SUSTAIN

SCN Working Group on Micronutrients: Information Sharing Template for 2005 and Earlier Activities

Table 1: Demographic Information

Name of Reporting Individual	***Alicia Fucile***
Institution/Organization	***SUSTAIN***
Contact address (Email)	**sustain@sustaintech.org**
Position	***Associate for Program Administration***

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Table 2: Measurement, assessment, monitoring and reporting micronutrient deficiencies

Geographic area(s) covered by this table	***Thailand, Mexico and Central America***
Project Name (if relevant)	***Efficacy of Elemental Iron Powders Used for Food Fortification***

	Micronutrients														
Activities	Iodine	Iron	Folate	Zinc	Calcium	Vit A	Vit B-12	Vit C	Vit D	Vit B-1	Vit B-2	Vit B-3	Vit B-6	Vit K	Vit E
Fortification Technology Improvement for Nutritional Impact		☑													

In January 2004, SUSTAIN and its research partners initiated a human efficacy trial to compare the efficacy of a fortified wheat-based snack containing electrolytic iron, hydrogen-reduced iron, or ferrous sulfate monohydrate in improving iron status in Thai women with low iron stores. This efficacy study was the final phase of a collaborative evaluation of iron powder efficacy carried out by SUSTAIN. In 2005, the feeding trials were complete and a report on the trial was published in the American Journal of Clinical Nutrition.

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Table 3: Food Fortification

	Micronutrients														
	Iodine	Iron	Folate	Zinc	Calcium	Vit A	Vit B-12	Vit C	Vit D	Vit B-1	Vit B-2	Vit B-3	Vit B-6	Vit K	Vit E
A. Food Aid Quality Enhancement Project															
Commodities															
Wheat	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑		☑
Maize	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑		☑
Cooking Oil						☑									
Complementary foods	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑		☑
Milk (As part of Corn Soy Milk, Instant Corn Soy Milk, & Wheat Soy Milk)	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑		☑
Soy	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑		☑
Bulgur		☑			☑	☑				☑	☑	☑			
Sorghum		☑			☑	☑				☑	☑	☑			
Activities															
Improving Delivery of Micronutrients in Fortified Products															
Strengthening Quality Assurance/ Quality Control															
Stimulating Industry Innovation															

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Table 3: Food Fortification

SUSTAIN is currently implementing a project to enhance the quality and nutrient profile of food aid sent overseas through the U.S. government's Food for Peace program (PL 480). This project addresses issues related to each of the micronutrients and commodities marked above. The two primary objectives for this project are to strengthen food aid commodity quality control and assurance systems, and identify nutritional and functional parameters for commodity reformulations/new products that better address the needs of today's food aid recipients.

As part of this effort we will be evaluating the fortified and blended commodities that were initially designed as complementary foods, but whose use has extended to other vulnerable groups, such as people living with HIV/AIDS, refugees, and pregnant and lactating women. Additionally SUSTAIN and its team of technical specialists and advisors are working on collaborating with stakeholder agencies to identify aspects of the commodity manufacture, procurement and distribution system that could be improved to enhance product quality.

One example of this collaboration on quality systems is our work to address problems with the multiplicity and precision of analytical methods used to test product compliance to specifications. Many labs have encountered accuracy and precision problems with vitamin A assays (a marker vitamin to assure correct addition of the vitamin premix), resulting in highly variable results from single samples. To improve the accuracy and execution of vitamin A analytical methods, SUSTAIN is conducting a round robin study of vitamin A assays and evaluating options for improving precision. Additionally we are assessing the effects of common preparation and cooking practices on the stability of micronutrients in these basic food staples. And we are assessing how the basic staples distributed in overseas relief efforts can be better formulated to meet the needs of targeted vulnerable groups.

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Table 3 (continued) Food Fortification:

	Micronutrients														
	Iodine	Iron	Folate	Zinc	Calcium	Vit A	Vit B-12	Vit C	Vit D	Vit B-1	Vit B-2	Vit B-3	Vit B-6	Vit K	Vit E
B. Tortilla Project: Mexico & Central America															
Activities															
Fortification & Dosification Technology Development		☑	☑	☑						☑	☑	☑			
Quality Assurance/ Quality Control		☑	☑	☑						☑	☑	☑			
Stimulating Industry Innovation		☑	☑	☑						☑	☑	☑			

SUSTAIN has provided technical support in Latin America to advance the fortification of corn masa flour, a convenience product used to manufacture tortillas, a major staple food in the region. As an extension to this project, SUSTAIN is now focused on addressing technical barriers to the fortification of tortillas manufactured from fresh masa (dough) via nixtamalization, a mechanized process developed by ancient Mayan and Aztec civilizations, that accounts for two thirds of the Mexican tortilla market. This project is focused on addressing technical barriers to masa tortilla fortification through the evaluation of liquid and dry premix options, research on nutrient and organoleptic analyses of tortillas fortified in the laboratory, the development of micronutrient dosing systems for scale-up trials in tortilla mills, and assessing product acceptability.

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Table 3 (continued) Food Fortification:

	Micronutrients															
	Iodine	Iron	Folate	Zinc	Calcium	Vit A	Vit B-12	Vit C	Vit D	Vit B-1	Vit B-2	Vit B-3	Vit B-6	Vit K	Vit E
C. Iron Enhancing Technologies																
Activities																
Fortification Technology		☑														
Improvement/Development		☑														
Stimulating Industry Innovation		☑														

The objective of SUSTAIN's iron enhancer activity was to assess the nutritional impact and commercial potential of ingredient technologies to enhance iron absorption in milled grain products and other food staples. In November 2004, SUSTAIN published scientific papers on five iron enhancing technologies: 1) sodium iron EDTA, 2) amino acid chelates, 3) encapsulated iron compounds, 4) phytate degradation, and 5) ascorbic acid. These papers stemmed from a SUSTAIN hosted a workshop in Washington DC in March 2003. A summary of workshop and other expert consensus on the iron enhancing technologies was also published in a Task Force Report, "Enhancing the Absorption of Fortification Iron," along with the scientific papers on each technology. The report summarizes key issues associated with each enhancer as well as consensus recommendations about appropriate food vehicles for each enhancing technology. In addition, a cost analysis model was developed and published in the same issue (INVNR, Vol. 74, No. 6).

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Table 3 (continued) Food Fortification:

	Micronutrients														
	Iodine	Iron	Folate	Zinc	Calcium	Vit A	Vit B-12	Vit C	Vit D	Vit B-1	Vit B-2	Vit B-3	Vit B-6	Vit K	Vit E
D. Evaluation of the Bioavailability of Elemental Iron Powders Used for Food Fortification															
Activities															
Fortification Monitoring and Evaluation		☑													
Quality Assurance/ Quality Control		☑													
Stimulating Industry Innovation		☑													

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Table 3 (continued) Food Fortification:

SUSTAIN and its research partners developed the Elemental Iron Powder project to evaluate the bioavailability of elemental iron powder fortificants in commercial use worldwide relative to ferrous sulfate (the standard most commonly used in iron bioavailability studies). SUSTAIN assembled a pool of all commercial elemental iron fortificants (available at the start of this project) allocated to the five different powder types based on production method for screening studies (phase I) and a human efficacy study in Thailand (phase II). In this project, SUSTAIN also assessed bioavailability screening methods developed to date. Results for the full suite of SUSTAIN's iron powder studies will be reported in a peer-reviewed journal in early 2006.

As part of this project, SUSTAIN also provided iron powder from its sample pool for human studies in China (Institute of Nutrition and Food Safety – CDC China in collaboration with ILSI) and for USDA (ARS Grand Forks - Human Nutrition Research Center). The feeding intervention for the China study was conducted among anemic school children in Nanyang City (Hunan Province). The USDA study was designed to assess whether the bioavailability of commercial elemental iron powders could be estimated by an isotope displacement method.

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Table 7: Any **other activities** associated with each micronutrient(s) that you/your organization are working on:

	Micronutrients														
Activities	Iodine	Iron	Folate	Zinc	Calcium	Vit A	Vit B-12	Vit C	Vit D	Vit B-1	Vit B-2	Vit B-3	Vit B-6	Vit K	Vit E
Operational Research		☑													

Development of SUSTAIN dissolution method to predict the bioavailability of iron foritifcants: Data on human absorption of iron fortificants is difficult, expensive, and time-consuming to generate. Consequently, there is a critical need for a rapid, affordable, and replicable bioavailability screen that can accurately predict how well iron fortificants are likely to be absorbed from fortified food staples. Based on the findings from our Elemental Iron Powders studies, we developed a rapid laboratory screen for distinguishing potentially effective iron food fortificants from products unlikely to be adequately bioavailable. Preliminary data indicated that SUSTAIN's dissolution test appears to have the potential to help identify optimal products and would also have applications in manufacturing quality control.

Use of stable iron isotopes to evaluate the bioavailability of elemental irons: Radioactive and stable isotopes are frequently used in applied nutrition studies as tracers to measure the absorption of minerals and trace elements in the human body. These isotopes have been used successfully to evaluate the bioavailability of soluble forms of iron fortificants, such as ferrous sulfate. Isotopes have also been used to evaluate the bioavailability of elemental irons, but questions have been raised about this application, as the isotopes are physically different from the commercial forms of poorly soluble iron they are used to assess. These differences (in particle size, shape, porosity and surface area) could potentially lead to differential absorption rates. Using

scanning electron microscopy, SUSTAIN explored how stable iron isotopes may differ from commercial powders. SUSTAIN's findings suggest that results obtained from stable isotope studies which measure the absorption of elemental iron powders should be interpreted cautiously. SUSTAIN is currently in the process of composing a short article for submission to a peer-reviewed scientific journal on our findings.