[42], the region is taking steps to improve agriculture, productivity and is addressing food security – not only for their domestic and intra-regional markets, but also for international trade and competitiveness.

Although there are several developed industries in the region grains, oilseeds, edible oils and rice are being imported to meet demand. Some are being imported in the raw or crude state for further processing while others are being imported processed or milled.

Trade within the region is advantageous as the Andean community offers preferential import duties to member states.

8.1.a. Andean Wheat Flour Markets

In the Americas, the flour millers are well-developed and organized. Many of the wheat flour millers participate in the Latin American Association of Industrial Millers (Asociación Latinoamericana de Industrias Molineros, ALIM). In 1997, at the ALIM General Assembly held in Lima, Peru, all of the association millers agreed to support the mandatory fortification of wheat flour, thereby committing to promote national legislations for mandatory fortification and work jointly with the health authorities to develop them[43].

In addition to the indispensable role of individual flour millers in the national food fortification programs and given their commitment and support of food fortification as a public health measure, the associations of industrial millers in Latin America and the Caribbean hold an important role in promoting and enabling effective flour fortification throughout the Region, particularly by tapping expertise and resources in technology transfer, business development, fair trade and marketing in support of food fortification.

Overall the Andes are net importers of wheat and wheat flour. Wheat flour mills operate throughout the region and, although there is some wheat production locally, imports are the main sources of supply. There is little to no trade of wheat flour within the region as the mills' capacities are normally sufficient to meet domestic demands.

[42] Refer to Appendix 1
[43] PAHO Report FCH/NU/49-24/04

Table 19: Wheat Imports into the Andean Countries 2002 - 2005

	WHEAT IMPORTS			
(tonnes)	2002	2003	2004	2005
Bolivia	410,329	283,058	195,972	157,633
Colombia	1,289,952	1,200,479	1,238,759	1,287,374
Ecuador	438,001	401,552	447,018	504,241
Peru	1,314,241	1,309,201	1,425,692	1,485,154
Venezuela	1,229,144	1,281,672	1,278,384	1,506,602

FAOSTAT © FAO Statistics Division 2007 - 11 July 2007

Wheat is a minor crop in Bolivia, accounting for 9 percent of grain production. Wheat is grown to some extent in most regions of the country, though the majority of the crop is produced in Santa Cruz and entire crop is being milled and consumed locally.

Despite repeated attempts by the government's National Wheat Institute to make the nation self-sufficient in wheat production, Bolivia continues to produce only about 20 percent of its national requirements. The flour milling industry is mainly centered in two cities Santa Cruz and La Paz.

Per capita consumption is relative low with an estimated 60 percent of the population living below the national poverty line.

Colombia depends heavily on wheat imports, and in 2005/2006, wheat imports accounted for 98 percent of total Colombia's wheat demand with imports reaching 1.3 million tonnes. The wheat industry continues to develop value added wheat products such as pastas, incorporating new technologies to reduce costs and increase productivity. This focus has reduced pasta prices for lower income consumers resulting in increased wheat demand.

Per-capita consumption is growing but remains relatively low. For 2006, industry calculation shows the following per-capita figures: wheat 31.4 kg, bread 21.8 kg, cookies 3.1 kg, and pasta 3.6 kg.

The largest flour mill is Harinera del Valle with 23% market share followed by Org. Solarte, with 19% market share.

Wheat production in Ecuador remains stagnant and rising imports are explained by sharp decreases in production and by growing consumption in both the human consumption and animal feed sectors.

Wheat is mostly used in Ecuador to produce flour suitable for bread and pasta, and its consumption is fairly stable despite fluctuations in the international markets Per capita

wheat consumption has also grown considerably, from 30 kg/year in 2002 to nearly 40 kg/year in 2006.

There are 25 flour mills located between the Sierra and the coast. The principal mills are: Molinos del Ecuador (12% market share), Industrial Molinera (12%), Molinera Manta (10%), Molinos La Unión (10%), Molinos Poultier (8%) y Molinos Superior (5%).

Wheat is considered only a minor crop in Peru therefore most of the wheat for milling is imported. Most of the wheat produced in Peru is soft wheat and it is consumed directly in soups and purees. This type of wheat is not suitable for milling.

The wheat milling industry in Peru is highly concentrated. Of the 22 mills in the country, the largest one, Alicorp S.A.A., accounts for about 50 percent of total wheat processed, and the top four mills account for about 80 percent of the wheat milled in the country. Cognorno S.A. is the 2nd largest with approx. 10% market share.

Bread consumption in Peru continues to be very small. According to industry officials Peruvian per capita consumption is around 26 kilograms per annum. With 10 kilograms per capita, Peru continues to be the second largest pasta consumer in South America.

Wheat production in Venezuela is negligible[44]. Only a small amount for local consumption is produced in the western Andean part of the country. Venezuela is heavily dependent on imports of wheat for domestic flour milling activities.

There are ten milling companies in Venezuela, eight national and two multinational. Total installed capacity in Venezuela is 1.9 MT, of which 1.6 MT are being used. All of the wheat milled is imported. Venezuelan milling capacity is highly concentrated: two groups control an estimated of 57 per cent of the installed capacity.

The largest milling group is Cargill of Venezuela, a multi-national with operations throughout LAC, with an estimated capacity of 2,210 tons per day. The second largest group is MONACA with an estimated capacity of 1,360 tons per day.

Consistent with the growth in the economy and confirmed by industry sources, wheat consumption in Venezuela has been increasing in the last three years. Per capita consumption is in the order of 56 kilos per year.

In summary, wheat flour and foods manufactured from wheat flour, such as pasta, are a food staple in the region and consumption is fairly stable despite fluctuations in the international markets.

[44] USDA GAIN Report - VE7002

8.1.b. Andean Corn (Maize) Markets

Although corn is not a food staple throughout the entire region, there is substantial production and consumption of corn flour in most countries. In Venezuela, corn is still a food staple and consumption is increasing in response to declining real incomes.

Corn flour mills are located throughout the entire region and it appears that local capacity is sufficient to meet demand in most countries.

Corn is Bolivia's most important domestically produced food grain accounting for 52 percent of grain production. Both white and yellow corn is grown in Bolivia about half of all white corn produced is consumed locally by Bolivia's small farmers, while the remainder is marketed to the livestock and poultry feed industry.

Colombian corn production has been low resulting in increased imports which represent 75 percent of total corn needs for both food processing and animal feed.

In Ecuador maize flour consumption is very low and around 2,500 tonnes of precooked maize flour is produced industrially. An artisan crude maize flour production exists dispersed mainly in the provinces of the Mountain range of Ecuador. Maize tortilla consumption does not exist in the country like in Mexico or Central America and most of the consumption is like tender maize or tostado.

Corn production in Peru is expected at 1.55 million tonnes for MY 2007 an increase of almost 11 percent compared to the previous year. This significant increase is due to good weather conditions, sufficient water supply and strong demand for yellow corn from the poultry industry. Among the several types of corn produced in Peru, the most important varieties are starchy corn (with production estimated at 285,000 tonnes in CY 2006) which is used directly in human consumption and yellow corn which is primarily used in the animal feed industry.

Corn is the main crop of Venezuela. As a consequence of the National Planting Plan, corn production in 2006 reached 1,900,000 MT of which about 70 percent is white corn. White corn is a staple on the Venezuelan diet and is traditionally purchased by the corn flour industry for producing a pre-cooked corn flour for human consumption.

Consumption of corn flour has increased over the past four years in response to declining real incomes, since corn flour is cheaper relative to other food products. In addition, the price of corn flour is now subject to controls. Government is supplying corn flour at the fixed price, or even below that level, at its distribution food chain, MERCAL.

It is important to note that recently there's been a huge increase in the demand for industrial corn for the production of ethanol which inevitably pushes up the price of food stuffs. This could be devastating to the poor who will pay the price as the developed world uses vital food stuffs to replace its fuel oil supplies.

8.1.c. Andean Sugar Markets

More than 100 countries produce sugar, 74% of which is made from sugar cane grown primarily in the tropical and sub-tropical zones of the southern hemisphere, and the balance from sugar beet which is grown mainly in the temperate zones of the northern hemisphere. Generally, the costs of producing sugar from sugar cane are lower than those of processing sugar beets. Currently 69% of the world's sugar is consumed in the country of origin while the balance is traded on world markets. Global sugar consumption continues to increase by about 2% per annum.

Table 20: Top 10 Sugarcane Producers Worldwide 2005

Top 10 Sugarcane Producers - 2005	
Country	(1000 tonnes)
Brazil	422,926
India	232,300
China	87,768
Pakistan	47,244
Mexico	45,195
Thailand	43,665
Colombia	39,849
Australia	37,822
Indonesia	29,505
USA	25,307
World Total	1,011,581
Source: *UN Food & Agriculture Organisation (FAO)*	

Colombia is largest sugar producer in the region and, although sugar production fell in 2005/2006, it is expected that it will rise only slightly in 2006/2007. Sugar exports have declined 20 percent while imports are increasing. This is the result of increases in ethanol production which has changed sugarcane use and resulted in significant changes in Colombia's sugar market. This as well as increased exports of confectionary products is resulting in a deficit in sugar supplies and a need to increase raw sugar imports[45].

Colombia imports raw sugar at a reduced duty from Brazil as a result of CAN-MERCOSUR free trade agreement, and duty free from Ecuador as member of the Andean Community. In 2005/2006, for the second consecutive year, Peru was the top destination for Colombian sugar exports and represented 13 percent of total Colombian exports. Colombia also exported to Chile and Haiti.

[45] USDA GAIN Report - CO7007

Bolivia's sugar cane is mainly grown in the Santa Cruz region. With four sugar mills with capacity to process 3.09 million tonnes of cane per year, Santa Cruz accounts for 84 percent of the country's milling capacity.

Most of the sugar production is for local use although there are limited exports. Per capita consumption is in the area of 23 kilograms annually.

Ecuador's cane sugar production for MY 2007 reached 500,000 MT (Raw Sugar Value), slightly up from last year. Consumption of sugar in Ecuador is increasing slowly, mainly driven by demand for specialty sugars for candy, chocolates and soft drinks manufacturing.

Ecuador has reduced its imports of refined sugars, as this market is being filled with domestic sugar. Exports of white sugar to and from Colombia and Peru are expected to remain constant.

Sugar mills produce raw sugar only as necessary to fill the U.S. Sugar TRQ, and it is usually the first sugar out after the harvest starts in June or July. After that, mills produce white sugar for local consumption and for export[46]. Sugar is considered by the government to be a staple and is used as one of several commodities used for the calculation of inflation indexes. Because of its social significance, sugar prices have been stable for the past few years although the government does not intervene to regulate them.

The main sugar processors are: San Carlos (33% market share), Valdez (30%), La Troncal (28%), Isabel María (1%), Monterrey (4%), IANCEM (4%). Most of the production is for white, refined sugar however there has been a recent increase in the production of brown sugar.

Cane sugar production in Peru[47] for CY 2007 is expected to rebound. Good weather conditions and strong investment in new plantations and more efficient processing plants will drive this increase. With current high levels of private investment, Peru should become self sufficient in sugar within the next three years.
Sugar imports in CY 2006 dropped 14 percent due to increased domestic production. Colombia was the leading supplier. Peru grants duty free access to Bolivian and Colombian sugar.

Sugar mills in Peru are located along the coast and have a total milling capacity of 37,000 MT of cane per day. Since sugar cane in Peru is produced year round, mills do not need to be very large.

Casa Grande, Peru's largest sugar producer was acquired in 2006 by Gloria, Peru's largest dairy processor. Gloria plans to invest $60 million to improve the company's

[46] USDA GAIN Report - EC7004
[47] USDA GAIN Report - PE7007

efficiency. Casa Grande has a milling capacity (10,000 MT of cane per day, a third of total capacity in Peru) and operates at less than fifty percent.

Cartavio, Peru's second largest sugar producer, has invested $58 million in the past seven years to improve its production, yields and processing efficiency. However, there still are some mills, such as Pomalca and Tuman, which refuse to merge with a strategic partner and continue falling in a financial black hole.

Venezuela's[48] sugar production does not meet demand. The lack of incentives to plant more area to sugar cane is defined by the existence of controlled prices at the retail level and increasing costs of production. Imports of raw and refined sugar are expected to continue in order to keep up with demand.

Because of the controlled price of sugar at the retail level, cane growers and millers have worked together in order to reduce production costs through achieving better yields and higher sugar content of the sugar cane. While there had been some increases in area planted to sugar cane, it has not had a significant effect in overall sugar production.

There are 14 sugar mills operating in Venezuela and for several years now sugar consumption in Venezuela has been slowly increasing. The sugar industry expects consumption to keep its upward trend in the upcoming years and estimates an increase in sugar consumption of two percent annually

Import licenses are awarded to mills based on the percentage of sugar cane received and milled. Import licenses are valid for four months, and can only be renewed if, on expiry, they have not been used for reasons outside the importer's control.

The region is a producer of sugar cane and there is inter-regional trade, however, most sugar is exported/imported in its raw form and refined locally.

It is important to note that more sugarcane is being diverted toward ethanol production as a consequence of expected higher demand for the product worldwide. In addition, sugar prices have not been as attractive as they were a year ago. In fact, the International Sugar Organization does not foresee a rebound in prices during the coming year due to a projected world surplus for MY 2006/07 of 6.5 million tonnes.

8.1.d. Andean Salt Markets

Although the three dominant salt producing nations in Latin America are Brazil, Chile and Mexico which produce 85%-95% there is substantial production in Colombia and Venezuela to meet local demand and intra-regional demand.

Table 21: Salt Production in the Andean Region 2001 - 2005

[48] USDA GAIN Report – VE7004

SALT PRODUCTION, BY COUNTRY										
(,000 tonnes)	2001		2002		2003		2004[e]		2005[e]	
Colombia Total	396	[r]	527		447		526	[r]	550	
Marine salt	286	[r]	336		248		294	[r]	300	
Rock salt	110	[r]	192		199		232	[r]	250	
Ecuador[e]	90		90		90		90		90	
Venezuela[e]	350		350		350		350		350	
[e]Estimated. [p]Preliminary. [r]Revised.										
Table includes data available through July 5, 2006.										
Source: http://minerals.usgs.gov/minerals/pubs/commodity/salt/										

It is necessary to make the distinction between the producers of crude salt and the processors of salt - the latter processes crude salt for distribution and sale to the wholesaler or to the final consumer. In Latin America there are over 1,000 medium and small scale producers. Their facilities range from a single pond producing 2 to 5 ton per year to well-organized facilities of up to 25,000 hectares[49].

Table 22: Number and Size of Salt Processors in the Andean Region

	Number of Salt Processors		
	Large scale > 100K ton/yr	Med scale 100 to 20K ton/yr	Small scale < 20K ton/yr
Bolivia	0	0	42
Colombia	3	5	50
Ecuador	1	2	10
Peru	1	2	50
Venezuela	2	2	10

Salt is produced in most countries in the region and quantities are usually sufficient to meet local demand. Where not produced or where sufficient quantities are not produced, trade within the region is usually the norm.

Colombia produces sizable amounts of rock and marine salt. Salt production in Colombia has two evaporation operations (marine salt) in Maraure (Department of Guajira), Galerazamba (Department of Bolivar), an underground salt mine in Zipaquira (Department of Cundinamarca), and by solution extraction in Nemocon (Department of

[49] PAHO - Publication: Salt 2000, 8th World Salt Symposium, Volume 2, pg 1033-38, 2000.

Cundinamarca) and Upin (Department of Meta). In recent years, Manaure has been producing about 60% of Colombia's salt.

Refisal S.A. is the largest salt refiner in Colombia and obtains its raw material of the mines of Zipaquirá and Nemocón and operates several processing plants.

Colombia's salt imports represent 6.5% of total consumption. In 2004, imports were from the following countries: Chile (79%), Perú (12%), Venezuela (5%), Netherlands Antilles (0,1%), and other (3,9%).

Venezuela has 14 salt processors, Sal Bahia and Tecnosal, with capacities of 240,000 and 150,000 ton per year respectively and account for approx. 75% of the total production of processed salt. The main medium and small processors are ALESCA, MOLISOCA and INDULSALCA. The 4 medium producers account for 60,000 ton or 18.2% and the 8 small and micro producers 20,000 ton or 6.1% of the total.

The industry on a whole may be regarded as mature and consolidated. Compared to most of the countries in the region it has relatively few processors, and only two producers. Most processors purchase crude salt from the most convenient source with respect to price and quality. This ensures competition and efficiency of operations by the crude salt producers.

The processing operations are for the most part mechanized. Most of the processors utilize the hydro refining process. Tecnosal is the largest plant of this type in the Region. INDULSALCA employs the evaporative process, while Sal Bahia employs both.

The quality of the finished salt product is high. Chemical quality is on par with similar products internationally and the packaging and presentation is very good. The secret of this industry's success has been management's recognition of the need to be efficient, and maintain high quality standards. The competitiveness of their product with regards to packaging, presentation, and price is constantly being emphasized.

In Ecuador 60% of salt is produced by ECUASAL. Others in the marketplace are FAMOSAL, Jueza SA, Profipil y Salfipil.

The marketing of salt throughout the region is in the process of change. As with many other products the salt market was highly protected within each country. Now with the reduction of trade barriers, the intra-regional trade in salt is increasing. Large, more efficient processors are beginning to export whilst those processors that have lagged behind in quality and efficiency are becoming anxious at the potential threat that imports will have on their sales.

There exists great variation in salt prices throughout the Region. As may be expected the variations are coming under pressure from liberalized trade and more open markets. In this changing environment the more efficient producers, processors and distributors will have an advantage. There is, however, a limit to the extent that they will dominate as a

large component of the price of salt is that of transportation. Local salt producers close to the market will always have the edge over the large ones.

8.1.e. Andean Edible Oil Markets

Edible Oils are produced throughout the region with palm oil being the highest followed by soybean oil and blended oils. Most countries are net importers of edible oil other than Ecuador where palm oil is produced in sufficient quantities to meet demand and imports of soybean oil are only used for blending.

Table 23: Edible Oil Trade Statistics in the Andean Region 2004

Edible Oils ANDES - FAO Statistics - Y2004			
(tonnes)	*Production*	*Exports*	*Imports*
Maize Oil	61,686	463	11,725
Sesame Oil	3,767	227	140
Soybean Oil	293,962	219,324	746,319
Palm oil	972,780	273,732	101,922
Sunflower oil	24,914	21,702	69,560
Vegetable Fats and Oils	185,584	257	23,611

Soybeans are the largest and most important field crop in Bolivia and is the country's primary commercial or industrial crop, with about 85 percent of production being processed and exported from the country and the balance used domestically. Indications are that crude soybean oil importers were Colombia (59%) and Venezuela (41%).

Total crushing capacity in Bolivia is 7,500 MT per day, enough to process its entire crop. The largest crushing companies are ADM-SAO with about 35 percent of the market, Fino and Rico with about 25 percent of the market each, and several small companies share the other 15 percent of the market.

Colombia's imports of soybeans and soybean products from the United States have risen steadily over the last three years, and imports from the United States should increase further as a result of the recently signed Colombia – U.S. Trade Promotion Agreement (CTPA) - due to elimination of the import duty upon implementation.

Production of soybeans is expected to decline in 2006/2007, and remain constant in 2007/2008. Planted area of African Palm continues to expand fueled by a government policy to blend 5% bio-diesel with diesel starting in 2008 and the expectation of greater bio-diesel blends in the near future.

Vegetable oil consumption continues to grow in Colombia, reflecting increased substitution for animal fats and oils in food products, as well as use in cosmetic and cleaning products. The palm oil growers federation -Fedepalma - developed a strong marketing campaign to expand the local consumption of palm oil that has become a key element of the increase in vegetable oil consumption.

Colombia main companies involved in edible oils are Alianza TEAM (40%), GRASCO S.A. (20%) and Lloreda Grasas (20%). Alianza TEAM has one product in the market, Oliosoya Vitamina E, fortified with vitamin E and Omega 6. It is being promoted as a heart-healthy product containing antioxidents.

Ecuador produces large quantities of palm oil for home use and imports of soybean oil remain stagnant with Argentina being the primary supplier crude soybean oil in 2005. In addition, Ecuador imported 2,500 MT of refined soy oil in CY 2005 (32% more than last year) mainly from Brazil, Bolivia and Chile. Soybean oil is used in Ecuador as part of a blend with palm oil to produce oils for home use.

Ecuador has a very small crushing capacity with particularly high processing costs caused by old equipment, high electricity costs and other inefficiencies. The small percentage of soybean being crushed locally is done so by the oil extracting industries that specialize in palm oil production.

Oil consumption is made up of approximately 74% palm oil, 23% soybean oil and 3% of other oils. The palm oil produced locally, whereas 95% of the soybean oil is imported. The main oil producing companies are La Fabril - La Favorita (57%), DANEC (25%), ALES (15%) and EPACEM (2%).

Peru's soybean oil imports are forecast at 330,000 MT in CY 2007 up from in CY 2006 were 303,000 MT. Soy oil consumption in CY 2006 was 312,000 MT and is expected to continue increasing as Peru's economy improves.

Imported crude oil is refined and bottled for retail sale. Peru does not produce any soybeans, and the limited crushing capacity is used to produce full fat soy meal for feed. On December 28, 2006, Peru unilaterally eliminated import duties for soybean oil (previously 12 percent).

Alicorp S.A.A. is Peru's largest processors (approx. 60% market share) and also and also has operations in Ecuador and Colombia.

Venezuela is heavily dependent on imports of crude edible oils to supply domestic demand for cooking oils as there is no sufficient domestic production. Government imports of processed oilseed products (vegetable oil and margarine) are expected to continue while further growth in oilseed imports by the private sector will be subject to the importers' ability to procure import licenses. Processed oilseed product imports carried out by the government are exempt from import tariffs, foreign exchange controls

and import licenses. It is expected that oilseed imports will grow because of demand from the food and industrial sectors.

South American countries like Bolivia, Paraguay, Argentina, Brazil, and Uruguay, are Venezuela's mayor oilseed suppliers because of tariff preferences given by Venezuela. In addition, imports of oilseeds from countries members of the ALADI[50] agreement (Latin American Integration Association) are exempt of the foreign exchange restrictions.

Basic consumer products, including vegetable oils and margarine continue to be under the retail price control policy established by the Government of Venezuela back in 2003.

The edible fat and oil market in Venezuela is characterized by direct links between producers, processors, and distributors. Cargill, the market leader, is the most important producer of vegetable oil. Cargill processes a wide variety of products for both home and industrial use. Cargill is followed is followed by Coposa and Alimentos Polar, domestically-owned oil processors.

8.1.f. Andean Rice Markets

Table 24: Rice Trade Statistics in the Andean Region 2004

Rice Y2004 - FAO Statistics						
(tonnes)	Bolivia	Colombia	Ecuador	Peru	Venezuela	Regional
Local Production						
Rice, paddy	331,336	3,016,241	1,778,380	1,884,896	974,091	7,984,944
Rice, milled	225,308	2,051,044	1,209,298	1,281,729	662,382	5,429,762
Exports						
Rice, paddy	54	762	22	1	274	1,113
Rice, milled	4,420	119	1,225	148	7,655	13,567
Imports						
Rice, paddy	102	5,277	652	357	28	6,416
Rice, milled	2,595	85,697	31	77,097	231	165,651

Rice is Bolivia's second most important food grain, accounting for 21 percent of grain production (milled-basis). The vast majority of production comes from the region of Santa Cruz, which accounts for 82 percent of national output.

[50] Refer to Appendix 1

Bolivia has been virtually self-sufficient in rice production since the 1960's however this is primarily the result of low per capita consumption, which amounts to 20 kilograms per capita annually.

Colombia's rice production fell in 2006 by 84,000 tons due to a reduction in area planted in the second half of 2005. Prices rebounded in late 2006 and stimulated rice plantings. A commitment from the government to continue agricultural supports and high import duties (80 percent) on rice from countries outside the Andean Community will reinforce increased plantings of rice. Imports from Ecuador and Venezuela enter duty free. Colombia is expected to increases its rice production by 114,000 tons, paddy basis, to 2.2 million tons in 2007.

The Colombian government supports rice storage that is used whenever the seasonal rice production does not meet demand, which usually happens during the second half of the year.

Colombia's per-capita milled rice consumption is estimated at 37 kilograms per year. Consumption has steadily increased over the past several years, but at a very slow rate.

In MY 2007 Ecuador's rice production is expected to increase by 3 percent to 495,000 tonnes. This increase will respond to very small current stocks of rice, due to unexpectedly large exports to Colombia throughout 2006.

Rice is a staple food of Ecuadorians for at least one meal a day and the majority of Ecuador's production is consumed locally. Per capita consumption is high due to higher prices of alternative staples, such as bread or pasta. Rice is also replacing other traditional staples in the highlands, such as quinoa and even potatoes.

Rice imports are a very sensitive issue in Ecuador. The Government of Ecuador is pushing a self-sufficiency program for rice by continuing to implement the Andean Price Band System (APBS) and by controlling imports.

Peru's rice production for CY 2007 is estimated at 1.6 million tonnes (milled basis), a slight increase compared to the previous year. A decrease in imports was the result of higher rice production due to good weather conditions and attractive prices. Uruguay continued to be the leading exporter to the Peruvian market with 32,756 tonnes.

Rice is a staple product in the Peruvian diet and is sold traditionally in small markets, weighed out and bagged from 50 kilos sacks. In recent years, with the expansion of supermarket chains in Peru, several consumer habits, including the purchase of rice, have changed. There is a growing demand
for prepackaged one-kilogram bags of rice.

Venezuela is self-sufficient in rice production and produces enough rice to supply the domestic market and to export small surpluses to neighboring countries.

Milled rice production increased in 2006 and the same trend is expected to continue with production estimated to grow about 5 percent, reaching 515,100 of total milled production in 2007.

The rice milling industry in Venezuela operates 47 mills but only 35 are currently active and idle capacity in 2005 was 51.87 percent. Many companies have not invested to modernize.

Rice is a traditional food and an important staple in the Venezuelan diet, yet per capita consumption is relatively low at an estimated 16 kg in 2006.

Mercal, as well as other government food social programs represents 45 percent of the total rice market; only a few big companies that can afford to sell rice at the lower prices required by these government outlets actually supply them.

Traditionally, Venezuela has been a net exporter of rice, sending about 10 percent of its rice crop annually to Colombia. However, Colombia tries to protect its domestic production by applying measures to restrain rice imports from Venezuela. Central American and Caribbean countries, which are not self-sufficient in rice, are also natural markets for the Venezuelan rice; some small amount of exports usually goes to those markets.

South American countries consumption of rice 39kg/ capita compared to the Caribbean with 48 kg/capita and Central America with 18 kg/capita.

Table 25: Rice Consumption per Capita in Andean Countries

COUNTRY	CONSUMPTION KG/CAPITA[51]
Ecuador	47
Peru	45
Colombia	37
Bolivia	20
Venezuela	19

8.1.g. Andean Vitamin and Mineral Markets

There are companies that have premix plants, offices and/or distribution facilities in the region (listed in Annex 3). There are others listed below that work in the region and have also expressed their availability is assisting with formulations based on applications and nutritional level requirements.

[51] Rice Congress of the Americas 2007 – Cancun, Mexico

Nealanders International Inc.,
6980, Creditview Road,
Mississauga, Ontario
L5N 8E2 – Canada
Tel: 1 905 812 7300
www.nealanders.com

Fortitech, Inc.
Riverside Technology Park
2105 Technology Drive
Schenectady, NY 12308
Tel: +1.518.372.5155
Fax: +1.518.372.5599
www.fortitech.com

Watson Inc.
301 Heffernan Drive
West Haven, CT 06516
Phone: 203-932-3000
Fax: 203-932-8266
www.watson-inc.com

8.2 Andean Region Policy Environment

Salt: It is now estimated that iodized salt is at 86% consumption levels[52] in Latin America and the Caribbean.

Table 26: Household Access to Iodized Salt, Andean Region

Country	% of households consuming iodized salt	Reference Year
Bolivia	90	2003
Colombia	92	1997
Ecuador	99	1999
Peru	93	1997
Venezuela	90	1998
Source: UNICEF, August 2004		

Salt Iodization is mandatory and legislated throughout the region.

[52] Source: UNICEF, 2006

Wheat Flour: All countries in the region have regulations making wheat flour fortification mandatory.

Corn (Maize) Flour:
Venezuela is the only country in the Andean region in which corn flour fortification is mandatory.

Rice:
There is no legislation making rice fortification mandatory in the region however there is at least one rice mill in Colombia fortifying with vitamin A and folic acid.

Sugar:
There appears to me no legislation making sugar fortification mandatory in the region. In 1990, Colombia issued Decree 1324 regulating mandatory sugar fortification with vitamin A in the country. The decree was reversed in 1992 by influence of ASOCAÑA (Asociación de Cultivadores de Caña de Azúcar de Colombia).

Vegetable Oil:
In Bolivia, it is mandatory that all edible vegetable oils be fortified with Vitamin A. A similar program is in discussion in Peru but to date, no legislation has been passed. Elsewhere in the Andean sub-region, there is no legislation making the fortification of edible oils mandatory. However, there is at least one processor in Colombia fortifying one brand with vitamin E and Omega 6.

In summary, PAHO has stated that in the developing world the LAC countries are leaders in food fortification due to their well-developed food industries; growing urbanization and the use of industrially processed foods; government and public acceptance of food fortification with micronutrients; and the passage of legislation to support fortification efforts[53].

8.3. Andean Regulatory Environments

As in all country initiatives a collaborative effort from all pertinent sectors of government and international organizations as well as a buy-in from private industry is the key to successful implementation of food fortification programs. Many issues must be discussed and addressed which include but are not limited to: feasibility; collaboration; development of standards and capability of adhesion to same; raw materials; supply chain; cost of implementation (both government and private); monitoring tools; cost effectiveness analysis; education at all levels and stages of implementation (producer, manufacturers, consumer); etc.

Although there appears to be no clear path for monitoring food fortification program in some of the countries, the following provides some details and activities per country.

[53] Health in the Americas, 2002 Edition, Volume 1 - Promoting Health in the Americas - page 184

Bolivia:
Many efforts in Bolivia to fortify commodities have been partially successful, and many reasons exist for the lack of total success. Some of them are politically motivated, as well as the fact that – for example in wheat flour – the government has not been able to control contraband product from neighboring countries, thus affecting the local industries.

Both government and industry are very well aware of the benefits to public health from fortification, as well as the excellent returns that supporting these projects would bring to the Bolivian people. Many international agencies and NGO's are and/or have been in Bolivia because of this.

Colombia:
Salt and wheat flour have mandatory fortification legislation and to a good extent do fortify their products. The rice industry is exploring the fortification of their product, even though in a limited fashion. Edible oil is a relatively sophisticated industry in Colombia and can very easily – from a technical point of view – fortify their products with vitamin A if it were to be mandated. In the maize flour industry, there are many small size food companies with very little technology, which manufacture ready-to-eat arepa flour (local tortilla type product) throughout the country; a situation which might be a difficulty in a fortification effort.

Regarding fortification of mass consumed products, Colombian industry and government are aware of its importance and how beneficial to public health the intervention is. According to consumption trends sugar and edible oil can be considered as good carriers for vitamin A fortification, but the need for this has not yet been established. Rice fortification at an experimental level is taking place in the country and it seems to be going well, even though the project is very limited.

Colombia is doing well in the aspect of food fortification and would be a good target for investment, if the need for such fortification is well defined before efforts are taken in this direction. Industry, in general, has a good rapport with government and through the industrial associations the needed support for a fortification effort is available.

The newly created Ministry of Social Protection (Health + Labor) defines all the issues regarding fortification of mass consumed foods.
Ministerio de la Protección Social
Ms. Adriana Rozo
Carrera 13 No. 32-76.
Bogotá

All issues regarding control of fortified foods (mandatory and non mandatory) are established by the Instituto Nacional de Vigilancia de Medicamentos y Alimentos (INVIMA).
INVIMA
Dr. Jairo Díaz
Carrera 68D No. 17-11.

Bogotá

Ecuador:
Wheat flour is fortified with a mix of vitamins and minerals with legislation since August 2006. The millers are complying with the legislation in various degrees. Salt has been fortified with iodine for about 30 years when legislation was enacted. Maize meal is basically not consumed and the oil and sugar industries have not contemplated fortification of their products. Fortification of sugar with Vitamin A was considered several years ago, but the health professionals (specifically many pediatricians) were opposed to it. The sugar industry based their refusal to even consider fortification on this opposition.

In Ecuador as in many other LA countries, the basic quality assurance of the fortified products does not exist. Control, surveillance and monitoring by the authorities are non existent and this would be an important area to focus on in order to obtain sustainability of the fortification programs.

The Ministry of Health is the one controlling and monitoring fortification. This is one by taking samples 3 times annually in each mill.

Ministerio de Salud Pública del Ecuador
Juan Larrea 444 y Riofrío
Quito
Ministra Caroline Chang
593-2-2541383
Dra. Nancy Vásconez, Directora General de Salud
593-2-2544267
Dr. Julio Alvear, Director de Normatización
593-2-2226411

Peru:
The fortification efforts in Peru have been many. As in many other Latin American countries, efforts have been made by the wheat milling industry; but also by NGO's and international agencies (UNICEF; WFP; USAID; etc.), who have developed formulated fortified products directed to the sectors of population that need them most. These products – papillas, powder drinks, and others – for many reasons have not been sustainable.

Yet, Peru knows of the need for fortified products and there have been conversations between government and industry to assess the possibility of sugar and edible oil fortified with vitamin A.

Salt fortified with iodine and wheat flour with a vitamin and iron mixes have legislation and standards issued by the government.

In the areas of quality assurance – control, surveillance and monitoring – the weakness is a lack of enforcement and this area is one which deserves much attention.

Venezuela:
Venezuela was one of the first countries (after Chile) to fortify wheat and cooked maize flour. Other than salt iodization, efforts to fortify other commodities have not been successful. The Institute of Nutrition has experimented with some fortified formulated products but they have not been supported and presently are not being marketed.

Relative to fortification of mass consumed commodities, Venezuela has been very active in the area of wheat and precooked maize flours and salt. Yet, with sugar, oil and rice no attempt has been made regarding fortification. Specifically, the edible oil industry would be a good target for vitamin A fortification; but, as said before, the need for such fortification and the assurance that the needy populations do consume edible oil at the required levels has to be established, before any attempt to meet and convince the industry of fortification should be made.

Ministry for Trade and Industry
Avenida Libertador, Centro Comercial Los Cedros
PH Caracas
Venezuela
Tel: +58 2 762 3810
Fax: +58 2 731 3027

9. Southern Cone Food Industry Assessment

The agricultural sector is an import contributor to the Southern Cone region's economy and the commodities being analyzed are mostly produced and traded within the region as well as being exported world-wide. As founders and members of Mercursor the countries of the Southern Cone benefit from a tax free trade agreement among the member countries. It is the 4th largest free-trade zone in the world.

After the instability in the region in the late 1980's and early 1990's the food industry faced stiff competition from foreign companies and was forced into structural changes. Many multinationals have expanded business in the region and many micro and small businesses were pushed out of the market or taken over by larger companies. This, plus the fact that there have been mergers and acquisitions internationally, has resulted in strong local concentration. For example, the food processing industry is now positioned as the second largest manufacturing sector in Brazil.

This is not to say that all companies in this region have been purchased and/or merged with the large conglomerates. Due to the sizeable population and market in this region and in Central & South American, large and medium sized companies are continuing to maintain their presence in the region – with many expanding their product lines and their market reach.

9.1.a. Southern Cone Wheat Flour Markets

In the Americas, the flour millers are well-developed and organized. Many of the wheat flour millers participate in the Latin American Association of Industrial Millers (Asociación Latinoamericana de Industrias Molineros, ALIM). In 1997, at the ALIM General Assembly held in Lima, Peru, all of the association millers agreed to support the mandatory fortification of wheat flour, thereby committing to promote national legislations for mandatory fortification and work jointly with the health authorities to develop them[54].

In addition to the indispensable role of individual flour millers in the national food fortification programs and given their commitment and support of food fortification as a public health measure, the associations of industrial millers in Latin America and the Caribbean hold an important role in promoting and enabling effective flour fortification throughout the Region, particularly by tapping expertise and resources in technology transfer, business development, fair trade and marketing in support of food fortification.

Argentina is on average the second largest wheat exporting country after the USA. However, currently, producers are weighing the risk of more government restrictions, such as export bans and price controls, against the benefit of increased world prices and demand before making planting decisions for the upcoming year. The wheat planted area will depend heavily on producer's confidence in the lifting of the export registration ban

[54] PAHO Report FCH/NU/49-24/04

and the effect new subsidy programs will have on the wheat production chain. Some analysts forecast wheat area will be down 15 percent from last year due to the wheat export ban that was reinstated at the beginning of March 2007.

Table 27: Wheat Flour Trade Statistics for 2004, Southern Cone

	Wheat Flour				
(tonnes)	Argentina	Brazil	Chile	Paraguay	Uruguay
Produce	11,490,898	4,189,569	1,383,589	514,800	383,472
Export	7,183,151	952,875	164	229,880	7,811
Import	215	3,490,420	163,865	7	70,906

A new system of subsidies has been put in place to control the domestic wheat supply to the milling industry and, in turn, control consumer bread, pasta, and flour prices. The wheat subsidy is two-fold, one part paid to the producer and the other paid to the miller. The sector feels secure that there will be enough wheat to meet their needs and millers do not feel the need to rush to purchase to secure their supply due to competition from the export sector.

Brazil is both a large producer and consumer of wheat flour. Brazil imports, on average, about 5 million tonnes of wheat from Argentina, however, it is widely believed that Argentina does not have sufficient quantities of wheat to supply Brazil, made even more evident by the closed export registry, which will require Brazilian wheat millers to look outside of Mercosur.

Recently Brazilian millers have been faced with higher input costs and significant competition from Argentine wheat flour. If the Argentine government does not equalize its export registration policy and differential export taxes, it is expected that wheat flour imports will continue to rise as a percentage of total wheat imports, likely leading to some consolidation in the Brazilian milling industry.

Brazilian wheat consumption continues to be relatively stable and inelastic. A possible increase in bread prices resulting from high commodity prices is not expected to have a significant impact on consumption levels.

In Chile, an increase in wheat planting intentions calls for a larger output which should result in smaller imports when compared to previous years. Wheat is politically Chile's most important annual crop. There are an estimated 89,000 producers, of which a little over 10,000 producers are in the so-called subsistence group with little or no alternative crops (production).

Consumption of wheat has been rather stagnant and in line with population increases during the last few years. According to the local bakery association, Chileans consume an average of close to 100 kilos of bread per capita per year, making them the second largest consumers of bread in the Western hemisphere after Germany.

The milling industry is Chile's main wheat destination. An estimated 85 percent of total wheat supply (domestic production plus imports – mainly from Argentina) is milled for flour. An estimated 80 percent of wheat flour is sold directly and produced by 85 milling facilities nationwide. Industry sources indicate that the wheat produced in Chile is in general of a lower quality than that required by the bread and pasta industry. It is mainly low in protein and the quality varies a lot.

The wheat and wheat flour industries in Paraguay and Uruguay are much smaller in comparison to Argentina, Brazil & Chile however still play important roles in the region and on the export market. Paraguay produces and mills a good portion of the countries requirements while Uruguay still relies on imports to supplement supplies.

There are three multi-nationals operating and/or partnering with flour mills in the region:

- Cargill with Molinos Harineros de Paraguay (Paraguay), Moinho São Valentin (Brazil) and Trigalia, a joint venture between Cargill and Molinos Río de la Plata (Argentina) plus several other processing facilities in Argentina & Chile.
- Bunge with operations in Argentina & Brazil where it is the market leader in wheat flour for industry and pre-mixed products for the baking and confectionary sector.
- ADM with several partnerships in the region.

Other players include:

- Industrias Harinas S.A. operates Molino San Salvador in Uruguay with a milling capacity of 12,000 tonnes monthly and is a major exporter to Argentina & Brazil. They also export wheat in bulk.
- Compañia Molinera San Cristóbal S.A. is one of the leaders in flour milling & processing with several locations throughout Chile.
- With Argentina being the largest producer and exporter in the region, they are represented by the Federaction Argentina de la Industrio Molinera and the following link contains the association's members: http://www.faim.org.ar/empasoc.htm

In summary, the flours mills located in the Southern Cone are manufacturing wheat from both local production and imports. All of the countries are producers of wheat, however, cannot always meet domestic demand. Those with regulations requiring fortification, import fortified flour which accounts for most (if not all) flour processed in the region to be fortified.

9.1.b. Southern Cone Corn (Maize) Flour Markets

Corn production in the Southern Cone is grown predominantly for animal feed with just a handful of mills operating to produce corn meal, flour, etc. Since corn flour is not major consumption item as it is in Mexico or Central America the mills producing corn flour are doing so in large part for the export market.

Brazil's corn production for 2007/08 is expected to continue to be strong, at 47 million tonnes, as farmers continue to take advantage of strong export opportunities. Poultry and swine production account for approximately 40 percent and 20 percent of domestic corn consumption respectively. Brazil has been importing some corn from Paraguay, mainly for the meat industry in the South.

Although Argentina'**s** corn production is mainly for animal feed, a certain percentage of the corn grown is of human consumption grade and is used for corn oil and meal processing.

Chile, Paraguay and Uruguay produce corn mainly for animal feed with some processing on human consumption corn done locally.

In Brazil, Cargill's corn wet milling plant is located in Uberlândia, in the state of Minas Gerais, and produces glucose, maltodextrin, natural and modified starches, gluten and corn meal.

Also, in Brazil, Mina Mercantil Industrial e Agrícola Ltda's plant situated north of the State of São Paulo has capacity to mill 60 tonnes per day.

In Argentina, Molinos Rio de la Plata SA produces corn oil and flour for domestic and export demand.

9.1.c. Southern Cone Sugar Markets

More than 100 countries produce sugar, 74% of which is made from sugar cane grown primarily in the tropical and sub-tropical zones of the southern hemisphere, and the balance from sugar beet which is grown mainly in the temperate zones of the northern hemisphere. Generally, the costs of producing sugar from sugar cane are lower than those of processing sugar beets. Currently 69% of the world's sugar is consumed in the country of origin while the balance is traded on world markets. Global sugar consumption continues to increase by about 2% per annum.

Brazil's sugarcane production for MY 2007/08 is forecast at 472 million metric tons[55], up more than 10 percent from the previous year, due to steady area expansion. Sugar production is projected to increase to 32.85 million tonnes, raw value. In addition, sugar exports are expected to reach 21.8 million tonnes (up 8 percent from the previous year).

[55] USDA GAIN Report - BR7003

Table 28: Top 10 Sugarcane Producers Worldwide, 2005

Top 10 Sugarcane Producers - 2005	
Country	(1000 tonnes)
Brazil	422,926
India	232,300
China	87,768
Pakistan	47,244
Mexico	45,195
Thailand	43,665
Colombia	39,849
Australia	37,822
Indonesia	29,505
USA	25,307
World Total	**1,011,581**

Source:
UN Food & Agriculture Organisation (FAO)

Argentina's sugar production for 2007/08 is forecast at 2.68 million MT (raw value), the highest ever. Argentine sugar exports in MY2008 are forecast to reach record levels - 825,000 MT (raw value)[56]. Despite a growing domestic demand, strong growth in production, with three record years in a row, is resulting in more abundant export surpluses with Chile expected to continue to be the second largest market, buying mostly refined sugar. After a few very profitable sugar crops, most mills are in a very good financial situation.

While Chile continues to be the largest importer of sugar in the region due to its production not being able to meet domestic demand, both Paraguay and Uruguay are net importers of sugar from neighboring countries.

Being the largest sugar producer in the world, Brazil's sugar industry has a blend of multi-nationals (such as Cargill), international and national companies processing, packaging and distributing sugar world-wide and regionally. Several have been identified Annex 3, however Appendix 3 lists more sugar refiners, processors, distributors in Brazil.

Ledesma is Argentina's number one sugar producer. It produces approximately 330,000 tonnes of sugar every year, which makes up approx. 20% of the country's total.

With many of the regions poorer population consuming sugar as the main source of energy and with Brazil and Chile being the main sources of supply to the other countries of the southern cone, they could be the vital key to introducing fortified sugar – not only to the immediate region, but to other developing countries in Latin American.

It is important to note that it is expected that more sugarcane will be diverted toward ethanol production as a consequence of expected higher demand for the product in Brazil.

[56] USDA GAIN Report - AR7009

In addition, sugar prices have not been as attractive as they were a year ago. In fact, the International Sugar Organization does not foresee a rebound in prices during the coming year due to a projected world surplus for MY 2006/07 of 6.5 million tonnes.

9.1.d. Southern Cone Salt Markets

The three dominant salt producing nations in Latin America - Brazil, Chile and Mexico - produce 85%-95% of the salt in the region. Most of it is produced by solar evaporation, though rock salt production is not uncommon, particularly in Chile where it's surface-mined. Demographic and economic analyses give strong clues about salt markets. Lesser-developed economies use salt primarily to feed people and animals; more developed economies use salt more for industrial production.

Table 29: Salt Production in the Southern Cone, 2001 - 2005

SALT PRODUCTION, BY COUNTRY												
(,000 tonnes)	2001		2002		2003		2004[e]		2005[e]	
Argentina	1,270		1,080		1,668	[r]	1,362	[r]	1,400	
Brazil Total	5,578		6,109		6,564	[r]	6,648	[r]	6,660	[p]
Brine salt	4,370		4,835		5,144		5,206	[r]	5,210	[p]
Rock salt	1,208		1,274		1,420	[r]	1,442	[r]	1,450	[p]
Chile	5,989		3,503		6,213		4,939	[r]	4,940	
[e]Estimated. [p]Preliminary. [r]Revised.										
Table includes data available through July 5, 2006.										
Source: http://minerals.usgs.gov/minerals/pubs/commodity/salt/										

In Chile, Sociedad de Punta de Lobos, S.A. (SPL Group of Companies) owns and operates the largest salt pit deposits in the world "Tarapaca Salar", in the Atacama desert. Since finalizing the purchase of the Salina Diamante Branco in Brazil and ISCO in the U.S., SPL currently produces approx. 6 million tonnes of salt.

There are also several smaller producers located in Chile and producing under their own brand for the local market. For example, Sal Trinidad operates out of Tarapacá salt pits and has 3 regional processing plants.

In Brazil Salinor is the largest producer of sea salt, accounting for more than 40% of the production with operations focused in Macau and Mossoró in the state of Rio Grande do Norte, on the northeastern part of Brazil. Macau´s unit current production is of 1 million tonnes annually and Mossoró´s plants can produce up to 1.3 million tonnes annually of coarse grade solar salt. Other than serving the domestic market, Salinor export within the region – mostly in bulk.

Refinaria Nacional de Sal S.A., is one of the smaller players in Brazil and has its operations in Cabo Frio, on the coast near Rio de Janeiro producing approx. half a 250,000 tonnes annually under the brand name Sal Cisne. They also have introduced a

light version of their salt and indicate that minerals (selenium, magnesium potassium, calcium, zinc and iodine) have been added.

In Argentina**,** Industrias Quimicas y Mineras Timbó, S.A., selling under the brand name Celusal, operates two plants and exports to several countries including Uruguay & Paraguay. They advise that their salt is enriched with iodine and have also introduced a new line which is fortified with iron.

Argentina, Brazil, Chile and Paraguay are all members of ALADI aiming at a Latin-American common market which can negotiate either regional or partial scope agreements in relation to various issues including health cooperation among its member countries.

9.1.e. Southern Cone Edible Oils Markets

The production of vegetable oils (canola, corn, cottonseed, coconut, olive, palm, peanut, safflower, soybean and sunflower) is high throughout the world, and consumption is increasing, especially among the lower socioeconomic groups.

The Southern Cone is a major producer and exporter of edible oils, particularly soybean oil. Imports by all countries are nominal except for Chile which has only one processing facility and Uruguay which has no processing facilities. Most of their oil imports originate in the region.

Table 30: Production of Edible Oils in the Southern Cone, 2004

Production Y2004						
(tonnes)	Argentina	Chile	Uruguay	Brazil	Paraguay	Regional
Maize Oil	35,700			63,600		99,300
Soybean Oil	4,569,700	32,600	99	5,545,000	263,100	10,410,499
Palm oil				142,000	2,770	144,770
Sunflower oil	1,208,500	220	15,769	28,400	14,104	1,266,993
Vegetable Fats/Oils	9,000			4,055	7,350	20,405

Source: FAO Trade Statistics

Table 31: Imports of Edible Oil in the Southern Cone, 2004

Imports Y2004						
(tonnes)	Argentina	Chile	Uruguay	Brazil	Paraguay	Regional
Maize Oil	76	68	2,644	183	88	3,059
Soybean Oil		10,813	12,976	26,903	1,699	52,391
Palm oil	240	338	3	21,094		21,675
Sunflower oil	1,419	1,411	2,952	13,016	2,183	20,981
Vegetable Fats/Oils	1,128	1,421	1	862	2	3,413

Source: FAO Trade Statistics

Brazil ranks as the world's leading soybean exporter and second-largest producer behind the U.S. In 2007, soybeans will make up a weighty 50 percent of Brazil's total grains and account for the vast majority of Brazilian oilseed production. Furthermore, the processing sector is well developed and Brazilian soybean research is advanced and easily mobilized.

Argentina is the world's third largest soybean producer and the world's largest exporter of soybean meal and oil. It is also the world's fourth largest sunflower seed producer and world's second largest sunflower seed oil exporter.

Paraguay is the fourth largest soybean exporter in the world, producing about two percent of the world soybean production. The main market for Paraguay's soybeans will continue to be Argentina as their crushing capacity increases in excess to domestic oilseed production, it is expected that crushers will increase imports from 'up-river' suppliers, such as Bolivia, Brazil, and Paraguay.

Chile has limited oilseed production and counts on its neighbors for supply of both oilseeds for crushing and crude vegetable oils for refining. Chile also purchases refined edible oils for their domestic market.

Uruguay continues to be a net importer of soybean oil since home grown soybean production continues to be destined almost exclusively to the export market. Soybean oil imports from April 1, 2006 through March 31, 2007 were 16,087 MT. Argentina was the major supplier, followed by Brazil. Since Uruguay's crushing industry is not expected to increase soybean crush in the coming year, it is likely imports of meals and oils will continue at the current level.

In addition to international and regional crushers, processors and distributors the major multi-nationals, Cargill, ADM and the Bunge Group, all operate in the region supplying both crude and refined oils.

- Cargill Agrícola S.A. is Brazil's largest soybean exporter and second-largest oilseed processor. Cargill produces and sells cooking oil, olive oil and blended cooking oil. CARGILL most popular brand LIZA is now marketing LIZA Nutriplus which is fortified with vitamins A, D and E.
- Cargill S.A.C.I. is ranked as one of the leading Argentine exporters of vegetable oils with three modern crushing plants -one for soybeans at Puerto San Martin, another for multiseed in Quequén (Buenos Aires Province) and the newest for sunflower seed in Bahía Blanca (also in Buenos Aires Province).
- CARGILL Paraguay processes soybeans in Minga Guazú and produces oils and fours for domestic and exports markets.
- Bunge Argentina S.A., with the Bunge y Born acquisition, the purchase of Guipeba S.A. and La Plata Cereal Co., has become the leading agri business company in the country and one of the world's top exporters of oilseeds, crude & edible oils and by-products.
- Bunge Alimentos is recognized as the largest agribusiness and food company in Brazil. Present in 15 states and producing vegetable oils, refined oils, margarines and vegetable fats, it is the fourth-largest exporter of Brazilian products.
- ADM, with locations in Argentina, Brazil and Paraguay, export oilseeds worldwide and have several lines of edible oils in their portfolio.

IMCOPA, located in Araucária, Brazil, has the capacity to produce 370 tones of crude and 400 tonnes of refined oil daily. ABC Inco – part of the Algar Group - operates one of the most modern industrial soybean processing installations in Brazil. It is a major producer of soybean oil, which is sold under the ABC brand in various states in Brazil.Reference can also be made to the Brazilian Association of Vegetable Oil Industries for additional processors (http://www.abiove.com.br/english/associadas).

In Argentina, Moreno, (owned by Glencore), is one of the world's largest producers and exporters of sunflower oil and meal operating four crushing plants (Necochea, Daireaux, Villegas and Grainer) with a combined annual capacity of 2 million tonnes.

ACEITERA MARTINEZ S.A. has been operating in Argentina for over 50 years and is currently one of the biggest bottlers in Argentina exporting to Chile, Paraguay and Brazil as well as several other Latin American countries such as Cuba, Venezuela, Panama, Peru and Colombia.

Molino Cañuelas is a leading flour producer; however, they have been producing and marketing vegetable oil in Argentina for the last 12 years with sales to Uruguay, Chile, Brazil and Paraguay as well as within Latina America including Bolivia, Peru, Panama, Cuba, Costa Rica, Surinam, Curacao and Trinidad & Tobago.

Although Paraguay is neither one of the leading producers nor exporters of edible oils a listing of processors can be found on the following site: http://www.viarural.com.ar/viarural.com.ar/agroindustria/aceite-de-soja/paraguay/default.htm

It is important to note that, when looking at the vegetable oil industry and oilseed production in this region, biodiesel fuels are a growing commodity in the region and that production is being diverted to this sector. This may have an effect on future supply of oilseeds and edible oils unless government intervention provides guarantees for availability since the biodiesel sector will have the ability to pay higher prices for oilseeds.

9.1.f. Southern Cone Rice Markets

Rice is produced mainly in Argentina, Brazil and Uruguay with smaller quantities being produced in Chile and Paraguay. Imports are very low except for Brazil and Chile where local demand must be satisfied through imports although the USDA does show Brazil exporting 20% of their production in Y2006.

Table 32: Rice Trade Statistics, Southern Cone, 2004

Rice Y2004 - FAO Statistics						
(tonnes)		Argentina	Brazil	Chile	Paraguay	Uruguay
Produce	paddy	1,060,000	13,277,000	119,270	125,000	1,262,000
	milled	720,800	9,028,360	81,104	85,000	858,160
Export	paddy	47,427	72		11,838	93,552
	milled	132,288	4,793	238	4,343	367,960
Import	paddy	267	214,797		180	104
	milled	6,224	487,331	72,406	333	19

Brazil is expected to import 750,000 tonnes of rice in 2006/07 and 900,000 tonnes in the 2007/08 trade year as domestic supplies and stocks become tighter. However, despite tightening supplies, Brazil is expected to export 125,000 tonnes[57], as part of an effort to maintain a presence in export markets. The milled rice that is now being exported is primarily going to Benin and Cuba. Imports are expected to be supplied by Uruguay, Paraguay and Argentina, with any residual coming from SE Asia.

Per capita rice consumption in Brazil is considered to be stable. The consumption of traditional milled rice is slowly declining as income levels rise, particularly in the Northeast. However, this decline is balanced by the increase in parboiled rice consumption, particularly in areas like São Paulo. It is still considered a staple food in Brazil, with most Brazilians consuming rice every day.

In Argentina the rice sector continues to experience consolidation and an increase in large producers with access to irrigation. Forecasts for the MY2007/08 milled rice production are at 765,000 tonnes and total rice exports at 450,000 MT due to stable demand and a slight increase in production with Brazil continuing to be the major importer.

Rice is not a staple product for the Argentine consumer and is not well incorporated into the Argentine diet. Per capita rice consumption in Argentina is very stable. Domestic rice consumption for is expected to be up slightly from previous years due to population increases.

Chile: Chile imports rice mainly from Thailand.

[57] USDA GAIN Report Number: BR7612

Uruguay is the largest rice producer in the region and the 7th largest world-wide. The heart of the Uruguayan rice industry is located in the Cuchilla Grande and on the Rio Olimar around the town of Trienta Y Tres. Approx. 185,000 ha of rice are grown with rice growing development increasing in the north of the country where warmer temperatures are tending to improve yields.

Per capita consumption of rice in Uruguay has remained steady since the early '90s.

Chile & Paraguay are net importers of rice and although the import from within the region they also import from Asia.

Urbano Agroindustrial Ltda is one of the largest rice processors in Brazil with 5 modern processing facilities and 3 distribution centers. A multitude of companies mill, package and sell rice in Brazil – both national and international .

Most of rice exports from Argentina in 2006 were concentrated among 3 companies which represented close to 50% of total exports – with approx. 280,000 tonnes shipped to Brazil.

A listing of many of the rice producers in Argentina can be found through the following weblink:
http://www.viarural.com.ar/viarural.com.ar/agricultura/arroz/arroceras/default.html

SAMAN is the leading rice processor in Uruguay and has the only parboiling plant. It is an integrated operator and has a close working relationship with its producers. It is among the five companies processing the highest volume of rice - 61 tonnes per hour.

A listing of many of the rice producers in Uruguay can be found through the following weblink: http://www.aca.com.uy/comision_sectorial/molinosarroceros.html

A listing of many of the rice producers in Paraguay can be found through the following weblink:
http://www.viarural.com.ar/viarural.com.ar/agroindustria/arroz/paraguay/default.html

In summary, rice consumption is generally high in the Southern Cone region and a staple for most of the population. Most of the companies are quite large and are shipping within the region, therefore, fortification by the major rice processors would have a carry over effect to neighboring countries.

9.1.g. Southern Cone Vitamin and Mineral Premix Markets

There are several companies have premix plants, offices and/or distribution facilities in the region. There are others listed below that work in the region and have also expressed their availability is assisting with formulations based on applications and nutritional level requirements.

Nealanders International Inc.,
6980, Creditview Road,
Mississauga, Ontario
L5N 8E2 – Canada
Tel: 1 905 812 7300
www.nealanders.com

Fortitech, Inc.
Riverside Technology Park
2105 Technology Drive
Schenectady, NY 12308
Tel: +1.518.372.5155
Fax: +1.518.372.5599
www.fortitech.com

Watson Inc.
301 Heffernan Drive
West Haven, CT 06516
Phone: 203-932-3000
Fax: 203-932-8266
www.watson-inc.com

9.2. Southern Cone Policy Environment

The environment is improving, but is far from being satisfactory. It is still perceived by some that food fortification is costly and the use of micronutrients is being promoted by industry for their own self-interest. In Brazil, the fortification of wheat and corn flour, with iron and folic acid, approved in the year 2002, was a significant step to combat such myths.

The food industries, represented by their major associations, are more open to discussion as they are starting to realize that the costs are nominal verses the returns. In turn, the policymakers are becoming more motivated to take actions against the health risks brought on by malnutrition and are becoming aware that the food industry can be a strategic ally.

However, it is still common to meet with high ranking officials occupying strategic decision making positions that have a very little information about the food fortification possibilities. Advocacy is still key.

Education programs are still needed at all levels; government, industry and consumers. However, programs to distribute fortified foods to those needing it most are essential to combat malnutrition and could be approached by organizations providing only fortified foods to the most vulnerable.

Salt: It is now estimated that iodized salt is at 86% consumption levels[58] in Latin America and the Caribbean.
ARGENTINA: Salt iodination is mandatory and started in 1967. Estimate 90% of salt consumed is iodized.
BRAZIL: Salt iodination is mandatory and started in 1953. Estimate 95% of salt consumed is iodized.
CHILE: Salt iodination is mandatory and started in 1958. Estimate 95% of salt consumed is iodized.
PARAGUAY: Salt iodination is mandatory and started in 1959. Estimate 83% of salt consumed is iodized.
URUGUAY: Salt iodination is voluntary and started in 1963. Estimate only 30% of salt is iodized.

Wheat Flour: All countries in the region have regulations making the fortification wheat mandatory although Brazil only fortifies with Folic Acid and Iron versus the others also fortifying with Thiamin, Riboflavin and Niacin.

Argentina has gone so far as to mandate the use of enriched/fortified flour in all products destined for domestic production, both locally-manufactured and imported.

Corn (Maize) Flour: Other than in Brazil where corn flour is fortified with Folic Acid and Iron, there appears to be no legislation however the consumption of corn flour in the Southern Cone is not as predominant as it is in Central America and is not considered a food staple in the region

Rice: Although rice is a food staple in the region, no standards or programs have been identified in the region. However, it has been noted that three rice mills in Brazil are adopting rice fortification. The amount of fortified rice at supermarket level is not yet significant and efforts are needed to advocate the importance of rice fortification with government authorities.

Sugar: Other than Paraguay where sugar is voluntarily being fortified with Vitamin A there appears to be no legislation.

In 2000, a project in Brazil was conducted by Acucar Guarani with ITAL – Institute of Food Technology aimed at the fortification of white sugar with vitamin A. Although the development of the technology was successful, Acucar Guarani declined to commercialize the product due to the high costs involved in advertising. The industry considered that the expenditure of several million dollars in advertising, without having

[58] Source: UNICEF, 2006

an interest from and support of government authorities did not pay off the required investments.

Vegetable Oil: The have been no fortification programs identified for vegetable oil in the region. However, having some of the largest crushing facilities located in this region, it would be an ideal start for fortifying refined oils priorfor export. There would be no purpose in fortifying crude degummed oil as Vitamin A would be destroyed during the refining, bleaching and deodorizing process. However, for those countries importing refined vegetable oils from the region, these could be shipped fortified.

The only mandatory fortification of fats and oils in the region has been identified for Chile where regulations require that margarine be fortified with Vitamins A and D.

In summary, PAHO has stated that in the developing world the LAC countries are leaders in food fortification due to their well-developed food industries; growing urbanization and the use of industrially processed foods; government and public acceptance of food fortification with micronutrients; and the passage of legislation to support fortification efforts[59].

9.3. Southern Cone Regulatory Environments

As in all country initiatives a collaborative effort from all pertinent sectors of government and international organizations as well as a buy-in from private industry is the key to successful implementation of food fortification programs. Many issues must be discussed and addressed which include but are not limited to: feasibility; collaboration; development of standards and capability of adhesion to same; raw materials; supply chain; cost of implementation (both government and private); monitoring tools; cost effectiveness analysis; education at all levels and stages of implementation (producer, manufacturers, consumer); etc.

Although there appears to be no clear path for monitoring food fortification program in some of the countries, the following provides some details per country.

Brazil:
For many decades Brazil was very resistant to food fortification practices. That situation seems to be reversing mainly due a better understanding of the potential of food fortification technologies primarily by government authorities. The creation of Anvisa, the National Agency for Food and Drugs Surveillance, was an important improvement within the Ministry of Health infra-structure.

The Agency is designated an autonomous agency which means that ANVISA is an independently administered, financially-autonomous regulatory agency, with security of tenure for its directors during the period of their mandates.

Brazilian federal regulations related to ANVISA can be found at

[59] Health in the Americas, 2002 Edition, Volume 1 - Promoting Health in the Americas - page 184

http://www.anvisa.gov.br
or at the Brazilian Federal Register web page
http://www.in.gov.br/.

Argentina:
The Argentine Food Code (Codigo Alimentario Argentino - CAA) regulates local food production and marketing. However, the CAA resolutions are being gradually replaced by Mercosur standards, which are based on the norms of: 1) the European Union; 2) the Codex; and 3) the FDA. (www.alimentosargentinos.gov.ar).

Chile:
Ministerio de Salud de Chile - www.minsal.cl

Vitamin Enrichment Requirements: The Ministry of Health has established maximum limits for vitamins and minerals added for food. Resolution Nº 393 and Nº 394 dated February 20, 2002 are the applicable regulations. Beyond these levels, the food becomes a food supplement and it must receive specific approval from the Ministry of Health.

Table 33: Chilean Limits for Vitamins and Minerals added to Foods

Vitamins	% RDA/Serving
Hydro-soluble vitamins	50
Vitamin C	100
E and K oil-soluble vitamins	100
A oil-soluble vitamins	25
D oil-soluble vitamins	40

The above limits do not apply to foods designed for special regimes, such as foods fortified to address a specific public health need. A calcium fortification limit is set by the Ministry of Health for each specific food product, according to the type of calcium salts used and the target population of the product.

Paraguay:

By a Decree # 20.830 of April 28th – 1998;
Article #1 – establishes the compulsory enrichment of wheat flour
Article # 5 designates the INAN – National Institute of Feeding and Nutrition as responsible of the control measures.
Article # 7 determines that dispositions of the Decree # 20.830 shall be in accordance of the Law # 736 of 1980.

However, the small wheat mills (1 to 10 tons) are out of the government's control and therefore it cannot be certified that 100% of Paraguayan wheat flour is enriched.

Uruguay:
Reference can be to pages 28-35 of document "Table de composición de alimentos de Uruguay" listing of micronutrients in foods - accessible through the following link:
http://www.chasque.apc.org/prensa/documentos/tabla.pdf

10. Country by Country Analysis of Opportunities for Food Fortification

10.1. Antigua and Barbuda

Total Population: 83,000
Rural Population: 51,128 (61.6%)
Est. Population with access to commercially processed food: 58.7%

Tourism continues to dominate the economy, accounting for more than half of GDP. The dual-island nation's agricultural production is focused on the domestic market and constrained by a limited water supply and a labour shortage stemming from the lure of higher wages in tourism and construction.

Antigua and Barbuda is primarily dependant on imports with no major processing of food commodities done domestically. With a total population of less than 100,000, agri-food products are generally purchased from the region.

Table 34: Food Industries and Trade – Antigua and Barbuda

Agriculture:	Sugarcane
Industries:	Sugar
Exports - commodities:	
Imports - commodities:	Wheat flour, sugar, edible oils, salt, milled rice

Industry Summary:
There is some local production of sugar from locally grown sugarcane.

Malnutrition:

Table 35: Incidence of Malnutrition – Antigua and Barbuda

Undernourished Population 2000-2002	17.9%
Chronic Malnutrition in Children Under Five Years: 1995 - 2002:	N/A
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	N/A
Households Consuming Iodized Salt – UNICEF Update 2004	N/A
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	49.4%
Women	26.5%
Pregnant Women	29.5%

Fortification:
Although fortification standards are not available, fortification efforts in those countries exporting to Antigua & Barbuda have a spill-over effect.

Table 36: Fortification Standards in Antigua and Barbuda

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
N/A	no legislation	N/A	no legislation	no legislation	no legislation

10.2 The Bahamas

Total Population: 323,000
Rural Population: 32,300 (10%)
Est. Population with access to commercially processed food: 93.3%

The Bahamas is a stable, developing nation with an economy heavily dependent on tourism and offshore banking. Tourism together with tourism-driven construction and manufacturing accounts for approximately 60% of GDP and directly or indirectly employs half of the archipelago's labour force. Manufacturing and agriculture together contribute approximately a tenth of GDP and show little growth, despite government incentives aimed at those sectors.

The Bahamas are primarily dependant on imports with no major processing of food commodities done domestically. Although some agri-food products are purchased regionally, with 77% of the food and agricultural products imported into the Bahamas coming from the United States, the Bahamas recognizes and accepts the U.S. standards for food and agricultural products.

Table 37: Food Industries and Trade – The Bahamas

Agriculture:	Sugarcane
Industries:	Salt
Exports - commodities:	Salt
Imports - commodities:	Wheat flour, milled rice, sugar, edible oils

Industry Summary:

- There is some local production of sugar from locally grown sugarcane.
- In addition, the Morton Salt Company, produced 1.2 million tons of salt in 2005. A multi-national, the Morton Salt Company supplies locally and within the region.

Malnutrition:

Table 38: Incidence of Malnutrition – The Bahamas

Undernourished Population 2000-2002	5.5%
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	N/A
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	N/A
Households Consuming Iodized Salt – UNICEF Update 2004	N/A

Prevalence of Anemia – 1995-2005

Preschool Aged Children	21.9%
Women	22.7%
Pregnant Women	23.3%

Fortification:

Although fortification standards are not available, fortification efforts in those countries exporting to the Bahamas have a spill-over effect.

Table 39: Fortification Standards in the Bahamas

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
N/A	no legislation	N/A	no legislation	no legislation	no legislation

10.3 Barbados

Total Population: 292,000
Rural Population: 137,532 (47.1%)
Est. Population with access to commercially processed food: 68.4%

Historically, the Barbadian economy had been dependent on sugarcane cultivation and related activities, but production in recent years has diversified into light industry and tourism. The government continues its efforts to reduce unemployment, to encourage direct foreign investment, and to privatize remaining state-owned enterprises.

Barbados' food processing industry plays a fundamental role in the island's economy. This industry is the largest employer in Barbados' manufacturing sector and is the largest single export-earning manufacturing sub-sector in Barbados.

Table 40: Food Industries and Trade - Barbados

Agriculture:	Sugarcane
Industries:	Sugar, wheat milling, corn milling, edible oils
Exports - commodities:	Sugar and molasses
Imports - commodities:	Wheat, corn, oilseeds Wheat flour, salt, rice

Industry Summary:

- Sugar refining is one of the two main agro-industries and only two operating factories remain. Built in 1980, Portvale is the newest factory, which started operations in 1982 but it cannot claim to have a "state of the art" plant and machinery since much of the installed equipment was bought second hand.
- ADM (Barbados Flour Mills) is one of two multi-nationals operating and/or partnering with flour mills in the region.
- Roberts Manufacturing Co. Ltd, imports soybean oil for bottling and further processing into margarine for both the local and regional market. The have distributors located in several countries throughout the Caribbean including Antigua, Dominica, Grenada, St. Kitts & Nevis, St. Lucia and St. Vincent.
- Corn flour and meal are processed locally for the domestic and regional markets.

Malnutrition:

Table 41: Incidence of Malnutrition – Barbados

Undernourished Population 2000-2002	3.2%

Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	N/A
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	N/A
Households Consuming Iodized Salt – UNICEF Update 2004	N/A
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	17.1%
Women	17.2%
Pregnant Women	23.0%

Fortification:

Table 42: Fortification Standards in Barbados

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
N/A	no legislation	A, B1, B2, Niacin, Fe Caribbean Standard, 1991	no legislation	no legislation	no legislation

10.4 Bermuda

Total Population: 64,000
Rural Population: 0
Est. Population with access to commercially processed food: 100%

Bermuda enjoys the highest per capita income in the world, more than 50% higher than that of the US. Its economy is primarily based on providing financial services for international business and luxury facilities for tourists. Most capital equipment and food must be imported. Bermuda's industrial sector is small and agriculture is almost nonexistent given that only six percent of the island's land is arable and the high population density.

The United States maintains a dominant presence in the market as Bermuda's primary trading partner. Other major trading partners include the United Kingdom, Canada, Italy, France, the Netherlands, and New Zealand. Food imports destined to the retail sector are estimated to be between 55-65 percent of total imports. The remaining 35-45 percent is channelled through the HRI food service sector.

Table 43: Food Industries and Trade - Bermuda

Agriculture:	
Industries:	
Exports - commodities:	
Imports - commodities:	Wheat flour, sugar, edible oils, salt, rice

Industry Summary:
There is no agri-food processing industry in Bermuda.

Malnutrition:
There is no data available.

Fortification:
Although fortification standards are not available, fortification efforts in those countries exporting to Bermuda have a spill-over effect.

Table 44: Fortification Standards in Bermuda

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
N/A	no legislation		no legislation	no legislation	no legislation

10.5 Dominica

Total Population: 68,000
Rural Population: 18,564 (27.3)
Est. Population with access to commercially processed food: 81.7%

The Dominican economy depends on agriculture, primarily bananas, and remains highly vulnerable to climatic conditions and international economic developments. Tourism has increased as the government seeks to promote Dominica as an "ecotourism" destination. The government began a comprehensive restructuring of the economy in 2003 - including elimination of price controls, privatization of the state banana company, and tax increases.

Dominica is primarily dependant on imports with little to no major processing of food commodities done domestically. With a total population of less than 100,000, agri-food products are generally purchased from within the region.

Table 45: Food Industries and Trade – Dominica

Agriculture:	
Industries:	
Exports - commodities:	
Imports - commodities:	Wheat flour, corn flour, sugar, edible oils, salt, rice

Industry Summary:

- None of the several commodities being assessed are processed in Dominica making it dependant on imports.

Malnutrition:

Table 46: Incidence of Malnutrition in Dominica

Undernourished Population 2000-2002	8.2%
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	N/A
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	N/A
Households Consuming Iodized Salt – UNICEF Update 2004	N/A
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	34.4%
Women	23.7%

Pregnant Women 35.1%

An FAO regional project is under way in Dominica to produce nutrition guides for healthy diets and lifestyles.

Fortification:

Although fortification standards are not available, fortification efforts in those countries exporting to Dominica have a spill-over effect.

Table 47: Fortification Standards in Dominica

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
N/A	no legislation	no legislation	no legislation	no legislation	no legislation

10.6 Grenada

Total Population: 105,000
Rural Population: 60,690 (57.8%)
Est. Population with access to commercially processed food: 61.3%

Grenada relies on tourism as its main source of foreign exchange, especially since the construction of an international airport in 1985. Strong performances in construction and manufacturing, together with the development of an offshore financial industry, have also contributed to growth in national output.

Grenada is primarily dependant on imports however has wheat flour and rice milling facilities which also serve neighbouring islands.

Food Industries and Trade - Grenada

Agriculture:	Sugarcane, corn
Industries:	Food and beverages
Exports - commodities:	Milled rice, wheat flour
Imports - commodities:	Wheat Wheat flour, sugar, edible oils, salt, rice

Industry Summary:

- ADM (Caribbean Agro Industries Ltd.) is one of two multi-nationals operating and/or partnering with flour mills in the region.
- Grenada Rice Mills Ltd. (a part of the Alesie Group of Companies, which consists of a network of rice-mills in the Caribbean) is primarily serving the Island of Grenada and neighbouring Islands.

Malnutrition:

Table 48: Incidence of Malnutrition – Grenada

Undernourished Population 2000-2002	4.9%
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	N/A
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	N/A
Households Consuming Iodized Salt – UNICEF Update 2004	N/A
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	32.0%
Women	24.0%

Pregnant Women 31.4%

An FAO regional project is under way in Grenada to produce nutrition guides for healthy diets and lifestyles.

Fortification:
Although fortification standards are limited, fortification efforts in those countries exporting to Grenada have a spill-over effect.

Table 49: Fortification Standards in Grenada

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
N/A	no legislation	B1, B2, Niacin, Fe (reduced)	no legislation	no legislation	no legislation

10.7 Guadeloupe

Total Population: 438,000
Rural Population: 876 (0.2%)
Est. Population with access to commercially processed food: 99.9%

Guadeloupe and Martinique are collectively referred to as the French Antilles. An estimated 36 percent of the total area of the islands of Guadeloupe is cultivable arable lands. Agricultural produce includes bananas, sugarcane, tropical fruits and vegetables Large sugar plantations that produce for both export and local consumption purposes continue to dominate, though many have been turned over to the cultivation of bananas.

Guadeloupe is primarily dependant on imports however has sugar production which serves also neighboring islands.

Table 50: Food Industries and Trade – Guadeloupe

Agriculture:	Sugarcane
Industries:	Sugar
Exports - commodities:	Sugar
Imports - commodities:	Wheat flour, edible oils, salt, rice

Industry Summary:
There is some local production of sugar from locally grown sugarcane for both the local and export markets.

Malnutrition:
There is no data available.

Fortification:
Although fortification standards are limited, fortification efforts in those countries exporting to Guadeloupe have a spill-over effect.

Table 51: Fortification Standards in Guadeloupe

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
N/A	no legislation	National program	no legislation	no legislation	no legislation

10.8 Guyana

Total Population: 739,000
Rural Population: 454,485 (61.5%)
Est. Population with access to commercially processed food: 58.8%

The Guyanese economy is exhibiting moderate economic growth based on expansion in the agricultural and mining sectors, a more favourable atmosphere for business initiatives, a more realistic exchange rate, fairly low inflation, and the continued support of international organizations. Chronic problems include a shortage of skilled labour and a deficient infrastructure.

Guyana's largest crops are sugar and rice respectively. Both are produced and processed locally and supply both the domestic and export markets.

Table 52: Food Industries and Trade – Guyana

Agriculture:	Sugarcane, rice, wheat, vegetable oils
Industries:	Sugar, rice milling, flour milling, edible oil refining
Exports - commodities:	Sugar, rice
Imports - commodities:	Wheat, corn, oilseeds Wheat flour, edible oils, salt

Industry Summary:

- In an effort to revitalize the industry the Guyana Sugar Company (GuySuCo) closed some factories, reduced acreage and signed an agreement with a management firm to assist in their restructuring and day-to-day activities. The industry has grown and Guyana has regained its reputation as a reliable supplier of high quality sugar to Europe, the US and CARICOM – exporting to Trinidad, Suriname, St. Lucia, Grenada, Antigua, Dominica, Barbados, St. Vincent and Jamaica.
- Guyana, where rice is the second largest crop after sugar, exports throughout the Caribbean. Approximately seventy-five rice mills operate in the country, and most millers also produce part of the paddy they mill. Many millers are planning, or have begun, an upgrade of their facilities, including dryers that use rice husks as fuel. The smaller mills produce rice mainly for domestic consumption while the larger mills concentrate mainly on exports. Alesie Guyana Ltd is the main office for production/shipment/quality control for the Alesie Group of Companies in Guyana with operates several facilities on the island and throughout the region.
- Due to their regulatory environment, Guyana imports salt from Trinidad, Jamaica and Cuba.
- Wheat flour and edible oils are processed locally however are supplemented with imports.

Malnutrition:

Table 53: Incidence of Malnutrition – Guyana

Undernourished Population 2000-2002	9.0%
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	10.1% 1997
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	N/A
Households Consuming Iodized Salt – UNICEF Update 2004	N/A
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	47.9%
Women	53.9%
Pregnant Women	52.0%

Fortification:

In August 2003 the Ministry of Health in collaboration with the Pan American Health Organisation (PAHO), The United States-based Centres for Disease Control and Prevention, The United Nations Children's Fund and The World Health Organisation (WHO), launched Guyana's national Filariasis programme. This is in keeping with the 2015 deadline for the Americas for the disease to be fully eradicated.

The campaign will be carried out through the use of DEC salt. It is the aim of local Health Officials, for DEC salt to replace ordinary iodised cooking salt in local households. It will contain Di-Ethyl Carbamazine (DEC), the agent which combats the worms that for Filaria. The Ministry's intention is to achieve the goal of eradicating Filaria by 2010. Guyana is the First country worldwide to embark on a Filariasis campaign by introducing DEC salt nationally. DEC Salt is sold at Supermarkets country wide at $20.oo per pound.

Table 54: Fortification Standards in Guyana

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
(draft standard 2005)	no legislation	B1, B2, Niacin, Fe (reduced) or Fe sulfate	no legislation	no legislation	no legislation

Sugar is the largest crop in Guyana as well as being well managed. Considering its export reach, fortification efforts should be pursued.

Rice is the second largest crop and is exported throughout the Caribbean. Also, Alesie Rice, a multinational, has its main facilities in Guyana and operations throughout the

Caribbean. Efforts should be made to fortify rice in Guyana which could have an effect on its import partners.

10.9 Haiti

Total Population: 9,296,000
Rural Population: 5,689,152 (61.2%)
Est. Population with access to commercially processed food: 59.0%

Haiti is the poorest country in the Western Hemisphere, with 80% of the population living under the poverty line and 54% in abject poverty. Two-thirds of all Haitians depend on the agriculture sector, mainly small-scale subsistence farming. The government relies on formal international economic assistance for fiscal sustainability.

About 75 percent of Haiti's food supply is satisfied through imports due to insufficient local production. Although there is some local production of rice, cereals and other products, quantities are not sufficient to meet local demand. A large portion of imports are staple products, such as wheat, rice, and sugar. Haiti's food chain is antiquated and yields from crops and processing are not maximized.

Table 55 - Food Industries and Trade - Haiti

Agriculture:	Sugarcane, rice, corn
Industries:	Sugar refining, flour milling, oil processing
Exports - commodities:	
Imports - commodities:	Wheat, corn, oilseeds, salt, rice Wheat flour, edible oils, paddy & milled rice

Industry Summary:
Although there is some activity in the food processing industry, Haiti requires imports of basic food commodities to meet its national demand.

- MercaSid, in the Dominican Republic, is the leading processor of corn products, both oil and flour, and is known to export to Haiti.
- Haiti is one of the regions largest oilseed and edible oil importers and primarily imports from the Southern Cone region.
- Although Haiti is one of the largest producers of rice in the region it is also the largest importer of milled rice in the region with most imports originating in the US and other large rice producing nations.
- In Haiti, where sugar has been a traditionally important agricultural commodity, the sugar industry has both been facing stiff competition from imports.

Malnutrition:
Haiti has the highest rates of infant, under-five and maternal mortality in the Western hemisphere. Diarrhoea, respiratory infections, malaria, tuberculosis and HIV/AIDS are the leading causes of death.

It should also be noted that lymphatic filariasis is also being recognized and addressed by Haiti and that, in addition to iodine, there are also programmes for the addition of DEC and in educating the public on the drawbacks of washing salt. The situation is very serious and funding for new salt plants was received, however, without additional funding and support the salt fortification initiative is stalled.

Table 56: Incidence of Malnutrition – Haiti

Undernourished Population 2000-2002	47.0%
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	21.9% 2000
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	N/A
Households Consuming Iodized Salt – UNICEF Update 2004	11% 2000
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	65.3%
Women	54.4%
Pregnant Women	63.2%

Fortification:

In 2006, with a grant to University of Notre Dame (UND) from the Bill & Melinda Gates Foundation, a salt fortification plant has been constructed. Salt, co-fortified with DEC and Iodine is being produced and will be distributed starting in four communities and will be sold at a lower price than regular salt. However, without additional funding and support the salt fortification initiative could be stalled.

Table 57: Fortification Standards in Haiti

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
no legislation	Legislated	B1, B2, Niacin, Fe (reduced) - Legislated	no legislation	no legislation	no legislation

With Haiti being primarily a net importer of foodstuffs, including edible oils, rice, flour and sugar, fortification efforts in exporting countries could have a spill-over effect especially if legislation existed in Haiti on imports.

However, enforcing legislation on Haitian production could be difficult considering the outdated state of many processors as well as the current political and economic climate.

10.10 Jamaica

Total Population: 2,682,000
Rural Population: 1,281,996 (47.8%)
Est. Population with access to commercially processed food: 68%

The Jamaican economy is heavily dependent on services, which now account for more than 60% of GDP. The economy faces serious long-term problems: high but declining interest rates, increased foreign competition, exchange rate instability, a sizable merchandise trade deficit, large-scale unemployment and underemployment, and a high debt burden.

Jamaica has limited arable land as well as a climate that is not conducive to growing most of the needed commodities. It does have a well developed processing sector and imports raw commodities as well as processed agri-food products.

Table 58: Food Industries and Trade – Jamaica

Agriculture:	Sugarcane
Industries:	Flour milling, sugar milling, edible oil refining, rice milling
Exports - commodities:	Sugar
Imports - commodities:	Wheat, corn, oilseeds, salt, paddy rice Wheat flour, sugar, edible oils, milled rice

Industry Summary:
Jamaica has a well developed processing sector and imports raw commodities as well as processed agri-food products.

- Jamaica has the largest volume of imports and consumption annually due to its large population and its confectionery industry. Jamaica fulfills its export quota obligations from domestic production while importing raw and refined sugar to satisfy domestic demands. The marketing of raw sugar and the retail distribution of refined sugar in Jamaica are handled exclusively by the state-owned Jamaica Cane Product Sales (JCPS).
- Wheat is imported and ground at the Jamaica Flour Mills. Baking flour accounts for about 40% of the total consumption of wheat flour in the country. Counter flour (coarse flour), which makes up about 60% of the total flour consumed, is sometimes imported from other Caribbean nations and must be fortified with vitamins and iron as per Jamaican law. Counter flour is the main type consumed by the lower socio-economic class.
- The Seprod Group operates Jamaica Grain and Cereals Limited and processes approximately 12,000 – 15,000 metric tonnes of corn annually into cornmeal, edible oil, grits, hominy, etc. Production of edible oil in Jamaica is restricted to the refining of imported crude vegetable oil. Soybean oil accounts for approximately 80 percent

of total vegetables oils that are refined and packaged in Jamaica each year. The main refining facility, SEPROD – Caribbean Products Co. Ltd., is currently operating at capacity.

Malnutrition:

The incidence of poverty is declining. However, almost one of every two Jamaicans who live in poverty is a child while only 37 per cent of Jamaicans are children.

Table 59: Incidence of Malnutrition – Jamaica

Undernourished Population 2000-2002	10.0%
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	3.4% 1999
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	N/A
Households Consuming Iodized Salt – UNICEF Update 2004	100% 1999
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	48.2%
Women	23.8%
Pregnant Women	40.7%

Fortification:

Although fortification standards are limited, fortification efforts in those countries exporting to Jamaica have a spill-over effect.

Table 60: Fortification Standards in Jamaica

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
KI, Fluoride	no legislation	B1, B2, Niacin, Fe (reduced)	no legislation	no legislation	no legislation

With Jamaica being a net importer of foodstuffs, including edible oils, rice, flour and sugar, fortification efforts in exporting countries could have a spill-over effect especially if legislation existed on imports.

However, the same legislation would have to be imposed on Jamaican production facilities since not all commodities being imported are already milled, processed or refined.

10.11 Netherlands Antilles

Total Population: 186,000
Rural Population: 55,614 (29.9%)
Est. Population with access to commercially processed food: 80.0%

Tourism, petroleum refining, and offshore finance are the mainstays of this small economy, which is closely tied to the outside world. The islands enjoy a high per capita income and a well-developed infrastructure compared with other countries in the region. Almost all consumer and capital goods are imported, the US and Mexico being the major suppliers. Poor soils and inadequate water supplies hamper the development of agriculture.

The Netherlands Antilles are importers in the agri-food industry, however, there is marine salt production.

Table 61: Food Industries and Trade - Netherlands Antilles

Agriculture:	
Industries:	Salt (Bonaire)
Exports - commodities:	Salt
Imports - commodities:	Wheat flour, corn flour, sugar, edible oils, milled rice

Industry Summary:

- In Bonaire, the multi-national (Cargill Salt) processes marine salt.

Malnutrition:

There is no data available.

Fortification:

Table 62: Fortification Standards in Netherlands Antilles

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
EU Standards	EU Standards	EU Standards	EU Standards	EU Standards	EU Standards

10.12 Saint Kitts and Nevis

Total Population: 49,000
Rural Population: 33,369 (68.1%)
Est. Population with access to commercially processed food: 54.4%

Sugar was the traditional mainstay of the Saint Kitts economy until the 1970s. The government closed the sugar industry following the 2005 harvest after decades of losses at the state-run sugar company. To compensate, the government has embarked on a program to diversify the agricultural sector and to stimulate other sectors of the economy. Activities such as tourism, export-oriented manufacturing, and offshore banking have assumed larger roles in the economy.

There is no significant agri-food processing in Saint Kitts and Nevis and most all products must be imported.

Table 63: Food Industries and Trade - Saint Kitts and Nevis

Agriculture:	Rice
Industries:	Rice milling
Exports - commodities:	
Imports - commodities:	Wheat flour, corn flour, sugar, edible oils, salt

Industry Summary:

- St. Kitts Rice Mills Ltd, a part of the Alesie Group of Companies, is serving the upper region of the Caribbean.

Malnutrition:

Table 64: Incidence of Malnutrition – Saint Kitts and Nevis

Undernourished Population 2000-2002	8.3%
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	N/A
Households Consuming Iodized Salt – UNICEF Update 2004	100% 2000
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	22.9%
Women	20.8%

Pregnant Women	25.6%

Fortification:
Although fortification standards are not available, fortification efforts in those countries exporting to Saint Kiss and Nevis have a spill-over effect.

Table 65: Fortification Standards in Saint Kitts and Nevis

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
N/A	no legislation	N/A	no legislation	no legislation	no legislation

10.13 Saint Lucia

Total Population: 161,000
Rural Population: 110,607 (68.7%)
Est. Population with access to commercially processed food: 54.0%

Changes in the EU import preference regime and the increased competition from Latin American bananas have made economic diversification increasingly important in Saint Lucia. The island nation has been able to attract foreign business and investment, especially in its offshore banking and tourism industries. The manufacturing sector is the most diverse in the Eastern Caribbean area, and the government is trying to revitalize the banana industry. Economic fundamentals remain solid, even though unemployment needs to be cut.

Saint Lucia is primarily dependant on imports with no major processing of food commodities done domestically.

Table 66: Food Industries and Trade - Saint Lucia

Agriculture:	
Industries:	Coconut processing
Exports - commodities:	Coconut oil
Imports - commodities:	Wheat flour, corn flour, sugar, edible oils, salt, rice

Malnutrition:

Table 67: Incidence of Malnutrition – Saint Lucia

Undernourished Population 2000-2002	7.8%
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	N/A
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	N/A
Households Consuming Iodized Salt – UNICEF Update 2004	N/A
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	32.2%
Women	25.0%
Pregnant Women	33.4%

An FAO regional project is under way in Saint Lucia to produce nutrition guides for healthy diets and lifestyles.

Fortification:
Although fortification standards are not available, fortification efforts in those countries exporting to Saint Lucia have a spill-over effect.

Table 68: Fortification Standards in Saint Lucia

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
N/A	no legislation	N/A	no legislation	no legislation	no legislation

10.14 Saint Vincent and the Grenadines

Total Population: 119,000
Rural Population: 47,005 (39.5%)
Est. Population with access to commercially processed food: 73.5%

Economic growth in this lower-middle-income country hinges upon seasonal variations in the agricultural and tourism sectors. Saint Vincent is home to a small offshore banking sector and has moved to adopt international regulatory standards.

Saint Vincent is primarily dependant on imports with little processing of food commodities done domestically.

Table 69: Food Industries and Trade - Saint Vincent and the Grenadines

Agriculture:	Coconuts
Industries:	Wheat milling, rice milling
Exports - commodities:	
Imports - commodities:	Wheat, paddy rice Wheat flour, corn flour, sugar, edible oils, salt, rice

Industry Summary:

- The East Caribbean Group of Companies of St. Vincent, whose partnership involves a share structure of 40% Maple Leaf Mills of Canada, 20% Government and 40% private investors, owns East Caribbean Rice Mills and East Caribbean Flour Mills in St Vincent and CARICOM Rice Mill in Guyana and export to Antigua, Barbados, Dominica, Grenada, Jamaica, St. Kitts & Nevis, and St. Lucia.

Malnutrition:

Table 70: Incidence of Malnutrition – Saint Vincent and the Grenadines

Undernourished Population 2000-2002	12.5%
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	23.5% 1996
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	N/A
Households Consuming Iodized Salt – UNICEF Update 2004	N/A
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	32.3%
Women	24.1%
Pregnant Women	32.7%

An FAO regional project is under way in Saint Vincent to produce nutrition guides for healthy diets and lifestyles.

Fortification:
Although fortification standards are limited, fortification efforts in those countries exporting to Saint Vincent and the Grenadines have a spill-over effect.

Table 71: Fortification Standards in Saint Vincent and the Grenadines

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
N/A	no legislation	B1, B2, Niacin, Fe (reduced)	no legislation	no legislation	no legislation

10.15 Surinam

Total Population: 452,000
Rural Population: 103,056 (22.8%)
Est. Population with access to commercially processed food: 84.7%

The economy is dominated by the mining industry, which accounts for more than a third of GDP and subjects government revenues to mineral price volatility. Surinam's economic prospects for the medium term will depend on continued commitment to responsible monetary and fiscal policies and to the introduction of structural reforms to liberalize markets and promote competition.

As most countries in the Caribbean Basin, Surinam has some activity in the food processing sector however depends on imports of both raw and processed foodstuffs for its domestic needs.

Table 72: Food Industries and Trade – Surinam

Agriculture:	Rice, palm kernels, coconuts
Industries:	Wheat milling, rice milling, edible oil processing
Exports - commodities:	
Imports - commodities:	Wheat Wheat flour, corn flour, sugar, edible oils, salt, rice

Industry Summary:

- Surinam, where half of the cultivable land is devoted to rice production, is a major exporter to CARICOM nations. However, there are several constraints to sustainable rice production in Suriname: unfavorable government policy, especially on input supply, milling, price control, and taxation of exports; degradation of irrigation infrastructure; yield potential of current varieties has reached a plateau.

Malnutrition:

Table 73: Incidence of Malnutrition – Surinam

Undernourished Population 2000-2002	11.0%
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	9.8% 2000
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	N/A
Households Consuming Iodized Salt – UNICEF Update 2004	N/A
Prevalence of Anemia – 1995-2005	

Preschool Aged Children	25.7%
Women	20.4%
Pregnant Women	32.4%

Fortification:

Although fortification standards are limited, fortification efforts in those countries exporting to Surinam have a spill-over effect.

Table 74: Fortification Standards in Surinam

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
N/A	no legislation	National program	no legislation	no legislation	no legislation

10.16 Trinidad and Tobago

Total Population: 1,340,000
Rural Population: 307,168 (23.2%)
Est. Population with access to commercially processed food: 83.9%

Trinidad and Tobago, the leading Caribbean producer of oil and gas, has earned a reputation as an excellent investment site for international businesses. Tourism is a growing sector, although it is not proportionately as important as in many other Caribbean islands. The economy benefits from a growing trade surplus.

Trinidad and Tobago's food processing industry is one of the most advanced manufacturing sub-sectors in the Caribbean region and exports several commodities to its neighbours.

Table 75: Food Industries and Trade – Trinidad and Tobago

Agriculture:	Rice, coconuts, sugarcane
Industries:	Salt, edible oil processing, wheat milling, rice milling, sugar milling
Exports - commodities:	
Imports - commodities:	Wheat, oilseeds, sugar Wheat flour, corn flour, sugar, edible oils, milled rice

Industry Summary:

- National Flour Mills of Trinidad exports to Jamaica, Barbados, Dominica, St. Lucia, Antigua, Grenada, St. Vincent, St. Kitts & Nevis, Guyana and Suriname. The Company's clientele include food manufacturers, bakeries, wholesalers and distributors.
- The Edible Oil Complex of National Flour Mills Ltd purchases and processes soybeans to produce oil in their extraction plant as well as purchasing crude soybean oil for refining. Other than supplying the local market, NFMs products can be found in Jamaica, Barbados, Dominica, St. Lucia, Antigua, Grenada, St. Vincent, St. Kitts, Guyana and Suriname.
- In Trinidad & Tobago all paddy produced locally is sold to the Rice Mill at Carlsen Field which is owned by the National Flour Mills. A negligible amount of milled rice is exported within the Caribbean community while a sizeable amount is still being imported and processed to meet local demand.

Malnutrition:

Table 76: Incidence of Malnutrition – Trinidad and Tobago

Undernourished Population	12.0%

2000-2002	
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	3.6% 2000
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	N/A
Households Consuming Iodized Salt – UNICEF Update 2004	N/A
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	30.4%
Women	23.3%
Pregnant Women	29.7%

Fortification:

Table 77: Fortification Standards in Trinidad and Tobago

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
N/A	no legislation	B1, B2, Fe, Ca Food & Drugs Act, Chapter 30.01, Act 8 of 1960, Amended by 39 of 1968, 156/1972	no legislation	no legislation	no legislation

Trinidad and Tobago process many of these commodities as well as export to neighboring countries therefore fortification efforts would benefit its population as well as have a spill-over effect. Having one of the most advanced manufacturing sub-sectors in the region would make Trinidad and Tobago a good target for fortification of rice, oil and sugar.

10.17 Cuba

Total Population: 11,260,000
Rural Population: 2,702,400 (24.0%)
Est. Population with access to commercially processed food: 84%

The government continues to balance the need for economic loosening against a desire for firm political control. It has rolled back limited reforms undertaken in the 1990s to increase enterprise efficiency and alleviate serious shortages of food, consumer goods, and services. The average Cuban's standard of living remains at a lower level than before the downturn of the 1990s, which was caused by the loss of Soviet aid and domestic inefficiencies.

Cuba remains highly dependent on imports of agricultural products to satisfy the food needs not only of its population (estimated at nearly 12 million), but also of its tourism sector, the country's largest industry. It primary trading partners are Canada, Europe, Latin America, and the Caribbean. Most of Cuba's food needs are imported by the Cuban government-operated Empresa Cubana Importadora de Alimentos (Alimport) under the auspices of the Cuban Ministry of Foreign Trade. Alimport is responsible for meeting domestic consumption needs, including ingredients for food manufacturers.

Table 78: Food Industries and Trade – Cuba

Agriculture:	Sugarcane, rice, corn
Industries:	Salt, sugar milling, flour milling, edible oil processing, rice milling
Exports - commodities:	Sugar, salt
Imports - commodities:	Wheat, oilseeds, paddy & milled rice Wheat flour, sugar, edible oils, rice

Industry Summary:

- Cuba is the largest importer of wheat and wheat products in the region. Cuba must import wheat for all its consumption needs and per capita consumptions is expected to continue to rise as consumers are introduced to an increasingly wide array of wheat-based foods. The Ministry in charge of the food industry operates all of Cuba's wheat flour mills
- A restructuring of the sugar industry in 2002 saw almost 50% of the sugar mills shut down. Production of sugar cane in 2005 was approximately 30% of 2002 levels. However, Cuba remains one of the largest exporters of sugar in the region.
- There are four (4) marine salt processing and distribution facilities which produce sufficient volumes to meet the national demand and some local export needs.
- There is no indigenous oilseed production in Cuba, which leads to dependency on imports of vegetable oil. There is also no modern processing plant in Cuba, which

limits potential for whole oilseed imports. As the Cuban economy begins to show growth, the demand for oilseeds and products (mainly soybean oil) is expected to increase.

- Cuba is a major importer of rice and in the last few years annual imports of milled rice have increased. Cuba's relatively poor economic standing renders it largely a rice-consuming population. Overall production has been on the decline for several years with relatively low yields so recently the Cuban Government has permitted private production on formerly state-owned farms, but growers have limited access to essential inputs, such as fertilizer; consequently, yields remain low.
- MercaSid, located in the Dominican Republic is the leading processor of corn products, both oil and flour, and is known to export to Cuba.

Malnutrition:

Cuba recorded an iron deficiency rate of 43.1 percent, with three out of each four persons affected showing having slight levels. Pregnant women with low pre-conception weight and expectant mothers in their 14 to 23 weeks were mostly affected (Sánchez Salazar et al, 2001).

Iron deficiency is high among pregnant women and children under two years old. In the eastern provinces, approximately one third of children under age two suffer from anaemia. Cuba has one of the highest rates of obesity among pre-school children in Latin America.

Table 79: Incidence of Malnutrition – Cuba

Undernourished Population 2000-2002	3.0%
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	4.6% 2000
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	N/A
Households Consuming Iodized Salt – UNICEF Update 2004	83% 2003
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	26.7%
Women	19.5%
Pregnant Women	39.1%

Fortification:

In early 2007 Cuba and Russia have signed an agreement to produce 662 tons enriched crackers and cereals which will supply cereals to children under the age of five and biscuits to elementary school students up to November 2007.

The World Food Program (WPF) is now preparing a new project for 2008-2012 which is also aimed at nutritional needs in Cuba's eastern provinces.

With help from UNICEF, Cuba has eliminated iodine-deficiency disorders by iodizing all salt.

Table 80: Fortification Standards in Cuba

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
Iodine		B1, B2, Niacin, Folic Acid, Fe (ferrous sulfate)	no legislation	no legislation	no legislation

Cuba has a high prevalence of anemia and is a net importer of many of its foodstuffs. Considering that rice is a food staple for Cubans and there is an every increasing demand for milled rice, importing fortified rice from its trading partners (such as ……..) would have a far reaching effect on the country's population.

10.18 Dominican Republic

Total Population: 9,470,000
Rural Population: 3,778,530 (39.9%)
Est. Population with access to commercially processed food: 73.0%

The Dominican Republic is a Caribbean representative democracy. Although the country has long been viewed primarily as an exporter of sugar, coffee, and tobacco, in recent years the service sector has overtaken agriculture as the economy's largest employer due to growth in tourism and free trade zones. Although the economy continues to grow at a respectable rate, high unemployment and inflation remain important challenges. The country suffers from marked income inequality the richest 10% enjoys nearly 40% of national income.

The Dominican Republic is a food deficit country and despite trade liberalization, local production is protected with non-tariff barriers such as import permits and domestic price quotas for products such as rice and sugar. The DR-CAFTA agreement allows a tariff rate quota (TRQ) regime for the currently protected products for a period of five to twenty years. The Dominican Republic has a well-developed agriculture industry however must import agri-food products to supplement local demand. It also as one of the more developed food processing sectors in the region however exports very little.

Table 81: Food Industries and Trade - Dominican Republic

Agriculture:	Sugarcane, rice, corn
Industries:	Sugar processing, flour milling, rice milling, edible oil processing, salt
Exports - commodities:	
Imports - commodities:	Wheat, corn, oilseeds, salt, paddy rice Wheat flour, edible oils, milled rice

Industry Summary:

- In the Dominican Republic where sugarcane is the principal crop and sugar is the prime product and export, the restructuring program initiated in 1999 involved the privatization of all sugar mills along with diversification of sugarcane lands and an emphasis on sugar by-products and derivatives. The two largest private producers, Central Romana and the Vicini group continue to dominate the Dominican sugar market.
- The Dominican Republic is a regional producer of salt. Production of rock salt was reported to be about 12,200 metric tonnes in 2001. The Dominican Republic's only rock salt mine is the Barahona Mine. The salt production is exported to the United States. Marine salt is produced in the Provinces of Baní, Barahona, and Monte Cristi.
- In the Dominican Republic, domestic vegetable oil production consists of crude palm oil plus a small volume of palm kernel oil. Local production of oil represents less than

10 percent of the total supply. Since the crushing facility was closed, vegetable oils are imported to satisfy local market requirements.

- The largest processor MERCASID controls approximately 71 percent of the market; LA FABRIL in Santiago has over 20 percent of the market and "Cesar Iglesias" the remaining eight percent. The estimated overall oil processing capacity exceeds 175,000 metric tons. Exports of Dominican edible oils to nearby islands are almost non-existent; however, small quantities of soybean oil have been exported to Haiti.
- The Dominican Republic is the largest producer of rice in the area however, with a smaller crop in 2005; imports of 45,000 metric tonnes were needed to meet normal market requirements and are the largest importer in the region.

Malnutrition:

Table 82: Incidence of Malnutrition – Dominican Republic

Undernourished Population 2000-2002	25.0%
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	6.1% 2000
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	23%
Households Consuming Iodized Salt – UNICEF Update 2004	18% 2000
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	34.6%
Women	27.1%
Pregnant Women	39.9%

During 2001, vitamin A supplementation coverage reached 73.9 per cent for children aged between six and 11 months, 54 per cent for those aged 12 to 24 months, 21 per cent for children aged 12 to 59 months, 66.6 per cent for school-aged children and 22 per cent for postpartum women.

Fortification:

On February 15, 2007 a national food fortification program aimed at dramatically reducing the rates of iron and vitamin A deficiency in Dominican Republic women and children, as well as the number of babies being born with serious physical defects, was launched by the Ministry of Public Health and Social

Project support will enable all wheat flour milled for domestic consumption to be fortified with iron, folic acid and other B complex vitamins, and 80 percent of sugar to be fortified with vitamin A. This is expected to reduce iron anemia rates from the current 27 percent to 20 percent in children under five and vitamin A deficiency from 22.7 to 10 percent during the project period. In addition, the number of birth defects to the brain and spinal cord is expected to decrease by 20 percent.

Six flour mills and seven sugar mills are participating in the project and the government plans to introduce new national laws to make fortification of wheat flour and sugar mandatory. Eighty percent of the Dominican Republic's population of around nine million people is expected to consume fortified flour and sugar by 2007.

Table 83: Fortification Standards in Dominican Republic

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
Iodine NORDOM 53 (2nd rev. 1998)	no legislation	B1, B2, Niacin, Folic Acid, Fe (ferrous sulfate) NORDOM 67:23-040	no legislation	no legislation	Mandatory with vitamin A NORDOM 67:24-006-009

Annual average vegetable oil consumption is 17.73 kg per capita therefore oil fortification should be considered.

As well as being one of the larges producers of rice in the region, the Dominican Republic also imports rice. With an annual consumption estimated at 50 kg/capita, rice fortification would have far reaching effects on the country's poor.

10.19 Puerto Rico

Total Population: 3,947,000
Rural Population: 98,675 (2.5%)
Est. Population with access to commercially processed food: 98%

Puerto Rico has one of the most dynamic economies in the Caribbean region with tourism traditionally being an important source of income. A diverse industrial sector has far surpassed agriculture as the primary locus of economic activity and income. Sugar production has lost out to dairy production and other livestock products as the main source of income in the agricultural sector.

Puerto Rico is an importer of processed food commodities with many of the products originating in the US.

Economic Summary:

Table 84: Food Industries and Trade - Puerto Rico

Agriculture:	
Industries:	
Exports - commodities:	
Imports - commodities:	Wheat flour, corn flour, sugar, edible oils, salt, rice

Malnutrition:
There is no data available.

Fortification:
With the US being its main trading partner and imports being processed foodstuffs US fortification standards would be applicable.

Table 85: Fortification Standards in Puerto Rico

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
		National program			

10.20 Belize

Total Population: 276,000
Rural Population: 141,864 (51.4%)
Est. Population with access to commercially processed food: N/A

In this small, essentially private-enterprise economy tourism is the number one foreign exchange earner followed by exports of marine products, citrus, cane sugar, bananas, and garments. Major concerns continue to be the sizable trade deficit and unsustainable foreign debt. The government in 2006 announced it would seek a restructuring of its sovereign debt and has been negotiating with international creditors to find an acceptable formula for doing so. A key short-term objective remains the reduction of poverty with the help of international donors.

Traditionally, Belize has been a consumer nation, relying heavily on foreign imports. Belize has a very small food processing industry. The only food sectors that have processing in Belize are juices, deli meats and some dairy products. Major trading partners include Mexico, Guatemala, Canada, the US and CARICOM member states.

Table 86: Food Industries and Trade – Belize

Agriculture:	Sugar
Industries:	Food processing
Exports - commodities:	Sugar
Imports - commodities:	Wheat flour, sugar, edible oils, salt, rice

Industry Summary:

- Corn flour is a major food staple in the region and, by far, exceeds the consumption of wheat flour.

Malnutrition:

Stunting due to malnutrition affects about one child in five. The figure among boys in some Maya communities is more than twice as high.

Table 87: Incidence of Malnutrition – Belize

Undernourished Population 2000-2002	5.1%
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	N/A
Children Under Five Years of Age with Subclinical Vitamin A	7%

Deficiency – 1997

Households Consuming Iodized Salt – UNICEF Update 2004	90%
	1994
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	35.9%
Women	31.2%
Pregnant Women	51.7%

Fortification:

Table 88: Fortification Standards in Belize

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
		Mandatory with Vitamins B1 and B2, iron, folic acid, and niacin	no legislation	no legislation	no legislation

Although fortification standards are limited, fortification efforts in those countries exporting to Belize have a spill-over effect.

10.21 Costa Rica

Total Population: 4,327,000
Rural Population: 1,657,241 (38.3%)
Est. Population with access to commercially processed food: N/A

Costa Rica's basically stable economy depends on tourism, agriculture, and electronics exports. Poverty has remained at roughly 20% for nearly 20 years, and the strong social safety net that had been put into place by the government has eroded due to increased financial constraints on government expenditures. Immigration from Nicaragua has increasingly become a concern for the government and has placed heavy demands on the social welfare system.

Although Costa Rica has a small food processing sector, it is dependant on imports for most of its basic food commodities. Its agriculture sector is primary comprised of coffee, bananas and pineapples.

Table 89: Food Industries and Trade - Costa Rica

Agriculture:	Sugar, corn, rice, palm
Industries:	Sugar
Exports - commodities:	Sugar, palm oil
Imports - commodities:	Wheat flour, corn flour, edible oils, salt, rice

Industry Summary:

- Corn flour is a major food staple in the region and, by far, exceeds the consumption of wheat flour.
- Based on data from the Costa Rican Sugar League (LAICA) cane and sugar production is expected to increase.
- There are no refining facilities in Costa Rica and all crude palm oil is exported.

Malnutrition:

In Costa Rica, of the 22.1 percent of breastfeeding mothers found to be anemic, the deficiencies were of 48.7 percent in iron, 84.2 percent in folic acid, 5.3 percent in vitamin B12, and 4.9 percent in vitamin A. Low socioeconomic level was the key factor explaining the deficiency (Blanco A., et al., 2003).

Table 90: Incidence of Malnutrition – Costa Rica

Undernourished Population 2000-2002	4.0%
Chronic Malnutrition in Children Under Five Years of Age	6.1%

Between 1995 - 2002:	1996
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	9%
Households Consuming Iodized Salt – UNICEF Update 2004	97%
	1996
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	20.9%
Women	18.9%
Pregnant Women	27.9%

Fortification:

In Costa Rica more than 80% of wheat flour is currently fortified with iron, folic acid and other complex B vitamins. The other areas of weakness in the programs are continually trying to be addressed. However, a highly important factor of success in the region was noted as being the commitment of a convinced pro-active private sector and the active participation of the organized consumer sector.

Table 91: Fortification Standards in Costa Rica

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
Mandatory fortification of salt with iodine	Mandatory with Vitamins B1 and B2, iron, folic acid, and niacin (Reglamento Centroamericana 28086-S September 1999)	Mandatory with Vitamins B1 and B2, iron, folic acid, and niacin (Reglamento Centroamericana R-UAC 67.01.15.2002	Mandatory with selenium, folic acid, vitamin B12, zinc; niacina; tiamina, vitamina E (Reglamento Centroamericana 33124-S June 2006)	no legislation	Mandatory with vitamin A (Reglamento Centroemricana 30140-S 2002)

10.22 El Salvador

Total Population: 6,668,000
Rural Population: 2,660,532 (39.9%)
Est. Population with access to commercially processed food: N/A

The smallest country in Central America, El Salvador has the third largest economy, but growth has been minimal in recent years. Hoping to stimulate the sluggish economy, the government is striving to open new export markets, encourage foreign investment, and modernize the tax and healthcare systems.

El Salvador's economy is primarily agricultural however it is more highly industrialized than its neighbours. Corn is the chief subsistence crop although rice, oilseeds and wheat are also grown. There is a small processing sector and currently the government is taking steps in increase exports within the region.

Table 92: Food Industries and Trade - El Salvador

Agriculture:	Sugar, corn, rice, oilseed, wheat
Industries:	Sugar refining, flour milling, rice milling, edible oil processing
Exports - commodities:	Sugar, rice, wheat flour, palm oil
Imports - commodities:	Wheat, corn, paddy rice, oilseeds, salt

Industry Summary:

- Corn flour is a major food staple in the region and, by far, exceeds the consumption of wheat flour.
- The Sugar Association expects no refined exports although there are several refiners/millers for the domestic market.
- El Salvador is a signatory to the Agreement on Central American Tariffs and Duties and a member of the Northern Triangle (commercial agreement with Honduras and Guatemala) and the Central American Common Market and has recently signed a free trade agreement with Mexico and the Dominican Republic; and is negotiating with Canada, Chile and Panama.
- Even though many food products come from Mexico and other nations that have signed free trade agreements El Salvador will not have immediate duty free access. Their products will begin a gradual tariff reduction that is expected to bring them to zero duty in a period of eight years. This will undoubtedly make products from those nations much more competitive than U.S. food and beverage products. Other than the U.S., products come from Canada, Central America, Colombia, Argentina, Chile, Uruguay and Europe

Malnutrition:

Table 93: Incidence of Malnutrition – El Salvador

Undernourished Population 2000-2002	11.0%
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	23.3% 1996
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	36%
Households Consuming Iodized Salt – UNICEF Update 2004	91% 1995
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	18.4%
Women	26.8%
Pregnant Women	10.5%

Fortification:

In El Salvador, Nicaragua and Panama more than 80% of wheat flour is currently fortified with iron, folic acid and other complex B vitamins. The other areas of weakness in the programs are continually trying to be addressed. However, a highly important factor of success in the region was noted as being the commitment of a convinced pro-active private sector and the active participation of the organized consumer sector.

Table 94: Fortification Standards in El Salvador

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
Mandatory fortification of salt with iodine (June 1069)	proposed but not yet mandatory?	Mandatory with Vitamins B1 and B2, iron, folic acid, and niacin (Reglamento Centroamericana R-UAC 67.01.15.2002	no legislation	no legislation	Mandatory with vitamin A (Decreto 843 April 1994)

Under the Sugar Law, Salvadoran Sugar Council (CONSAA) is in charge of regulating the sector. CONSAA has a board of directors that includes members from the government, sugar producers and sugar mills.

With corn being a food staple in El Salvador, legislating imported corn flour to be fortified would force the exporter countries to fortify.

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10.23 Guatemala

Total Population: 12,710,000
Rural Population: 6,710,880 (52.8%)
Est. Population with access to commercially processed food: N/A

Guatemala is the largest and most populous of the Central American countries with a GDP per capita roughly one-half that of Brazil, Argentina, and Chile. The agricultural sector accounts for about one-fourth of GDP, two-fifths of exports, and half of the labour force. The distribution of income remains highly unequal with about 56% of the population below the poverty line.

Coffee, sugar, and bananas are the leading commercial and export crops in Guatemala's mainly agricultural economy. There is some manufacturing, primarily of refined sugar, for export. The United States, Mexico, El Salvador, Venezuela, Germany, and Japan are the major trading partners.

Table 95: Food Industries and Trade – Guatemala

Agriculture:	Sugarcane, corn
Industries:	Sugar
Exports - commodities:	Sugar, palm oil
Imports - commodities:	Wheat flour, corn flour, sugar, edible oils, salt, rice

Industry Summary:

- Guatemala exports around 70% of its total sugar production and is the world's sixth largest exporter and Latin America's second largest, accounting for around 4% of net world exports and three quarters of its total production. ASAZGUA, the Guatemalan Sugar Association, expects that around 84% of total exports will be raw sugar.
- There are 13 active sugar mills in the country. Comercializadora de Guatemala (COMETRO) maintains a legal oligopoly on the domestic wholesale and retail markets, established by decree in 1997 and distributes to retailers through 38 warehouses strategically located throughout the country.
- Pantaleon and Concepcion are two leading cane sugar factories operating in Guatemala since the late 1800s and early 1900s, respectively; they are now part of the Pantaleon group. Currently, Pantaleon is the largest sugar producer in the Central American region, and is positioned among the ten major groups in Latin America.
- Guatemala exports of palm oil are mainly to Mexico and El Salvador. Total imports of soybean oil are domestically consumed.

- Crude sunflower seed oil is mostly imported from the U.S. and the refined oil is re-exported to the rest of the Central American countries. El Salvador is the major importer for Guatemala's sunflower oil. Guatemala's vegetable oil production continues to increase as local consumption of vegetable oil, shortening, and margarine increases. Exports of finished oils and margarines to neighbouring countries are experiencing a similar increase.
- Mexico is a main competitor for the Guatemalan import food market. The existence of a free trade agreement between the Central American countries provides a great opportunity for constant exchange of products. Mexico has been expanding into the Guatemalan market and recently signed a free trade agreement with the northern triad of Central America. Mexico already has a large presence in the bread, snacks, fresh produce and other consumer-oriented markets.

Malnutrition:

In the case of chronic malnutrition (low height-for-age), highly prevalent in the region, Guatemala stands out, since even though it has achieved significant progress it still presents the worst situation among all the Latin American and Caribbean countries. Together with Honduras, moreover, Guatemala presents a deficit that is over ten times greater than the expected average value (2.5 percent), followed by Haiti, El Salvador and Nicaragua.

Table 96: Incidence of Malnutrition – Guatemala

Undernourished Population 2000-2002	24.0%
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	46.4% 1999
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	16%
Households Consuming Iodized Salt – UNICEF Update 2004	67% 2002
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	38.1%
Women	20.2%
Pregnant Women	22.1%

Fortification:

Guatemala has actively participated in many projects for salt iodization and wheat flour fortification with iron and other vitamins and was the first country to fortify sugar with vitamin A.

In Guatemala more than 80% of wheat flour is currently fortified with iron, folic acid and other complex B vitamins. The other areas of weakness in the programs are continually trying to be addressed. However, a highly important factor of success in the region was noted as being the commitment of a convinced pro-active private sector and the active participation of the organized consumer sector.

Together with Costa Rica and Panama, they continue to be very active in fortification activity; maize flour (nixtamilized masa) and rice fortification are being experimenting with and there are instances of test marketing of these fortified mass consumed commodities. Guatemala has plans for voluntary fortification of parboiled rice in 2009.

Table 97: Fortification Standards in Guatemala

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
Mandatory fortification of salt with iodine (March 1955)	proposed but not yet mandatory - so far just voluntary	Mandatory with Vitamins B1 and B2, iron, folic acid, and niacin (Reglamento Centroamericana R-UAC 67.01.15.2002	no legislation - but Plans for voluntary fortification of parboiled rice in 2009	no legislation, however there is voluntary fortification with Vitamin A and beta-carotene	Mandatory with vitamin A (reglamento 121-2000)

To keep a control on the fortification of salt with iodine - among other things - a program was established in 1994 by the Guatemala's Ministry of Education, with the assistance of the United Nations Children's Fund (UNICEF) and the Institute of Nutrition of Central America and Panama (INCAP). The Program is called Programa de Escuelas Centinelas de Micronutrientes, and it has been surveying students and analyzing salt samples brought from their homes every year since then. One of the Program's principal concerns is the amount of iodine that people – especially children - consume with salt. Its objective with the school surveys is to estimate the distribution of iodine in salt for the nation as a whole.

Unidad de Regulación y Control de Alimentos

- Ing. Gladys Arriola. Jefe de Control de Alimentos

- Ing. Manuel Lezana, Director de Regulacion, Vigilancia y Control de Servicios de Salud

Introducing mandatory fortification of corn flour would encourage those countries exporting to Guatemala to fortify.

10.24 Honduras

Total Population: 6,834,000
Rural Population: 3,663,024 (53.6%)
Est. Population with access to commercially processed food: 64.1%

Honduras, the second poorest country in Central America and one of the poorest countries in the Western Hemisphere, with an extraordinarily unequal distribution of income and massive unemployment, is banking on expanded trade under the US-Central America Free Trade Agreement (CAFTA) and on debt relief under the Heavily Indebted Poor Countries (HIPC) initiative. The country has met most of its macroeconomic targets, and began a three-year IMF Poverty Reduction and Growth Facility (PRGF) program in February 2004. The economy relies heavily on a narrow range of exports, notably bananas and coffee, making it vulnerable to natural disasters and shifts in commodity prices, but in recent years has experienced a rapid rise in exports of light manufacturers.

As one of the poorest nations in the Western Hemisphere Honduras remains dependent on U.S. aid. The economy is based on agriculture; bananas and coffee are the most important exports. Industry, concentrated chiefly in San Pedro Sula, is small and consumer-oriented, including the production of processed food (mainly sugar and coffee).

Table 98: Food Industries and Trade – Honduras

Agriculture:	Sugar cane, palm kernels
Industries:	Sugar, edible oil processing
Exports - commodities:	Palm oil
Imports - commodities:	Wheat flour, corn flour, sugar, edible oils, salt, paddy & milled rice

Industry Summary:

- Corn flour is a major food staple in the region and, by far, exceeds the consumption of wheat flour.
- Asoprosalh in Honduras is currently undergoing an upgrade and expansion. The acquisition and installation of a salt processing plant in San Lorenzo (mill, washer, dryer, sifter and an iodine and fluoride dispenser) in order to produce a higher quality salt and supply at competitive prices in the Honduran market with export potential to El Salvador and Nicaragua. The company is made up of 10 partners who are salt producers, therefore, they could supply raw material that will be required by the company.
- The extraction of palm oil is the primary source of business of the Palcasa cooperative in Honduras and is undergoing expansion to increase production.
- Honduras has been particularly active in the international arena, negotiating agreements with its Central American neighbors. In 2001, Honduras signed a free-

trade agreement with Mexico and joined El Salvador, Guatemala, Costa Rica, Panama, Belize, and Mexico in the Puebla-Panama Plan, which seeks greater harmonization of political, economic, social, and environmental policies. Despite these regional alliances, the United States is still dominant in the local economy, accounting for approximately 75 per cent of all foreign direct investment in the country.

Malnutrition:

Sixty-eight per cent of Honduran families are poor, mainly in rural and periurban areas. There are significantly more poor families in rural areas (75 per cent) than in urban areas (57 per cent).

In poor Honduran households typical diets do not provide adequate calories or diversity to meet energy and micronutrient requirements. A calorie deficit of 22 percent of daily requirements has been noted in Lempira, La Paz and Intibuca. Diets in the rural areas are comprised largely of maize and beans (with some variation in local staples such as rice or cassava). Hondurans consume few fruits or vegetables and livestock is reared almost exclusively for sale or as a form of savings. These dietary limitations are reflected in the high anemia among children and women of reproductive age throughout the country. The problem of limited dietary diversity is noted in the current situation. The study from which the situation is derived notes that 80 percent of the calories are derived from just ten foods (Rogers, Swindale and Ohri-Vachaspati 1996).

Table 99: Incidence of Malnutrition – Honduras

Undernourished Population 2000-2002	22.0%
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	29.2% 2001
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	14%
Households Consuming Iodized Salt – UNICEF Update 2004	80% 1998
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	29.9%
Women	14.7%
Pregnant Women	32.4%

Fortification:

In Honduras more than 80% of wheat flour is currently fortified with iron, folic acid and other complex B vitamins. The other areas of weakness in the programs are continually trying to be addressed. However, a highly important factor of success in the region was noted as being the commitment of a convinced pro-active private sector and the active participation of the organized consumer sector.

Table 100: Fortification Standards in Honduras

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
Mandatory with iodine (Sept 1961)	proposed but not yet mandatory	Mandatory with Vitamins B1 and B2, iron, folic acid, and niacin (Reglamento Centroamericana R-UAC 67.01.15.2002	no legislation	no legislation	Mandatory with vitamin A (Decreto 385 - Oct 1976)

Honduras has a long history of community-based delivery of health and nutrition services, now supported by the Ministry of Health (MOH) through the Integrated Care of the Child (AIN) program. This offers a proven approach for Donation programs to adopt to reach households in rural areas with behavioral change strategies, preventative services and referrals for curative care. However, high malnutrition, childhood anemia and fertility rates still characterize parts of the country, especially the west. Targeting of all children under age two, the use of growth monitoring and promotion, and attention to women's nutrition and access to modern contraceptives are all areas that need to be emphasized.

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Departamento de Regulación Sanitaria, Secretaría de Salud
Dra. Vilma Estrada

Secretaria de Industria y Comercio (Department of Industry and Commerce)

Secretaria de Agricultura y Ganaderia (Department of Agriculture and Cattle Ranching)

Secretaria Tecnica y de Cooperaci6n Internacional (SETCO) (Department of International Cooperation)

Secretaria de Recursos Naturales y Ambiente (Department of Natural Resources and the Environment)

The extraction of palm oil is the primary source of business in Honduras and the major processor is undergoing expansion to increase production. Also per capita consumption of vegetable oil is approx. 11 kg per capita annually. Working with the industry to introduce fortification is recommended.

10.25 Mexico

Total Population: 104,266,000
Rural Population: 25,023,840 (24.0%)
Est. Population with access to commercially processed food: 83.9%

Mexico has a free market economy that recently entered the trillion dollar class. It contains a mixture of modern and outmoded industry and agriculture, increasingly dominated by the private sector. The income distribution remains highly unequal with approx. 40% of the population living below the poverty line. Mexico has 12 free trade agreements with over 40 countries including, Guatemala, Honduras, El Salvador, the European Free Trade Area, and Japan, putting more than 90% of trade under free trade agreements. The government has stated that its top priorities include reducing poverty and creating jobs.

Mexico's trade regime is among the most open in the world, with free trade agreements with the U.S., Canada, the EU, and many other countries. Current market conditions in present solid demand growth for imported food products as only 12% of Mexico's land area is arable, of which less than 3% is irrigated. This, coupled with a general lack of economic opportunity in rural areas, has made it difficult to raise the productivity standards of Mexico's subsistence farmers. However, Mexico has a very strong food processing sector and is an exporter of certain commodities, such as corn flour, within LAC.

Table 101: Food Industries and Trade - Mexico

Agriculture:	Corn, wheat, soybeans, rice
Industries:	Wheat & corn flour milling, sugar milling, edible oil processing, rice milling, salt
Exports - commodities:	Corn & wheat flour, edible oils
Imports - commodities:	Wheat, corn, oilseeds, sugar, paddy rice Wheat flour, edible oils, milled rice

Industry Summary:

- In Mexico, Grupo Gruma, one of the largest producers of corn flour, entered the wheat milling market in Mexico in 1996 by acquiring a 60% ownership interest in Archer-Daniels-Midland's wheat flour operation, Molinera de Mexico. During the year ended December 31, 2005, approximately 90% of Molinera's wheat flour production was sold in bulk and 10% was sold for the retail segment. Most of the bulk sales are made to thousands of bakeries and, to a lesser extent, to cookie and pasta manufacturers. Most of the retail sales are made to large supermarkets and wholesalers throughout Mexico.
- Other major players in the Mexican wheat flour market are Grupo Minsa, S.A. de C.V., Munsa, Trimex, Tablex, La Espiga and Elizondo.

- In Mexico, one of major players in the industrialized corn flour market is Grupo Gruma that controls approx. 70% of the market share..Gruma, S.A. is engaged in the production and distribution of tortilla, corn and wheat flour. Gruma are also present in the Costa Rican market and they have expanded their operations into Guatemala, Honduras, El Salvador, Nicaragua, and Ecuador. Gruma Centroamerica produces corn flour, and to a lesser extent tortillas and snacks. It also cultivates and sells hearts of palm and process and sells rice.
- Grupo Minsa is the second-largest corn flour producer in Mexico. It owns and operates six plants in Mexico, two in the US, and one in Guatemala.
- Being the largest sugar producer in the region the sugar cane industry has a socioeconomic effect on 12 million people. La Unión Nacional de Cañeros participa participates in 43% of the total cane production. There are currently 58 sugar mills spread across 15 of Mexico's 32 states. Overall, there are 11 private sugar groups with more than one mill, the government group with 13 mills, and 8 mills that are working independently.
- Cargill, a major multi-national, entered the Mexican sugar market in 2000 in addition to its other sugar operations worldwide.
- Mexico produces mainly marine salt and, although it is one of the three largest producers in Latin America, it exports primarily out of LAC.
- The oilseed crushing industry is a major importer of oilseeds to offset the deficit between its vegetable oil consumption and its domestic production. The Mexican crushing industry is expected to expand as smaller, inefficient crushers are replaced by larger crushers. Two multinationals are currently positioned in Mexico: Cargill and Bunge which exports soybean oil to Nicarauga, Panama, Guatemala, Honduras, Costa Rica and El Salvador.

Malnutrition:

Economic growth over the last decade has made Mexico an upper-middle income country, but there remain tremendous disparities and social exclusion. Approximately 24 million Mexicans live in extreme poverty.

In Mexico (1999), anemia prevalence of 27.8 percent among pregnant mothers between 12 and 49 years old was identified. Prevalence among non-pregnant mothers was 20.8 percent, with a higher occurrence in rural areas (Shamah-Levy T. et al., 2003).

In children, anemia reaches its greatest value during the second year of life, affecting half of all children. The prevalence of iron deficiency reaches 52 percent of the children under five years of age (2/3 of children between one and two years old, and less than half of those between three and four years of age) (Rivera et al., 2003).

Table 102: Incidence of Malnutrition – Mexico

Undernourished Population 2000-2002	5.0%
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	17.7% 1999

Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997		18%
Households Consuming Iodized Salt – UNICEF Update 2004		90% 1999
Prevalence of Anemia – 1995-2005		
	Preschool Aged Children	29.4%
	Women	20.8%
	Pregnant Women	26.2%

Mexico's Special Programme for Food Security has advanced from pilot phase to expansion phase, covering 33 rural development districts in 16 states, generating knowledge and instruments to combat hunger and improve food security in areas with high marginalization and extreme poverty.

Fortification:

Relative to fortification efforts in Mexico, it is expected that maize (nixtamilized masa) and wheat flour be fortified with iron or an iron compound, folic acid and vitamins of the B group. Many efforts are being done in reaching these goals especially with tortilla flour. Both products are widely consumed and manufactured in centralized factories.

The very same thing can be said about fortifying edible oil with vitamin A. It is a relatively easy process and the large industries command the market. Here, the need for such fortification has to be established and the advocacy efforts will yield positive results.

Salt is presently being iodized and legislation and some monitoring exist.

Fortification of sugar has had several "intents" by the government, but the many problems to resolve have made this task very difficult. The industrial machine is old and not well maintained; sugar had been subsidized and many of the mills belong to the government.

Table 103: Fortification Standards in Mexico

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
mandatory fortification with iodine and fluoride (Mexican norm 040-SSA1-1993)	proposed but not yet mandatory	Mandatory with folic acid and iron (Mexican Norm 147-SSA1-1996)	none	none	none

Mexico is on its way to become a developed country, and the industry (including basic commodities) is well organized as well as the distribution channels making this characteristic efficient for fortification efforts. The government lacks somewhat in food control, even though efforts and improvements are evident. Self quality control and assurance is being done by large and medium industries and small ones are jumping in

the trend. Food safety and HACCP are integral part of food science and technology training and the closeness with USA markets, which Mexico is a very important supplier, has forced the country to adapt Good Agricultural Practices (GAP) as well as Good Manufacturing Practices (GMP) which now includes frequent government inspections.

The Health authorities in Mexico have been working on different fortification initiatives to help increase micronutrient intake in Mexico. These initiatives have led to the regulation for the fortification of wheat flour and salt (addition of Fluor and Iodine) through the official Mexican Norms NOM-147-SSA1-1996 and NOM-040-SSA1-1993, respectively.

In addition, there is a new proposal for regulation of fortification of flours from other cereals, including nixtamalized corn through the project -NOM-000-SSA1-2005. However this proposed regulation has not been approved due to diverse issues. One of the issues affecting fortification is the fact that large corn industrialization companies do not support mandatory fortification unless these same criteria is applied to the small artisanal nixtamalized masa mills. In addition, voluntary fortification is not usual due to the lack of regulation regarding specific health claims. Tortillas are a staple of the Mexican diet, with an annual per capita consumption of 65 kilograms - the highest per capita consumption of corn in the world.

Efforts by the government to fortify sugar with vitamin A have been made in the past, but political motivation as well as price disputes and negative attitudes towards the need for additional vitamin A in the diet by some health officials have made these intentions futile.

The oil industry, where technology is well known, is ready to fortify edible oil, but, again, the position of some health officials has not promoted this intention. These positions not only include health related concerns, but also, labeling and what will be allowed in health claims. Consumption of edible oils is 35 kg/capita.

10.26 Nicaragua

Total Population: 5,463,000
Rural Population: 2,288,997 (41.9%)
Est. Population with access to commercially processed food: 71.9%

Nicaragua has widespread underemployment and the third lowest per capita income in the Western Hemisphere. Distribution of income is one of the most unequal on the globe. While the country has progressed toward macroeconomic stability in the past few years, GDP annual growth has been far too low to meet the country's needs, forcing the country to rely on international economic assistance to meet fiscal and debt financing obligations.

Nicaragua is a net importer of food commodities although it does have a small processing sector for sugar refining which it exports within LAC.

Table 104: Food Industries and Trade – Nicaragua

Agriculture:	Sugarcane, rice, corn, soybeans
Industries:	Flour milling, rice milling, edible oil processing, sagar
Exports - commodities:	Palm oil
Imports - commodities:	Wheat flour, corn flour, sugar, edible oils, salt, rice

Industry Summary:

- Sugar continues to lead the list of Nicaraguan exports with key destinations in 2006 including the Haiti, Jamaica, Mexico and Peru. The private sector buys and sells all sugar. There are approx. 650 sugar producers and the national market is supplied by a network of approx. 40 distributors, who work in coordination with Central Azucarera de Nicaragua.
- Nicaragua is a large rice producer in the region however also has to import to supplement their domestic supply. AGRICORP operates four mills and processes more than 50% of the nation’s rice.

Malnutrition:

One of every three children has some degree of chronic malnutrition and nine per cent suffer from severe malnutrition. The maternal mortality rate (MMR) of 150 per 100,000 live births is unacceptably high. In the Atlantic region and areas difficult to access, MMR may be twice as high as the national average.

Table 105: Incidence of Malnutrition – Nicaragua

Undernourished Population 2000-2002	27.0%
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	20.2% 2001
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	31%
Households Consuming Iodized Salt – UNICEF Update 2004	97% 2003
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	25.6%
Women	16.0%
Pregnant Women	32.9%

Fortification:

In Nicaragua more than 80% of wheat flour is currently fortified with iron, folic acid and other complex B vitamins. The other areas of weakness in the programs are continually trying to be addressed. However, a highly important factor of success in the region was noted as being the commitment of a convinced pro-active private sector and the active participation of the organized consumer sector.

Nicaragua is considering fortification for rice.

Table 106: Fortification Standards in Nicaragua

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
Mandatory with iodine (Sept 1977)	proposed but not yet mandatory	Mandatory with Vitamins B1 and B2, iron, folic acid, and niacin (Reglamento Centroamericana R-UAC 67.01.15.2002	no legislation	no legislation	Mandatory with vitamin A (1999)

Ministry of Agriculture (MAG-FOR)

10.27 Panama

Total Population: 3.232.000
Rural Population: 1.363.904 (42.2%)
Est. Population with access to commercially processed food: 71.7%

Panama's dollarized economy rests primarily on well-developed services that include operating the Panama Canal, banking, container ports, flagship registry, and tourism. A slump in agricultural exports and the global slowdown held back economic growth in 2000-03; growth picked up in 2004-06 led by export-oriented services and a construction boom stimulated by tax incentives. The government has implemented tax reforms, as well as social security reforms, and backs regional trade agreements and development of tourism. Unemployment remains high with an estimated 37% of the population living below the poverty line.

Panama's agricultural output is limited by the small land mass, of which nearly 9% is arable land (including permanent crops). As a result, the majority of food products in Panama are imported: imports constitute 84% of the total agri-food market.

Table 107: Food Industries and Trade – Panama

Agriculture - products:	Rice, corn, sugarcane
Industries:	Sugar milling
Exports - commodities:	Sugar, coffee
Imports - commodities:	Wheat flour, corn flour, sugar, edible oils, salt, rice

Industry Summary:

- Panama is a large rice producer in the region however also has to import to supplement its domestic supply.

Malnutrition:

Panama is one of the two Central American countries that have experienced a rise in chronic malnutrition of children under 5 in the last six years. Malnutrition affects about 19 per cent of this population. The problem is more serious among children living in areas with a predominantly indigenous population: more than half of all these children suffer from underweight.

Table 108: Incidence of Malnutrition – Panama

Undernourished Population 2000-2002	26.0%

Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	14.4% 1997
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	6%
Households Consuming Iodized Salt – UNICEF Update 2004	95% 1998
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	30.6%
Women	40.3%
Pregnant Women	36.4%

Panama has now essentially eliminated iodine deficiency disorder among its population.

Fortification:

In Panama more than 80% of wheat flour is currently fortified with iron, folic acid and other complex B vitamins. The other areas of weakness in the programs are continually trying to be addressed. However, a highly important factor of success in the region was noted as being the commitment of a convinced pro-active private sector and the active participation of the organized consumer sector.

Table 109: Fortification Standards in Panama

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
Mandatory fortification with iodine (Nov 1969)	no legislation	Mandatory with Vitamins B1 and B2, iron, folic acid, and niacin (Reglamento Centroamericana R-UAC 67.01.15.2002	no legislation	no legislation	Mandatory with vitamin A (Decreto 385 October 1976)

Panamanians consume approx. 72 kg / capital of rice annually mostly due to the large Asian community. With no local rice production of milling, legislation regarding rice fortification on imports would encourage the exporting countries to fortify rice.

10.28 Bolivia

Total Population: 9,182,000
Rural Population: 3,269,792 (35.6%)
Est. Population with access to commercially processed food: 76.1%

Bolivia is one of the poorest (64% of the population live below the poverty line) and least developed Latin American countries although Bolivia's fiscal position has improved in recent years, and the country had a record 6% fiscal surplus for 2006. The three major sectors of the Bolivian economy are energy, mining, and agriculture. Bolivia's chronic poverty and public indebtedness remain daunting challenges. A large percentage (estimates range between 65 and 85 percent) of the population lives outside the formal economy, while many more face the grinding reality of securing livelihood through small-scale agriculture.

Table 110: Food Industries and Trade – Bolivia

Agriculture - products:	soybeans, corn, sugarcane, rice
Industries:	Flour milling, rice milling, edible oil processing, sugar
Exports - commodities:	soybeans and edible oils
Imports - commodities:	Wheat, Wheat flour, corn flour, sugar, edible oils, salt, rice

Industry Summary:

- Wheat is a minor crop in Bolivia, accounting for 9 percent of grain production and the entire crop is being milled and consumed locally. Despite repeated attempts by the government's National Wheat Institute to make the nation self-sufficient in wheat production, Bolivia continues to produce only about 20 percent of its national requirements.
- Corn is an important domestically produced food grain accounting for 52 percent of grain production. Both white and yellow corn is grown in Bolivia about half of all white corn produced is consumed locally by Bolivia's small farmers, while the remainder is marketed to the livestock and poultry feed industry.
- Bolivia's sugar cane is mainly grown in the Santa Cruz region. With four sugar mills with capacity to process 3.09 million tonnes of cane per year, Santa Cruz accounts for 84 percent of the country's milling capacity.
- Soybeans are the largest and most important field crop in Bolivia and is the country's primary commercial or industrial crop, with about 85 percent of production being processed and exported from the country and the balance used domestically. Indications are that crude soybean oil importers were Colombia (59%) and Venezuela

(41%). Total crushing capacity in Bolivia is 7,500 MT per day, enough to process its entire crop. The largest crushing companies are ADM-SAO (a multi-national) with about 35 percent of the market, Fino and Rico with about 25 percent of the market each, and several small companies share the other 15 percent of the market.

- Rice is Bolivia's second most important food grain, accounting for 21 percent of grain production (milled-basis). The vast majority of production comes from the region of Santa Cruz, which accounts for 82 percent of national output. Bolivia has been virtually self-sufficient in rice production since the 1960's however this is primarily the result of low per capita consumption, which amounts to 20 kilograms per capita annually.

Malnutrition:

More than a quarter of Bolivian children suffer from moderate or severe stunting resulting from malnutrition.

Table 111: Incidence of Malnutrition – Bolivia

Undernourished Population 2000-2002	N/A
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	26.8% 1998
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	11%
Households Consuming Iodized Salt – UNICEF Update 2004	90% 2003
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	51.6%
Women	32.9%
Pregnant Women	37.0%

Health, nutrition and early childhood development programmes, provided by UNICEF, are improving the quality of life in more than 50 impoverished municipalities with mostly indigenous populations.

Fortification:

Many efforts in Bolivia to fortify commodities have been partially successful, and many reasons exist for the lack of total success. Many of them are politically motivated, as well as the fact that – for example in wheat flour – the government has not been able to control contraband of the product from neighboring countries, thus affecting the local industries.

Table 112: Fortification Standards in Bolivia

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
Mandatory fortification of salt with iodine - as per Decree of 1986	mandatory fortification - Decreto Supremo No. 24420 del 27 de Noviembre de 1996	no legislation	no legislation	Oil must be fortified with Vitamin A - as per Decreto Supremo No. 28094 de fecha 27 de abril de 2005	no legislation

Both government and industry are very well aware of the benefits to public health from fortification, as well as the excellent returns that supporting these projects would bring to the Bolivian people. Many international agencies and NGO's are and/or have been in Bolivia because of this.

With four sugar mills providing 84 percent of the country's milling capacity efforts to fortify sugar should be considered..

10.29 Colombia

Total Population: 44,946,000
Rural Population: 10,157,796 (22.6%)
Est. Population with access to commercially processed food: 84.9%

Colombia's economy continues to improve in part because of austere government budgets, focused efforts to reduce public debt levels, an export-oriented growth strategy, an improved security situation in the country, and high commodity prices. Ongoing economic problems include reforming the pension system and reducing high unemployment.

The food industry is one of the largest and most vital sectors in the economy; accounting for 21% of industrial production. The industry has state-of-the-art technology and is a major producer of many intermediate and consumer-ready categories such as vegetable oils and margarines both for domestic and export markets.

Table 113: Food Industries and Trade – Colombia

Agriculture - products:	Rice, tobacco, sugarcane, oilseeds
Industries:	Wheat & corn flour milling, sugar, edible oil processing, salt, rice milling
Exports - commodities:	Palm oil
Imports - commodities:	Wheat, corn, wheat flour, edible oils, milled rice

Industry Summary:

- Colombia depends heavily on wheat imports, and account for 98 percent of total Colombia's wheat demand. The wheat industry continues to develop value added wheat products such as pastas, incorporating new technologies to reduce costs and increase productivity. This focus has reduced pasta prices for lower income consumers resulting in increased wheat demand.
- The largest flour mill is Harinera del Valle with 23% market share followed by Org. Solarte, with 19% market share.
- Colombia is the largest sugar producer in the region however due to recent crop yields sugar exports have declined 20 percent while imports are increasing. An increase in ethanol production as well as increased exports of confectionary products is resulting in a deficit in sugar supplies and a need to increase raw sugar imports.
- Colombia imports raw sugar at a reduced duty from Brazil as a result of CAN-MERCOSUR free trade agreement, and duty free from Ecuador as member of the Andean Community.

- Peru was the top destination for Colombian sugar exports and represented 13 percent of total Colombian exports. Colombia also exported to Chile and Haiti.
- Colombia produces sizable amounts of rock and marine salt. Refisal S.A. is the largest salt refiner in Colombia and obtains its raw material of the mines of Zipaquirá and Nemocón and operates several processing plants. Colombia's salt imports represent 6.5% of total consumption. In 2004, imports were from the following countries: Chile (79%), Perú (12%), Venezuela (5%), Netherlands Antilles (0,1%), and other (3,9%).
- Colombia's imports of soybeans and soybean products from the United States have risen steadily over the last three years, and imports from the United States should increase further as a result of the recently signed Colombia – U.S. Trade Promotion Agreement (CTPA) - due to elimination of the import duty upon implementation.
- Vegetable oil consumption continues to grow in Colombia, reflecting increased substitution for animal fats and oils in food products. The palm oil grower's federation - Fedepalma - developed a strong marketing campaign to expand the local consumption of palm oil that has become a key element of the increase in vegetable oil consumption.
- Colombian companies involved in edible oils are Alianza TEAM (40%), GRASCO S.A. (20%) and Lloreda Grasas (20%). Alianza TEAM has one product in the market, Oliosoya Vitamina E, fortified with vitamin E and Omega 6. It is being promoted as a heart-healthy product containing antioxidants.
- A commitment from the government to continue agricultural supports and high import duties (80 percent) on rice from countries outside the Andean Community will reinforce increased plantings of rice. Imports from Ecuador and Venezuela enter duty free.

Malnutrition:

One third of all children are anaemic. Stunting affects 14 per cent of children under age five; 7 per cent of newborns have low birth weight.

Table 114: Incidence of Malnutrition – Colombia

Undernourished Population 2000-2002	13.0%
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	13.5% 2000
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	14%
Households Consuming Iodized Salt – UNICEF Update 2004	92% 1997
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	27.7%
Women	23.6%
Pregnant Women	31.1%

Colombia is expanding its food security actions, with a significant increase in FAO activity.

Fortification:
The wheat flour industries as well as the salt industries are regulated and to a good extent do fortify their products.

It is interesting to note that rice fortification at an experimental level is taking place and seems to be going well, even though the project is very limited. There is however one rice mill fortifying with vitamin A and folic acid.

In the maize flour industry, there are many small size food companies with very little technology, which manufacture ready-to-eat arepa flour (local tortilla type product) through out the country; situation which might be a difficulty in a fortification effort.

In 1990, Colombia issued Decree 1324 regulating mandatory sugar fortification with vitamin A in the country. The decree was derogated in 1992 by influence of ASOCAÑA (Asociación de Cultivadores de Caña de Azúcar de Colombia).

There is one edible oil processor fortifying one brand with vitamin E and Omega 6. It is being promoted as a heart-healthy product containing antioxidants.

Table 115: Fortification Standards in Colombia

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
Mandatory fortification of salt with iodine - DECRETO 547 DE 1996	no legislation	mandatory fortification - DECRETO NUMERO 1944 DE 1996	no legislation	no legislation	no legislation

Relative to the food processing industry as it relates to the fortification with micronutrients, Colombia is a well advance country. Industry and government are aware of its importance and how beneficial to public health the intervention is. Colombia is doing well in the aspect of food fortification and would be a good target for investment, if the need for such fortification is well defined before efforts are taken in this direction. Industry, in general, has a good rapport with government and through the industrial associations the needed support for a fortification effort is available.

The newly created Ministry of Social Protection (Health + Labor) defines all the issues regarding fortification of mass consumed foods. All issues regarding control of fortified foods (mandatory and non mandatory) are established by the Instituto Nacional de Vigilancia de Medicamentos y Alimentos (INVIMA).

According to consumption sugar and edible oil can be considered as good carriers for vitamin A fortification.

Edible oil is a relatively sophisticated industry in Colombia and could very easily – from a technical point of view – fortify their products with vitamin A if it were to be mandated.

10.30 Ecuador

Total Population: 13,061,000
Rural Population: 4,858,692 (37.2%)
Est. Population with access to commercially processed food: 75.1%

Ecuador has substantial petroleum resources, which have accounted for 40% of the country's export earnings and one-third of central government budget revenues in recent years. However, underemployment and poverty have stayed persistently high.

In addition to domestically grown commodities, imported ingredients for the food processing industry continue to originate mainly in Colombia, Chile, the United States and Mexico. According to import statistics, most demanded products are: milk powder, processed sugars, sugar ingredients, flour, and cereals.

Table 116: Food Industries and Trade – Ecuador

Agriculture - products:	Rice, manioc (tapioca), sugarcane, corn, wheat
Industries:	Rice milling, flour milling, edible oil processing, sugar, salt
Exports - commodities:	Palm oil
Imports - commodities:	Wheat, oilseeds Wheat flour, edible oils

Industry Summary:

- Wheat production in Ecuador remains stagnant and rising imports are explained by sharp decreases in production and by growing consumption. Wheat is mostly used in Ecuador to produce flour suitable for bread and pasta, and its consumption is fairly stable despite fluctuations in the international markets.
- There are 25 flour mills located between the Sierra and the coast. The principal mills are: Molinos del Ecuador (12% market share), Industrial Molinera (12%), Molinera Manta (10%), Molinos La Unión (10%), Molinos Poultier (8%) y Molinos Superior (5%).
- With cane sugar production slightly up from last year Ecuador has reduced its imports of refined sugars, as this market is being filled with domestic sugar. Exports of white sugar to and from Colombia and Peru are expected to remain constant. Sugar is considered by the government to be a staple and is used as one of several commodities used for the calculation of inflation indexes. Because of its social significance, sugar prices have been stable for the past few years although the government does not intervene to regulate them.
- The main sugar processors are: San Carlos (33% market share), Valdez (30%), La Troncal (28%), Isabel María (1%), Monterrey (4%), IANCEM (4%). Most of the

production is for white, refined sugar however there has been a recent increase in the production of brown sugar.

- 60% of salt is produced by ECUASAL. Others in the marketplace are FAMOSAL, Jueza SA, Profipil y Salfipil.
- Ecuador produces large quantities of palm oil for home use and imports of soybean oil remain stagnant with Argentina being the primary supplier crude soybean oil in 2005. In addition, Ecuador imported 2,500 MT of refined soy oil (32% more than last year) mainly from Brazil, Bolivia and Chile. Soybean oil is used in Ecuador as part of a blend with palm oil to produce oils for home use.
- Ecuador has a very small crushing capacity with particularly high processing costs caused by old equipment, high electricity costs and other inefficiencies. The small percentage of soybean being crushed locally is done so by the oil extracting industries that specialize in palm oil production.
- Oil consumption is made up of approximately 74% palm oil, 23% soybean oil and 3% of other oils. The palm oil is produced locally, whereas 95% of the soybean oil is imported. The main oil producing companies are La Fabril - La Favorita (57%), DANEC (25%), ALES (15%) and EPACEM (2%).
- Rice imports are a very sensitive issue in Ecuador. The Government of Ecuador is pushing a self-sufficiency program for rice by continuing to implement the Andean Price Band System (APBS) and by controlling imports.

Malnutrition:

Stunting from chronic malnutrition affects 26 per cent of children under 5. Rates are markedly worse for indigenous children.

Table 117: Incidence of Malnutrition – Ecuador

Undernourished Population 2000-2002	N/A
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	27.1% 1999
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	14%
Households Consuming Iodized Salt – UNICEF Update 2004	99% 1999
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	37.9%
Women	29.2%
Pregnant Women	37.8%

The Government's maternal and child health programme has achieved 95 per cent coverage for basic immunizations. Pregnant women also receive iron supplements, while young children receive vitamin A and iron supplements along with their vaccinations.

As a result of UNICEF's collaboration with the Ministry of Health and the salt industry, 99 per cent of the population now consumes iodized salt.

Fortification:
Wheat flour is fortified and millers have complied with the legislation in various and different degrees.

Salt has been fortified with iodine for about 30 years when legislation was enacted.

Maize meal is basically not consumed and the oil and sugar industries have not contemplated fortification of their products.

Table 118: Fortification Standards in Ecuador

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
Mandatory fortification of salt with iodine	no legislation	According to Supreme Decree of August 2006, fortification with iron, folic acid, and B vitamins is mandatory	no legislation	no legislation	no legislation

In Ecuador the concept of fortification is well known, and several efforts have been made by the Government with the aid of different agencies (UNICEF, WFP, others) to make available fortified industrialized food products (instant powder drinks; papillas; and others) but as in other countries the programs have had a lack of funds (continuous funding) and thus sustainability. It is important to note that programs like "PANN 2000" were successful at the beginning, including new and innovative distribution (and selling) schemes which allowed the products to reach the most needy populations without excessive costs.

Fortification of sugar with Vitamin A was considered several years ago, but the health professionals (specifically many pediatricians) were opposed to it. Based on this situation the sugar industry based their refusal to even consider it.

The Ministry of Health (Ministerio de Salud Pública del Ecuador) is the one controlling and monitoring fortification. This is done by taking samples 3 times annually in each mill.

In Ecuador as in many other LA countries, the basic quality assurance of the fortified products does not exist. Control, surveillance and monitoring by the authorities are loose. This could be an important area to focus on in order to obtain sustainability of the fortification programs.

Rice is a staple food of Ecuadorians for at least one meal a day and the majority of Ecuador's production is consumed locally. Per capita consumption of 47 kg is high due to higher prices of alternative staples, such as bread or pasta. Rice is also replacing other traditional staples in the highlands, such as quinoa and even potatoes. Therefore rice fortification efforts should be evaluated.

Ecuador produces large quantities of palm oil and imports of crude & refined soybean oil for domestic use. Since fortification of sugar with vitamin A has been unsuccessful, consideration should be given to introduction edible oil fortification.

10.31 Peru

Total Population: 27,274,000
Rural Population: 6,927,596 (25.4%)
Est. Population with access to commercially processed food: 83.0%

Peru's economy reflects its varied geography - an arid coastal region, the Andes further inland, and tropical lands bordering Colombia and Brazil. Abundant mineral resources are found in the mountainous areas, and Peru's coastal waters provide excellent fishing grounds. Despite the strong macroeconomic performance, underemployment and poverty have stayed persistently high. Economic growth continues to be driven by exports of minerals, textiles, and agricultural products.

Farming provides the livelihood for the majority of Peruvians, some of whom remain outside the money economy. The food processing sector in Peru is growing steadily at 7 percent annually due to local consumption and growing exports.

Table 119: Food Industries and Trade – Peru

Agriculture - products:	Sugarcane, rice, corn
Industries:	Flour milling, edible oil processing, sugar, rice milling
Exports - commodities:	
Imports - commodities:	Wheat, corn, oilseeds Wheat flour, edible oils, milled rice

Industry Summary:

- Wheat is considered only a minor crop therefore most of the wheat for milling is imported. The wheat milling industry in Peru is highly concentrated. Of the 22 mills in the country, the largest one, Alicorp S.A.A., accounts for about 50 percent of total wheat processed, and the top four mills account for about 80 percent of the wheat milled in the country. Cognorno S.A. is the 2nd largest with approx. 10% market share.
- Peru should become self sufficient in sugar within the next three years. Sugar imports in CY 2006 dropped 14 percent due to increased domestic production. Colombia was the leading supplier. Peru grants duty free access to Bolivian and Colombian sugar. Sugar mills in Peru are located along the coast and have a total milling capacity of 37,000 MT of cane per day. Since sugar cane in Peru is produced year round, mills do not need to be very large.
- Casa Grande, Peru's largest sugar producer was acquired in 2006 by Gloria, Peru's largest dairy processor. Gloria plans to invest $60 million to improve the company's efficiency. Casa Grande has a milling capacity (10,000 MT of cane per day, a third of total capacity in Peru) and operates at less than fifty percent.

- Cartavio, Peru's second largest sugar producer has invested $58 million in the past seven years to improve its production, yields and processing efficiency.
- Imported crude oil is refined and bottled for retail sale. Peru does not produce any soybeans, and the limited crushing capacity is used to produce full fat soy meal for feed. On December 28, 2006, Peru unilaterally eliminated import duties for soybean oil (previously 12 percent). Soy oil consumption is expected to continue increasing as Peru's economy improves.
- Most popular vegetable oils are mainly made from soybeans, sunflower and corn that are imported from Bolivia, Chile and Argentina.
- Alicorp S.A.A. is Peru's largest edible oil processors (approx. 60% market share) and also has operations in Ecuador and Colombia.
- A decrease in imports of rice was the result of higher production due to good weather conditions and attractive prices. Uruguay continued to be the leading exporter to the Peruvian market with 32,756 tonnes.
- Rice is a staple product in the Peruvian diet and is sold traditionally in small markets, weighed out and bagged from 50 kilos sacks. In recent years, with the expansion of supermarket chains in Peru, several consumer habits, including the purchase of rice, have changed. There is a growing demand for pre-packaged one-kilogram bags of rice.

Malnutrition:

Of the 3.8 million people living in extreme poverty, 2.1 million are children. Of the total 10.2 million under-18 population, more than 6.5 million live below the poverty line. Socio-economic disparities and exclusion continue to characterize the country affecting more children and adolescents who are not benefiting from the economic growth.

Table 120: Incidence of Malnutrition – Peru

Undernourished Population 2000-2002	N/A
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	25.4% 2000
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	30%
Households Consuming Iodized Salt – UNICEF Update 2004	93% 1997
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	50.4%
Women	40.4%
Pregnant Women	42.7%

Fortification:

The fortification efforts in Peru have been many and NGO's and world agencies (UNICEF; WFP; USAID; etc.) have developed formulated fortified products directed to the sectors of population that need them most. These products – papillas, powder drinks, and others – for many reasons have not been sustainable.

Salt fortified with iodine and wheat flour with a vitamin and iron mixes have legislation and standards issued by the government. A study to add Fluor to the salt, where needed is understudy.

Table 121: Fortification Standards in Peru

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
Iodization is mandated by El Decreto de Ley Nº 17387 (salt for human and animal consumption must be fortified by Potassium iodate between 30 to 40 ppm). Fluoridation is being discussed.	no legislation	Fortification of wheat flour with iron, folic acid, thiamine, riboflavin, and niacin is mandated by Ley Nº 28314 de Fortificación de Harina de Trigo del 23 de Junio del 2006	no legislation	The mandatory fortification of oil with Vitamin A is under discussion but no legislation as yet exists	The mandatory fortification of sugar with Vitamin A is under discussion but no legislation as yet exists

Peru knows of the need for fortified products and there have been conversations between government and industry to assess the possibility of sugar and edible oil fortified with vitamin A. In the areas of quality assurance – control, surveillance and monitoring – the weakness is a lack of enforcement of the rules and regulations.

Discussions to mandate the fortification of oil and sugar should be reopened.

10.32 Venezuela

Total Population: 26,726,000
Rural Population: 3,180,394 (11.9%)
Est. Population with access to commercially processed food: 92.0%

Venezuela remains highly dependent on oil revenues, which account for roughly 90% of export earnings, more than 50% of the federal budget revenues, and around 30% of GDP. Economic growth in 2006 reached about 9%. This spending, combined with recent minimum wage hikes and improved access to domestic credit, has fuelled a consumption boom but has come at the cost of higher inflation. Imports have also jumped significantly.

Although there is agri-food production and processing in Venezuela, the domestic demand exceeds production and, therefore, must import raw, crude and processed commodities.

With the objective of keeping food products available at reasonable prices, the Government of Venezuela implemented price controls on February 11, 2003. This move was made in conjunction with the imposition of a strict exchange rate policy, and was an attempt by the government to help restrain inflation. There is no indication that the GOV will lift price controls in the short term.

Products under price controls are: rice, oatmeal, corn flour, wheat flour, bread, pasta, sugar, coffee, salt, beef, pork meat, poultry, eggs, sardines, tuna, corn oil, sunflower oil, vegetable blended oil, powdered milk, milk infant formula, white cheese, margarine, lentils, peas and black beans.

Table 122: Food Industries and Trade – Venezuela

Agriculture - products:	Corn, sugarcane, rice
Industries:	Wheat and corn flour milling, sugar, edible oil processing, salt, rice milling
Exports - commodities:	
Imports - commodities:	Wheat, corn, oilseeds Wheat flour, edible oils

Industry Summary:

- Venezuela is heavily dependent on imports of wheat for domestic flour milling activities. There are ten milling companies in Venezuela, eight national and two multinational. Total installed capacity in Venezuela is 1.9 MT, of which 1.6 MT are being used. All of the wheat milled is imported. Venezuelan milling capacity is highly concentrated: two groups control an estimated of 57 per cent of the installed capacity.

- The largest milling group is Cargill of Venezuela, a multi-national with operations throughout LAC. The second largest group is MONACA.
- Corn is the main crop of Venezuela. White corn is a staple on the Venezuelan diet and is traditionally purchased by the corn flour industry for producing a pre-cooked corn flour for human consumption.
- Venezuela's sugar production does not meet demand. The lack of incentives to plant more area to sugar cane is defined by the existence of controlled prices at the retail level and increasing costs of production. Imports of raw and refined sugar are expected to continue in order to keep up with demand. Because of the controlled price of sugar at the retail level, cane growers and millers have worked together in order to reduce production costs through achieving better yields and higher sugar content of the sugar cane.
- There are 14 sugar mills operating in Venezuela and for several years now sugar consumption in Venezuela has been slowly increasing.
- Import licenses are awarded to mills based on the percentage of sugar cane received and milled. Import licenses are valid for four months, and can only be renewed if, on expiry, they have not been used for reasons outside the importer's control.
- Venezuela has 14 salt processors, Sal Bahia and Tecnosal account for approx. 75% of the total production of processed salt. The main medium and small processors are ALESCA, MOLISOCA and INDULSALCA. The 4 medium producers account for 18.2% and the 8 small and micro producers for 6.1% of the total.
- Venezuela is heavily dependent on imports of crude edible oils to supply domestic demand for cooking oils as there is no sufficient domestic production. Government imports of processed oilseed products (vegetable oil and margarine) are expected to continue while further growth in oilseed imports by the private sector will be subject to the importers' ability to procure import licenses. Processed oilseed product imports carried out by the government are exempt from import tariffs, foreign exchange controls and import licenses. It is expected that oilseed imports will grow because of demand from the food and industrial sectors.
- South American countries like Bolivia, Paraguay, Argentina, Brazil, and Uruguay, are Venezuela's mayor oilseed suppliers because of tariff preferences given by Venezuela.
- The edible fat and oil market in Venezuela is characterized by direct links between producers, processors, and distributors. Cargill, a multi-national, is the market leader and the most important producer of vegetable oil. Cargill is followed is followed by Coposa and Alimentos Polar, domestically-owned oil processors.
- Venezuela is self-sufficient in rice production and produces enough rice to supply the domestic market and to export small surpluses to neighbouring countries. The rice milling industry in Venezuela operates 47 mills but only 35 are currently active and idle capacity in 2005 was 51.87 percent. Many companies have not invested to modernize.
- Mercal, as well as other government food social programs represents 45 percent of the total rice market; only a few big companies that can afford to sell rice at the lower prices required by these government outlets actually supply them.
- Traditionally, Venezuela has been a net exporter of rice, sending about 10 percent of its rice crop annually to Colombia. However, Colombia tries to protect its domestic

production by applying measures to restrain rice imports from Venezuela. Central American and Caribbean countries, which are not self-sufficient in rice, are also natural markets for the Venezuelan rice; some small amount of exports usually goes to those markets.

Malnutrition:

Infant mortality has been reduced, but maternal mortality is still high, even though 94 per cent of births occur in health facilities.

At least 21 per cent of children under five are malnourished to some degree.

Anemia prevalence of 38.1 percent was discovered in children from two to seven years old. In a significant percentage of these children, anemia was not a secondary manifestation of malnutrition, since only 14.4 percent had low height and 9.4 percent had low weight (Castejón et al., 2004).

Table 123: Incidence of Malnutrition – Venezuela

Undernourished Population 2000-2002	17.0%
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	12.8% 2000
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	7%
Households Consuming Iodized Salt – UNICEF Update 2004	90% 1998
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	19.1%
Women	16.9%
Pregnant Women	27.1%

Venezuela is financing an important food security programme, with technical assistance from FAO that envisages actions in various spheres of food security, including urban and periurban horticulture.

Fortification:

Venezuela was one of the first countries (after Chile) to fortify wheat and cooked maize flour.

Efforts to fortify other commodities other than salt with iodine, in Venezuela have not been successful, yet the Institute of Nutrition has experimented with some fortified formulated products but they have not been supported and presently are not being marketed.

Table 124: Fortification Standards in Venezuela

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
mandatory	mandatory	mandatory	no legislation	no legislation	no legislation

With vegetable oil consumption being approx. 12 kg /capita annually and with the edible fat and oil market characterized by direct links between producers, processors, and distributors consideration should be given to introducing fortification.

10.33 Argentina

Total Population: 38,747,000
Rural Population: 3,642,218 (9.4%)
Est. Population with access to commercially processed food: 93.7%

Argentina benefits from rich natural resources, a highly literate population, an export-oriented agricultural sector, and a diversified industrial base. The government restructured its debt in 2005 and paid off its IMF obligations in early 2006, reducing Argentina's external debt burden. Real GDP growth averaged 9% during the period 2003-06, bolstering government revenues and keeping the budget in surplus.

Argentina's economy has traditionally been based on agriculture. As an exporter of wheat and corn Argentina rivals the United States, Canada, and Australia. Its other agricultural products include oilseeds and soybeans.

Table 125: Food Industries and Trade – Argentina

Agriculture - products:	Sunflower seeds, soybeans, corn, wheat, rice, sugar
Industries:	Flour milling, sugar refining, edible oil processing, rice milling, salt
Exports - commodities:	Oilseeds, edible oils, cereals
Imports - commodities:	

Industry Summary:

- Argentina is on average the second largest wheat exporting country after the USA. A new system of subsidies has been put in place to control the domestic wheat supply to the milling industry and, in turn, control consumer bread, pasta, and flour prices. The wheat subsidy is two-fold, one part paid to the producer and the other paid to the miller.
- Cargill and Bunge, multi-nationals, are large players in the Argentinean marketplace.
- Although Argentina’s corn production is mainly for animal feed, a certain percentage of the corn grown is of human consumption grade and is used for corn oil and flourl processing. Molinos Rio de la Plata SA produces corn oil and flour for domestic and export demand.
- Argentina’s sugar production for 2007/08 is forecast to be the highest ever and sugar exports are forecast to reach record levels. Despite a growing domestic demand, strong growth in production, with three record years in a row, is resulting in more abundant export surpluses with Chile expected to continue to be the second largest market, buying mostly refined sugar.

- Ledesma is Argentina's number one sugar producer. It produces approximately 330,000 tonnes of sugar every year, which makes up approx. 20% of the country's total.
- Industrias Quimicas y Mineras Timbó, S.A., selling under the brand name Celusal, operates two plants and exports to several countries including Uruguay & Paraguay. They advise that their salt is enriched with iodine and have also introduced a new line with is fortified with iron.
- Argentina is the world's third largest soybean producer and the world's largest exporter of soybean meal and oil. It is also the world's fourth largest sunflower seed producer and world's second largest sunflower seed oil exporter.
- Cargill S.A.C.I. is ranked as one of the leading Argentine exporters of vegetable oils with three modern crushing plants -one for soybeans at Puerto San Martin, another for multiseed in Quequén (Buenos Aires Province) and the newest for sunflower seed in Bahía Blanca (also in Buenos Aires Province).
- Bunge Argentina S.A., with the Bunge y Born acquisition, the purchase of Guipeba S.A. and La Plata Cereal Co., has become the leading agri-business company in the country and one of the world's top exporters of oilseeds, crude & edible oils and by-products.
- Moreno, (owned by Glencore), is one of the world's largest producers and exporters of sunflower oil and meal operating four crushing plants (Necochea, Daireaux, Villegas and Grainer) with a combined annual capacity of 2 million tonnes.
- ACEITERA MARTINEZ S.A. has been operating in Argentina for over 50 years and is currently one of the biggest bottlers in Argentina exporting to Chile, Paraguay and Brazil as well as several other Latin American countries such as Cuba, Venezuela, Panama, Peru and Colombia.
- Molino Cañuelas is a leading flour producer; however, they have been producing and marketing vegetable oil in Argentina for the last 12 years with sales to Uruguay, Chile, Brazil and Paraguay as well as within Latina America including Bolivia, Peru, Panama, Cuba, Costa Rica, Surinam, Curacao and Trinidad & Tobago.
- The rice sector continues to experience consolidation and an increase in large producers with access to irrigation with Brazil continuing to be the major importer.
- Most of rice exports from Argentina in 2006 were concentrated among 3 companies which represented close to 50% of total exports – with approx. 280,000 tonnes shipped to Brazil.
- Glencore, through its subsidiaries in Argentina and Uruguay, own five rice mills with a combined annual capacity of 400,000 tonnes. Adecoagro, is a fully integrated rice operation (Molinos Ala). Coop. Arroceros Villa Elisa operates both rice and soya production facilities in Argentina.

Malnutrition:

Table 126: Incidence of Malnutrition – Argentina

Undernourished Population 2000-2002	N/A
Chronic Malnutrition in Children Under Five Years of Age	12.4%

Between 1995 - 2002:	1996
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	9%
Households Consuming Iodized Salt – UNICEF Update 2004	90%
	1996
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	18.1%
Women	18.0%
Pregnant Women	25.4%

Fortification:

Argentina has gone so far as to mandate the use of enriched/fortified flour in all products destined for domestic production, both locally-manufactured and imported.

Table 127: Fortification Standards in Argentina

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
Salt iodination is mandatory	no legislation	Enrichment with iron, thiamin, riboflavin, niacin and folic acid is mandatory. Law #25.630	no legislation	no legislation	no legislation

The Argentine Food Code (Codigo Alimentario Argentino - CAA) regulates local food production and marketing. However, the CAA resolutions are being gradually replaced by Mercosur standards, which are based on the norms of: 1) the European Union; 2) the Codex; and 3) the FDA.

Being the world's third largest soybean producer and fourth largest sunflower seed producer Argentina is one of the leading suppliers to edible oils. There are also several multi-national and international processors operating which would make Argentina an ideal candidate for edible oil fortification efforts.

10.34 Brazil

Total Population: 186,831,000
Rural Population: 29,519,298 (15.8%)
Est. Population with access to commercially processed food: 89.4%

Characterized by large and well-developed agricultural, mining, manufacturing, and service sectors, Brazil's economy outweighs that of all other South American countries and is expanding its presence in world markets. Since 2004, Brazil has enjoyed continued growth that yielded increases in employment and real wages. Productivity gains - particularly in agriculture - have contributed to the surge in exports.

The food processing industry is positioned as the second largest manufacturing sector in Brazil. Furthermore, the food industry is a key segment of the economy, serving as an anchor to alleviate unemployment, inflation and trade deficits. The food processing sector in Brazil is large, diversified and modern by international standards. The production of higher-value processed food and beverage products is expanding and the industry is paying more attention to nutritional and physical attributes of processed foods, as well as to packaging of products.

Table 128: Food Industries and Trade- Brazil

Agriculture - products:	Soybeans, wheat, rice, corn, sugarcane
Industries:	Flour milling, sugar milling, rice milling, edible oil processing, sugar, salt
Exports - commodities:	Oilseeds, edible oils, sugar, milled rice, wheat, wheat flour
Imports - commodities:	Wheat, corn, paddy rice Wheat flour, edible oils, milled rice

Industry Summary:

- Brazil is both a large producer and consumer of wheat flour. Brazil imports, on average, about 5 million tonnes of wheat from Argentina, however, it is widely believed that Argentina does not have sufficient quantities of wheat to supply Brazil, made even more evident by the closed export registry, which will require Brazilian wheat millers to look outside of Mercosur.
- Recently Brazilian millers have been faced with higher input costs and significant competition from Argentine wheat flour. If the Argentine government does not equalize its export registration policy and differential export taxes, it is expected that wheat flour imports will continue to rise as a percentage of total wheat imports, likely leading to some consolidation in the Brazilian milling industry.
- Bunge has operations in Argentina & Brazil where it is the market leader in wheat flour for industry and pre-mixed products for the baking and confectionary sector.

- Brazil's corn production for 2007/08 is expected to continue to be strong as farmers continue to take advantage of export opportunities. Animal feed production accounts for approximately 60 percent of domestic corn consumption respectively. Brazil has been importing some corn from Paraguay, however mainly for the meat industry in the South.
- Cargill's corn wet milling plant is located in Uberlândia, in the state of Minas Gerais, and produces glucose, maltodextrin, natural and modified starches, gluten and corn meal. Mina Mercantil Industrial e Agrícola Ltda's plant situated north of the State of São Paulo has capacity to mill 60 tonnes per day.
- Being the largest sugar producer in the world, Brazil's sugar industry has a blend of multi-nationals (such as Cargill), international and national companies processing, packaging and distributing sugar world-wide and regionally.
- Salinor is the largest producer of sea salt, accounting for more than 40% of the production. Other than serving the domestic market, Salinor export within the region – mostly in bulk.
- Refinaria Nacional de Sal S.A. is one of the smaller players in Brazil and has its operations producing approx. half a 250,000 tonnes annually under the brand name Sal Cisne. They also have introduced a light version of their salt and indicate that minerals (selenium, magnesium potassium, calcium, zinc and iodine) have been added.
- Brazil ranks as the world's leading soybean exporter and second-largest producer behind the U.S. Furthermore, the processing sector is well developed and Brazilian soybean research is advanced and easily mobilized.
- Cargill Agrícola S.A. is Brazil's largest soybean exporter and second-largest oilseed processor. Cargill produces and sells cooking oil, olive oil and blended cooking oil. CARGILL most popular brand LIZA is now marketing LIZA Nutriplus which is fortified with vitamins A, D and E.
- Bunge Alimentos is recognized as the largest agribusiness and food company in Brazil. Present in 15 states and producing vegetable oils, refined oils, margarines and vegetable fats, it is the fourth-largest exporter of Brazilian products.
- IMCOPA, located in Araucária, Brazil, has the capacity to produce 370 tones of crude and 400 tonnes of refined oil daily.
- ABC Inco – part of the Algar Group - operates one of the most modern industrial soybean processing installations in Brazil. It is a major producer of soybean oil, which is sold under the ABC brand in various states in Brazil.
- The milled rice that is now being exported is primarily going to Benin and Cuba. Imports are expected to be supplied by Uruguay, Paraguay and Argentina, with any residual coming from SE Asia.
- A multitude of companies mill, package and sell rice in Brazil – both national and international. Urbano Agroindustrial Ltda is one of the largest rice processors in Brazil with 5 modern processing facilities and 3 distribution centers.

Malnutrition:

Some 12 million children live in the semi-arid region comprising Brazil's most vulnerable and impoverished states. Literacy, infant mortality and water coverage here are well below the national average.

Table 129: Incidence of Malnutrition – Brazil

Undernourished Population 2000-2002	N/A
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	10.5% 1996
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	40%
Households Consuming Iodized Salt – UNICEF Update 2004	88% 2000
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	54.9%
Women	23.1%
Pregnant Women	29.1%

In the Southern Cone, FAO has provided technical assistance from the very inception of Brazil's Zero Hunger Programme, particularly in refining programmes aimed at improving food access.

Fortification:

Three rice mills in Brazil are adopting rice fortification. The amount of fortified rice at supermarket level is not yet significant and efforts are needed to advocate the importance of rice fortification with government authorities.

In 2000, a project in Brazil was conducted by Acucar Guarani with ITAL – Institute of Food Technology aimed at the fortification of white sugar with vitamin A. Although the development of the technology was successful, Acucar Guarani declined to commercialize the product due to the high costs involved in advertising. The industry considered that the expenditure of several million dollars in advertising, without having an interest from and support of government authorities did not pay off the required investments.

Table 130: Fortification Standards in Brazil

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
Salt iodination is mandatory since 1953 (Law # 1994). Resolution of Anvisa #130/03 establishes content	Enrichment with iron and folic acid is mandatory. Resolution of Anvisa - RDC # 344 - Dec.13th /2002	Enrichment with iron and folic acid is mandatory. Resolution of Anvisa -RDC # 344 - Dec.13th/2002	no legislation	no legislation	no legislation

equal or superior to 20 mg/kg to a maximum of 60 mg of iodine / kg of salt					

For many decades Brazil was very resistant to food fortification practices. That situation seems to be reversing mainly due a better understanding of the potential of food fortification technologies primarily by government authorities. The creation of ANVISA, the National Agency for Food and Drugs Surveillance, was an important improvement within the Ministry of Health infra-structure.

The Agency is designated as an autonomous agency which means that ANVISA is an independently administered, financially-autonomous regulatory agency, with security of tenure for its directors during the period of their mandates.

Although annual per capita consumption of sugar is estimated at 50 kg (55-65% being direct consumption) the industry declined to fortify sugar with vitamin A. However, annual average vegetable oil consumption is 13.31/kg per capita. The annual under 5 child death rate due to VAD in 2003 was 4224. Added vitamin A provided through oils is roughly presumed to lower the prevalence of VAD 20% which would result in 845 few deaths annually. In addition, it is estimated that 40% of Brazil's children under five years of age suffer from Subclinical Vitamin A Deficiency.

With Brazil being the second largest oilseed producer, crusher and refiner worldwide, fortification of edible oils with vitamin A would improve not only the domestic VAD situation but would have a spillover effect to those countries in LAC purchasing refined oils from Brazil.

10.35 Chile

Total Population: 16,295,000
Rural Population: 2,004,285 (12.3%)
Est. Population with access to commercially processed food: 91.8%

Chile has a market-oriented economy characterized by a high level of foreign trade. Chile continues to attract foreign direct investment, but most foreign investment goes into gas, water, electricity and mining. Unemployment has exhibited a downward trend over the past year, dropping to 7.8% at the end of 2006.

Agriculture is the main occupation of about 15% of the population and produces less than half of the domestic needs. The dependence on an adequate food supply is one of Chile's major economic issues.

Table 131: Food Industries and Trade – Chile

Agriculture - products:	Wheat, corn, oats, sugar beets
Industries:	Flour milling, edible oil processing, sugar refining, salt, rice milling
Exports - commodities:	Corn
Imports - commodities:	

Industry Summary:

- Wheat is politically Chile's most important annual crop. The milling industry is Chile's main wheat destination. An estimated 85 percent of total wheat supply (domestic production plus imports – mainly from Argentina) is milled for flour. An estimated 80 percent of wheat flour is sold directly and produced by 85 milling facilities nationwide. Industry sources indicate that the wheat produced in Chile is in general of a lower quality than that required by the bread and pasta industry. It is mainly low in protein and the quality varies a lot.
- Cargill, ADM and Bunge, all multi-nationals, are operating in the Chilean marketplace. Compañia Molinera San Cristóbal S.A. is one of the leaders in flour milling & processing with several locations throughout Chile
- Although there is significant sugar production, Chile is expected to continue buying mostly refined sugar.
- Sociedad de Punta de Lobos, S.A. (SPL Group of Companies) owns and operates the largest salt pit deposits in the world "Tarapaca Salar", in the Atacama desert. Since finalizing the purchase of the Salina Diamante Branco in Brazil and ISCO in the U.S., SPL currently produces approx. 6 million tonnes of salt. It operates 4 processing and packing plants in Chile and ships region-wide, however, due to logistics, Central America is being supplied from its location in Brazil.

- There are also several smaller producers located in Chile and producing under their own brand for the local market. For example, Sal Trinidad operates out of Tarapacá salt pits and has 3 regional processing plants.
- Chile has limited oilseed production and counts on its neighbours for supply of both oilseeds for crushing and crude vegetable oils for refining. Chile also purchases refined edible oils for their domestic market.
- Chile imports rice mainly from Thailand.

Malnutrition:

In Chile the fortification of powdered milk with various micro minerals, including iron, they were able to reduce the incidence of anemia by around 80 percent in less than three years.

Table 132: Incidence of Malnutrition – Chile

Undernourished Population 2000-2002	N/A
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	1.5% 2002
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	3%
Households Consuming Iodized Salt – UNICEF Update 2004	100% 1999
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	24.4%
Women	22.5%
Pregnant Women	28.3%

Fortification:

The only mandatory fortification of fats and oils requires that margarine be fortified with Vitamins A and D.

Table 133: Fortification Standards in Chile

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
N/A	no legislation	Enrichment with iron, thiamin, riboflavin, niacin (since 1955) and folic acid (since 2000) is mandatory	no legislation	no legislation	no legislation

Chile counts on edible oil supply from its neighbors and requesting imported oils to be fortified would encourage fortification efforts in the region.

10.36 Paraguay

Total Population: 5,904,000
Rural Population: 2,450,160 (41.5%)
Est. Population with access to commercially processed food: 72.2%

Landlocked Paraguay has a market economy marked by a large informal sector. This sector features both re-export of imported consumer goods to neighbouring countries. A large percentage of the population derives its living from agricultural activity, often on a subsistence basis. On a per capita basis, real income has stagnated at 1980 levels.

More than half of Paraguay's workers are engaged in agriculture and food processing. Paraguay's main trading partners are the fellow members of Mercosur, the United States, and European Union countries.

Table 134: Food Industries and Trade – Paraguay

Agriculture - products:	Sugarcane, soybeans, corn, wheat, cassava (tapioca), rice
Industries:	Sugar refining, flour milling, edible oil processing, rice milling, salt
Exports - commodities:	Oilseeds, edible oils, wheat flour, paddy rice
Imports - commodities:	Corn, sunflower oil

Industry Summary:

- Paraguay produces and mills a good portion of the countries wheat flour requirements.
- Paraguay is a net importer of sugar from neighbouring countries.
- Paraguay is the fourth largest soybean exporter in the world, producing about two percent of the world soybean production. The main market for Paraguay's soybeans will continue to be Argentina.

Malnutrition:

Table 135: Incidence of Malnutrition – Paraguay

Undernourished Population 2000-2002	N/A
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	10.9% 1998
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	25%
Households Consuming Iodized Salt – UNICEF Update 2004	83%

	1998
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	30.2%
Women	26.2%
Pregnant Women	39.3%

Paraguay is initiating the formulation of a national programme for food security with strong political support and financing potential.

Fortification:
Sugar is voluntarily being fortified with Vitamin A.

Table 136: Fortification Standards in Paraguay

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
Salt iodination is mandatory	no legislation		no legislation	no legislation	Sugar can be enriched with vitamin A

The National Institute of Feeding and Nutrition (INAN) are responsible for the control measures.

However, the small wheat mills (1 to 10 tons) are out of the government's control and therefore it cannot be certified that 100% of Paraguayan wheat flour is enriched.

With average vegetable oil consumption of 15 kg /capita annually, fortification efforts should be considered.

10.37 Uruguay

Total Population: 3,326,000
Rural Population: 232,820 (7.0%)
Est. Population with access to commercially processed food: 95.3%

Uruguay's well-to-do economy is characterized by an export-oriented agricultural sector, a well-educated work force, and high levels of social spending. The economy grew about 12% in 2004 as a result of high commodity prices for Uruguayan exports, a competitive peso, growth in the region, and low international interest rates, and it continued to grow nearly 7% annually in 2005 and 2006.

Uruguay remains dependent on agriculture although agricultural production accounts for only 9% of the gross domestic product (GDP), agricultural-related products make up more than half of the country's exports. The industrial sector is largely based on the transformation of agricultural products. However, crop production in Uruguay has never been as important as livestock raising. Only about 8 percent of the land area is dedicated to growing crops compared with 75 percent dedicated to livestock.

Table 137: Food Industries and Trade - Uruguay

Agriculture - products:	Rice, wheat, corn, barley
Industries:	Flour milling, rice, milling, sugar, edible oil processing
Exports - commodities:	Wheat flour, edible oil, rice (paddy & milled)
Imports - commodities:	Wheat, corn Wheat flour, edible oils

Industry Summary:

- Although Uruguay produces wheat and mills flours, it still relies on imports of wheat flour to supplement supplies.
- Industrias Harinas S.A. operates Molino San Salvador in Uruguay with a milling capacity of 12,000 tonnes monthly and is a major exporter to Argentina & Brazil. They also export wheat in bulk.
- Uruguay is a net importer of sugar from neighbouring countries.
- Uruguay continues to be a net importer of soybean oil since home grown soybean production continues to be destined almost exclusively to the export market. Since Uruguay's crushing industry is not expected to increase soybean crush in the coming year, it is likely imports of oils will continue at the current levels.
- Uruguay is the largest rice producer in the region and the 7th largest world-wide.
- SAMAN is the leading rice processor in Uruguay and has the only parboiling plant. It is an integrated operator and has a close working relationship with its producers. It is among the five companies processing the highest volume of rice - 61 tonnes per hour.

Glencore, through its subsidiaries in Argentina and Uruguay, own five rice mills with a combined annual capacity of 400,000 tonnes.

Malnutrition:

Table 138: Incidence of Malnutrition – Uruguay

Undernourished Population 2000-2002	N/A
Chronic Malnutrition in Children Under Five Years of Age Between 1995 - 2002:	7.9% 1995
Children Under Five Years of Age with Subclinical Vitamin A Deficiency – 1997	N/A
Households Consuming Iodized Salt – UNICEF Update 2004	N/A
Prevalence of Anemia – 1995-2005	
Preschool Aged Children	19.1%
Women	16.9%
Pregnant Women	27.1%

Fortification:

Table 139: Fortification Standards in Uruguay

Salt	Maize Flour	Wheat Flour	Rice	Oil	Sugar
Salt iodination is mandatory	no legislation	Enrichment with iron and folic acid is mandatory. Decree # 130/06	no legislation	no legislation	no legislation

With Uruguay being the 7th largest producer of rice world-wide and domestic consumption at 22 kg per capita annually, efforts should be made in introducing fortification.

11. Conclusions and Recommendations

11.1. Key Barriers Facing Fortification in the LAC Region

In this report we have focused on six food vehicles as potential carriers of micronutrients: wheat flour, corn flour, edible vegetable oils, rice, sugar, and salt.

In order for a food to efficiently and effectively convey a micronutrient to a population, the fortification program must be feasible from the technical, political, and cultural perspectives. A lack of feasibility from any one of these perspectives will critically damage the program and will render useless any investment made in the program. For this reason, it is necessary to critically examine the fortification options and to eliminate or postpone those options for which too many potential barriers exist at the present time.

Wheat Flour:
As we have seen in previous sections of this report, fortification of wheat flour with iron, folic acid, and a variety of vitamins is a common and often mandatory program in Latin American and Caribbean countries. The technology is well developed and capacity to implement the technology and private sector commitment abound in the region. It does, however, present some areas which are variable across the region and which could be improved. For example, the iron compounds which are used variy across the region, with some forms of iron being more bioavailable than others. Also, in some countries the per capita consumption of wheat flour is too low for the fortification to have the desired health impact. The levels of fortification folic acid have not been optimized either.

The countries where average daily per capita consumption of wheat flour products - g/p/d) are, in descending order of consumption: Guyana, Cuba, Antigua, Dominica, Belize, Neth. Antilles, Jamaica, St. Vincent, Trinidad & Tobago, St. Lucia, Uruguay, Argentina, and Chile.

Table 140: Barriers and Constraints to Wheat Flour Fortification Programs

Potential Vehicle	**Micronutrient Fortificant**	**Technical Barriers related to fortification process**	**Political and or Socio-Cultural Barriers**	**Implementation or Program- related Challenges & Considerations**
Wheat Flour	Iron + folic acid + B vitamins	None – widely practiced and accepted. Suboptimal type and concentration of iron in several countries. Folic acid levels low in some countries	No significant barriers	Heterogeneous quality control standards; hard to enforce QC with cross border trade; Low consumption in many LAC countries

(red = significant barrier; orange = consideration or challenge ; green = no significant barrier)

Corn Flour:

As detailed in various sections of this report, the fortification of corn flour with iron, folic acid and B vitamins is currently mandatory in a small handful of countries; and is set to soon become mandatory across additional countries in Central America. In the LAC region, consumption of corn flour is highest in Central America and Mexico. It is also high, and increasing, in parts of the Andes (Colombia, Venezuela, and parts of Peru). Thus corn flour fortification is an intervention that should mainly be considered for the Central America and Mexico sub-region.

Indeed, several bodies are pursuing this program as a regional intervention. The greatest barrier facing this regional initiative is the difference in production that currently exists between the traditional nixtamalized masa[60] artisanal producers and industrialized corn flour producers. The technical processes for fortifying centrally processed corn flour are well developed and relatively easy to implement. In contrast, the technical processes for fortifying wet artisanal masa corn are not well developed.

Another issue which complicates the potential effectiveness of a corn fortification program is the fact that centrally processed corn flour is largely consumed by wealthier , urban population whereas nixtamalized masa corn flour is largely consumed by the poorer, rural segments of the population who are the logical targets of a fortification program.

Table 141: Barriers and Constraints to Corn Flour Fortification Programs

Potential Vehicle	**Micronutrients in Fortificant**	**Technical Barriers related to fortification process**	**Political and or Socio-Cultural Barriers**	**Implementation or Program- related Challenges & Considerations**
Corn Flour	Iron + folic acid	Low bioavailability of most iron form due to phytate content. Process for fortification in artisanal mills not sufficiently developed	Formative research for fortification at small scale mill is lacking.	>60 % of corn consumed is not in form of flour but rather as nixtamalized masa[61] from small wet mills. Variable consumption across the region (nixtamalized in Central America & Mexico; precooked in Andes).

(red = significant barrier; orange = consideration or challenge ; green = no significant barrier)

Rice:

[60] ***Masa nixtamalera*** is nixtamalized maize dough, made from corn boiled with lime and ground in a *molino* (a mill dedicated to that purpose) or on a *metate* (flat grinding stone). Thus, it is made from wet hominy, reduced to a dough by grinding, and not from corn flour.

As detailed elsewhere in this report, the fortification of rice with iron, folic acid, and B vitamins is mandatory in Costa Rica and only recently in Panama. While the Costa Rican law allows either extruded and reconstituted rice grains or natural grains covered with a film containing the micronutrients, the Panamanian law leaves the specifications up to the discretion of the Ministry of Health. Costa Rican rice contains Selenium, iron, zinc, and B-vitamins, while the Panamanian product only considers iron and B-vitamins.

One of the constraints that hamper rice fortification is the additional cost due to fortification, which has been estimated at approximately 1.5- 2.5% of the total cost of rice. In a sustainable market situation, this would have to be passed on to the consumer; a situation which might lead to the rice not reaching a small segment of the population to whom the fortification targeted.

A second constraint which faces rice fortification programs in LAC is the scattered, non-centralized nature of rice production in the region. In most LAC countries, a significant proportion of the national production is dispersed throughout the country; and this poses evident difficulties for enforcement and quality control. Nevertheless, most Central American and Caribbean countries where rice is a staple food are net rice importers, which means that rice could be fortified along the supply chain of imported rice perhaps more easily than the nationally produced grain. Rice fortification would be most well suited for Panama, Costa Rica, Nicaragua, & most Caribbean nations where daily consumption is significant.

Table 142: Barriers and Constraints to Rice Fortification Programs

Potential Vehicle	**Micronutrient Fortificant**	**Technical Barriers related to fortification process**	**Political and or Socio-Cultural Barriers**	**Implementation or Program- related Challenges & Considerations**
Rice	Iron Folic Acid Zinc Other B-vitamins	Extrusion technology not widely disseminated; (requires high initial capital investment)		Some issues with iron retention due to washing rice before cooking; cost; non-centralized nature of rice production and distribution

(red = significant barrier; orange = consideration or challenge ; green = no significant barrier)

Vegetable Oil:

As mentioned earlier in this report, Bolivia is thus far the only Latin American country to make mandatory the fortification of oil with Vitamin A.

From an industrial perspective, the fortification of edible vegetable oil with Vitamin A is a relatively simple process that does not require significant investment in new machinery. In Bolivia, the major producers were able to incorporate Vitamin A fortification quite easily into their production routines.

One of the challenges which faces the Bolivian program, and other voluntary or prospective programs, is the unstable nature of Vitamin A, particularly when it is exposed to light. This is a real challenge because consumers, particularly high end consumers, prefer to purchase oil in transparent containers so that the product can be seen and inspected before and after purchase. In the Bolivian context, this challenge is mitigated somewhat by the fact that the poorer, rural segments of the population habitually purchase daily allotments of oil from local stores; and in the local stores the oil is warehoused in bulk, opaque containers. In any given context, this issue of Vitamin A stability and the nature of oil containers would haveto be considered in advance of an oil fortification program.

A second challenge which could hinder the success of an oil fortification program is the fact that oil, in many segments of the population, is a foodstuff whose consumption should be limited. Most Latin American societies contain a significant proportion of individuals who are over-nourished and/or obese. As a result, public health nutrition is – rightly - increasingly concerned with the promotion of healthy, balanced diets. Thus oil fortification programs have met (and will continue to meet) with organized resistance which interprets the fortification of oil as a promotion of additional oil consumption by the population at large.

Table 143: Barriers and Constraints to Vegetable Oil Fortification Programs

Potential Vehicle	**Micronutrient Fortificant**	**Technical Barriers related to fortification process**	**Political and or Socio-Cultural Barriers**	**Implementation or Program- related Challenges & Considerations**
Vegetable Oil	Vitamin A	None – fairly simple industrial process however Stability of Vitamin A is an issue	Increased consumption of oil should not be promoted for health reasons;	Stability of Vitamin A is an issue; consumers not accepting of opaque containers

(red = significant barrier; orange = consideration or challenge ; green = no significant barrier)

Sugar:

As seen elsewhere in this report, the fortification of sugar with Vitamin A is mandatory across most of Central America. The technology for fortifying sugar with Vitamin A is reasonably well developed and does not pose a barrier against such a fortification program. Conversely, the technology for fortifying sugar with iron is not sufficiently developed and currently poses the preliminary barrier against an iron-sugar fortification program.

A significant challenge which could hinder any sugar fortification program – regardless of type of fortificant – is the acceptability of sugar as a vehicle. Like oil, sugar is a controversial choice of vehicle because of its potential negative health impacts if consumed in large amounts. Sugar fortification programs have met – and will continue to meet – with organized resistance which interprets the fortification of sugar as a promotion of additional sugar consumption by the population at large.

Table 144: Barriers and Constraints to Sugar Fortification Programs

Potential Vehicle	**Micronutrient Fortificant**	**Technical Barriers related to fortification process**	**Political and or Socio-Cultural Barriers**	**Implementation or Program- related Challenges & Considerations**
Sugar	Vitamin A	None	**Increased consumption should not be promoted for health reasons**	
Sugar	Iron	Technology not sufficiently developed (NaFeEDTA & ferrochel only)		Cost effectiveness not resolved (additional cost ~15%)
Sugar	Folic Acid	**Technology still being developed, but highly feasible**		

(red = significant barrier; orange = consideration or challenge ; green = no significant barrier)

Salt:

Fortification of salt with iodine is common practice in most countries and while ongoing challenges do confront the sustainability of the effort, salt iodization is still the single most successful fortification effort in the world.

Given that iron-deficiency anemia is the most common micronutrient deficiency in LAC, the ability of salt to bring iron to Latin American populations is an extremely important

question. To date, the technology for producing double-fortified salt (DFS) has been developed and DFS is being successfully implemented as a program in India. In the context of Latin American and the Caribbean, a principal barrier to DFS is the quality of the salt produced and used in the region. The quality of salt in Central America and parts of the Caribbean (notably Haiti and Dominican Republic) is quite low: the salt crystals are large and the salt contains impurities. This is a barrier to DFS as only high quality salt can be easily fortified with the most affordable iron compounds. The option does exist to fortify lower quality salt with more expensive iron compounds; however this option in turn generates a problem of cost-effectiveness and the willingness of the market to pay substantially more for double fortified salt.

In addition, the use of salt as a vehicle for fortification raises many of the same issues as do oil and sugar. Like oil and sugar, salt is a vehicle whose use is controversial because its intake should be limited, particularly in certain segments of the population. Salt-iron fortification programs may thus have to confront resistance from sectors of society which interpret the fortification of salt as a form of promotion for additional salt consumption by the population at large.

Table 145: Barriers and Constraints to Salt Fortification Programs

Potential Vehicle	**Micronutrient Fortificant**	**Technical Barriers related to fortification process**	**Political and or Socio-Cultural Barriers**	**Implementation or Program- related Challenges & Considerations**
Salt	Iodine	None – process is sufficiently developed	No significant barriers	Multiple small producers make quality control difficult; Coarse salt fortification (Dom. Republic, Haiti) not effective due to washing of salt before culinary use.
Salt	Iodine + Iron	Process is well developed ; Salt specifications may require purity levels beyond some countries' artisan production capacity	No significant barriers	Cost effectiveness is a the key issue to be resolved for this to become market sustainable
Salt	Folic Acid	Technology still being developed		

(red = significant barrier; orange = consideration or challenge ; green = no significant barrier)

11.2 Recommendations for Promoting Food Fortification in LAC

There is a need for advocacy, strengthening of public-private sector partnerships, and transferring of lessons learned in food fortification between the sub-regions.

The Latin American and Caribbean region has a long and for the most part successful track record in food fortification with micronutrients. Significant progress in VMD control has been achieved through wheat flour, sugar and salt fortification. The virtual elimination of IDD has practically been achieved in this region with universal salt iodization. Vitamin A deficiency (VAD), on the other hand, has been effectively decreased with a combination of Vitamin A supplementation and sugar fortification in Central America, where VAD used to be a severe public health problem only two decades ago. The effectiveness of the combined approach on Vitamin A status in Central America has been heterogeneous, as impact is directly proportional to the coverage of the programs used to deliver the interventions. The current known prevalence of VAD, when weighed against the trends of obesity and overweight among women of child bearing age, does not warrant for investments in oil fortification with vitamin A in the majority of countries.

More importantly, we should focus on the sustainability of ongoing food fortification programs in the region. Sustainability will depend ultimately on the consolidation of fair and transparent public-private sector partnerships that work together to improve the nutritional and health status of the nations they serve. On the one hand there is a long recognized need to acknowledge the contribution of the food industry in VMD control as a means to motivate the continuation of their commitment. On the other hand, enforcement institutions and the organized consumer sector have still not been given the importance and necessary resources to play an effective and active role in quality control, and demand creation for fortified foods. Poor enforcement of food fortification regulations weakens the resolve of the food industry to comply. In a very real sense, for food fortification programs to improve, governance has to improve. For example, to address the basic need for capacity building in the sub region, Guatemala, El Salvador, Honduras and Nicaragua t(he CA-4 countries) have recently begun to work jointly with support from the Inter American Development Bank and the Centers for Disease Control to improve crucial program components through national micronutrient fortification committees, standard quality control, monitoring and evaluation guidelines and systems. The 5-year initiative plans to operationalize a Central American system of food fortification as a regional public good.[62] A similar approach should be encouraged and nurtured in the Andean and CARICOM sub regions.

Anemia control requires a multi-pronged approach – Now!

Anemia is the most pervasive nutritional disorder in the Latin America and Caribbean region. Based on specific nutrient deficiency data from Mexico, Nicaragua, Bolivia, Costa Rica, and Chile and the epidemiological profile of malaria, hookworm infestation

[62] http://www.iadb.org/int/redes/rpg/index.aspx?mid=50&scid=207&cid=180

and other infections in most countries, it may be inferred that at least 50% of the anemia in women of child bearing age is due to iron deficiency and probably a higher percentage among children under 5 years of age throughout the region. Children 6-23 months are most vulnerable to develop anemia and suffer from the long term consequences of constrained neurological and behavior development and of diminished physical work productivity later in life.

At the same time, children under 2 years are much less likely to benefit from iron fortification of massively consumed staples and condiments. Infants and young children require targeted fortified food interventions, such as those that have been effectively implemented in Chile, Cuba, Mexico, the USA and Canada (i.e. milk, industrially processed complementary foods, home fortification of typical complementary foods with Sprinkles-like powders).

Iron fortification of staple foods and condiments is meant to improve the iron nutritional status of older children and adults, particularly women on child bearing age. For fortification to be effective for women of child bearing age, food fortification should provide >60% and >90% of the EAR for the target group, respectively[63]. This is most likely to be achieved through provision of multiple foods fortified with bioavailable forms of iron. The countries with the highest prevalence of anemia among women of child bearing age, a group susceptible to mass food fortification interventions are Guyana, Haiti, Ecuador, Bolivia, Guatemala, and Peru. In this respect, the harmonized Central American wheat flour and corn flour fortification regulations which mandate the use of ferrous fumarate instead of elemental iron powders is an exemplary decision by the Ministries of Commerce and Health, which should be emulated. Its implementation should be carefully enforced, monitored and evaluated.

International technical & financial assistance agencies should thus jointly pursue similar sub-regional initiatives in food fortification in the Andean and CARICOM groups of nations where iron deficiency is also highly prevalent. The CA-4 and Andean countries represent two aggregations of nations that would stand to benefit from sub regional VMD prevalence surveys, a systematic approach to determining food and nutrient intake by the target population groups, fortification of multiple foods with bioavailable iron, and harmonized food fortification regulations and quality control approaches.

A multi-pronged approach to anemia requires advances in the fortification of rice, sugar, and salt with iron.

In addition to wheat and corn flours, rice, sugar and salt may be fortified with iron. The cultural and financial feasibility of applying country-specific combinations of these fortification technologies should be evaluated with particular attention to those nations with ineffective iron supplementation programs for women and persistently high anemia prevalence (>30%): Guyana (1997-8), Haiti (2006), Peru (2004), Panama (1999), Bolivia

[63] Dary O. The importance and limitations of food fortification for the management of nutritional anemias. Chapter 19. pp. 316-336. In: Nutritional Anemia. K Kraemer & MB Zimmermann (editors). Signt & Life Press. New York (2007).

(2003), Belize (1998) and perhaps Ecuador (1986). Of particularly recent development is the possibility of adding iron and other micronutrients to extruded rice flour which is then reconstituted into and marketed as a fortified rice grain premix[64]. The efficacy of iron fortified rice has been proven with school children who consumed 100 g of fortified rice daily for 2 months in India (20 mg iron/100 g rice). According to our data, with the exception of Panama, which has the highest per capita rice consumption in the region, rice consumption in Central America is low (18 kg/capita), compared to the Caribbean (48 kg/capita) and South American countries (39 kg/capita). Rice constitutes the principal staple in Ecuador, Panama, Costa Rica, Haiti, Suriname and Guyana. However, challenges that would have to be tackled include the fact that most of these countries rely in differing degrees on importation to meet their demand for rice and in most instances local production is widely dispersed throughout the territory. Fortification of rice with iron, zinc, folic acid and B-12 could then be applicable in these countries. For the Central American and Andean countries where rice is not a significant part of the daily diet, however, sugar, salt and noodles could be the only other alternative vehicles. And, given the minute amount of folic acid necessary to prevent NTDs, addition of this vitamin is highly feasible in bouillon cubes, salt and/or sugar.

There is a need to update the epidemiological data on vitamin and mineral deficiency prevalence in high burden countries.

Other than for anemia, updated data on the prevalence of VMD at the national level or in subgroups where these deficiencies tend to concentrate is scant in the region, particularly regarding the baseline situation for zinc, folic acid, and vitamin B12. Despite this lack of uniform data for every country within the region it is evident from available information that, with the notable exception of Nicaragua and Cuba, the poorest countries are also the ones with highest prevalence of VMD. Moreover, and not diminishing the significance of large population pockets in the more developed countries in this region, the countries being more severely affected by these deficiencies seem to aggregate within the Central American (CA-4) and Andean sub-regions, which facilitates the proposition and implementation of sub regional targeted approaches with resulting economies of scale in several dimensions (financial, political, cultural, etc). In this regard, a South-to-South collaboration model between prestigious public health research institutions such as the INSP in Cuernavaca, INCAP in Guatemala, INCIENSA in Costa Rica, and INTA in Santiago de Chile, private sector and governments should be pursued to accomplish the following:

1. Create sub regional technical advisory committees to work with countries in tracking progress, solving constraints to programs, and liaising with international technical groups (such as CDC, MI, A2Z, GAIN), and in transferring technologies and knowledge to others working on VMD control in other regions of the world (i.e. Africa and Asia).

[64] Moretti D, Zimmermann MB, Muthayya S, Thankachan P, Lee T-C, Kurpad AV, Hurrell RF. Extruded rice fortified with micronized ground ferric pyrophosphate reduces iron deficiency in Indian schoolchildren: a double-blind randomized controlled trial. Am J Clin Nutr 2006;84:822–9.

2. Produce nutritional modules for well established national surveys, such as the DHS (http://www.measuredhs.com/countries/start.cfm), the MICS (http://www.childinfo.org/), the LSMS (http://www.worldbank.org/LSMS/guide/select.html#table) and other national household surveys;
3. Design and implement pilot effectiveness trials for multiple fortified foods with iron in different sub regional settings (rice, salt, sugar, other cereal flours); and
4. Design, implement, and disseminate of VMD surveys and surveillance systems[65].

Zinc deficiency places significant constraints on the immune system and growth of children under 5 years of age. Zinc deficiency control saves lives and will no doubt be a key intervention to close the infant and child mortality gap between the present and the Millennium Development Mortality reduction Goal. However, targeting countries and population groups within countries is currently difficult due to the lack of information on the national prevalence of zinc deficiency. Other than estimates of risk of zinc deficiency based on dietary intake from food balance sheets and the prevalence of childhood stunting, there are no national data on the prevalence of zinc deficiency within the region, except for Mexico, where zinc deficiency (<65 µg/dL) affects 36% of children 6-24 months old, and 22% of children 25 to 59 months old.

Countries with very high prevalence of stunting (like Guatemala, Haiti and Honduras) may be the first to benefit from ascertaining the magnitude of zinc deficiency and implementing targeted interventions to revert that situation. Moreover, therapeutic and preventive zinc supplementation as well as home fortification and fortified industrially processed complementary foods containing zinc should be the first line of defense against zinc deficiency in infancy and childhood. Large scale dietary or food fortification interventions with zinc have not been adequately assessed for effectiveness, particularly for this age group, even in populations where breast feeding is optimal and zinc intake by the mother should result in higher zinc concentration in breast milk. Nonetheless, it is technically feasible to add zinc safely to cereal flours, ready to eat cereals, fluid and powdered milk.

The levels of folic acid used in wheat and corn flour need to be revised and optimized urgently. Other food vehicles for folic acid need to be added to the interventions against NTDs in the region.

Folic acid deficiency during the first 4 weeks of pregnancy results in tens of thousands of newborn and stillborn babies with congenital defects in the region, the most common of which are neural tube closure defects (NTDs). Minor cases of Spina Bifida may not result in any symptoms or disabilities while severe cases almost always do. Common

[65] See Gorstein J, Sullivan KM, Parvanta I, Begin F. Indicators and Methods for Cross-Sectional Surveys of Vitamin and Mineral Status of Populations. The Micronutrient Initiative (Ottawa) and the Centers for Disease Control and Prevention (Atlanta), May 2007. In: www.micronutrient.org/resources/publications/Indicators%20for%20Cross-Sectional%20Surveys.pdf

complications that occur in these patients may include partial or complete paralysis, hydrocephalus, bowel and bladder problems, which will require special care and significant levels of sophistication of the health and social support systems in place.

Wheat flour is already fortified with folic acid in most LAC countries and has most likely reduced the burden associated with NTDs in countries like Chile and Costa Rica.

However, wheat flour consumption is low in the countries with the higher NTDs rates: Mexico, Belize, Guatemala, El Salvador, Honduras, Nicaragua and Panama. The same holds true if one considers wheat flour as a vehicle for the rural poor in the countries with the largest absolute numbers of NTDs: Brazil (6390), Mexico (5740), Colombia (1958), Argentina (1520), Peru (1212), Venezuela (1154), and Guatemala (1023). The levels of folic acid used in wheat and corn flour need to be revised and optimized urgently. Other food vehicles for folic acid need to be added to the interventions against NTDs in the region. Fortification of other vehicles is technologically and financially feasible and should be scaled up urgently to reach the rural poor in most of these countries.

In summary….

In short, future investment in tackling VMD by any means should include sub regional strategies to:

1. Update the epidemiological data on VMD, with particular emphasis on national samples for zinc, B-12 and folate status and sub-national samples for VAD in the CA-4 countries (Guatemala, El Salvador, Honduras, and Nicaragua) and the Inter-Andean alliance countries (Colombia, Ecuador, Peru, Bolivia and Paraguay). Where applicable, accurate national estimates should be obtained for VMD prevalence in the principal indigenous groups, in women of child bearing age and in children under 5 years of age.
2. Harmonize food fortification regulations to facilitate trade and avoid weakening of food fortification programs due to (legal or illegal) introduction of unfortified commodities and products from neighboring countries and/or the perception of food fortification as a technical barrier to trade, for instance.
3. Strengthen national and border control measures to enforce food fortification laws.
4. Initiate technology transfer and pilot effectiveness trials of multiple fortified foods and condiments to tackle anemia and NTDs, paying particular attention to careful planning in line with WHO food fortification guidelines in order to secure the safety and effectiveness of potential multi-pronged interventions in the different sub regional settings.

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