Cost and Economic Benefit Training Workshop Report

Dar es Salaam, Tanzania
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The pace of real gross domestic product (GDP) in Africa has doubled in the last decade, and six of the world's fastest growing economies are on the continent. Expanding economies and increasing agricultural production mean wider access to food - and consequently many indicators of malnutrition are falling throughout the continent. However, prevalence of vitamin and mineral deficiency remain stubbornly high – often affecting more than half the population. These deficiencies contribute to maternal and neonatal mortality, add significant caseloads to health care systems and prevent significant segments of children and adults from reaching their full productive potential – as students, workers, parents and citizens. Achieving reductions in the prevalence of these micronutrient deficiencies will not only reduce the current national burden but also generate human capital to fuel future economic growth.

Africa's growing milling sector and expanding food markets offer an opportunity to reach a wide range of at-risk African consumers with fortified grain staples, such as wheat and maize flour, which will add key vitamins and minerals to the daily diet. Though food fortification is largely possible because of commitments by food companies, political leaders create an enabling policy and business environment. The moral imperative to protect the health and survival of citizens remains a powerful message to political leaders.

Advocacy based on national economic development has emerged as a very effective channel to secure national policy support for fortification. To accelerate the development of food fortification programs, Smarter Futures, a partnership for Africa of the Flour Fortification Initiative (FFI), Helen Keller International (HKI), the International Federation for Spina Bifida and Hydrocephalus (IF), AkzoNobel, organized a workshop to equip national champions with the tools to make the economic case for wheat flour fortification.

Country Delegations:
Eight country teams, representing Ethiopia, Kenya, Malawi, Mozambique, Rwanda, Tanzania, Uganda, and Zimbabwe, participated in the workshop. Delegates came from government ministries, milling companies and international organizations. The full list of participants is available here.

Workshop Program Overview:
An excel-based modeling tool was designed to provide a standard, user-friendly framework for country teams to develop national benefit-cost projections for flour fortification. The tool synthesizes global evidence on the function impacts of anemia as well as iron, vitamin A and folic acid deficiencies with national data on prevalence of

micronutrient deficiencies, mortality rates and other public health data to project the baseline human and economic consequences of these vitamin and mineral deficiencies: or the "cost of doing nothing." Additionally, the tool blends evidence of global wheat flour fortification effectiveness with data on national flour consumption milling industry structure and costs; global prices of fortification inputs such as fortificant premix; and any pre-existing or proposed fortification standards to estimate the benefit-cost ratio of wheat flour fortification. Prior to the workshop, participant teams were provided with a list of national indicators required to drive calculations imbedded in the excel tool. At the event, plenary sessions introduced the general concepts and principles, but the majority of time was spent working as national teams to reach consensus on data inputs for the tool and to develop national estimates for the economic impact of micronutrient deficiencies along with the coverage, effectiveness and of flour fortification. The framework of the excel tool guided participants step-by-step through numerous exercises, which ultimately led to the realization of the benefit-cost ratio projections. At the end of the workshop, each country gave a short presentation about the findings of their work.

The subsequent sections of the report describe the plenary sessions, the country presentations and next steps. A locked version of the modeling tool has been filled with data from an imaginary, non-existent country called "Fortifitopia" for those who would like to see how the spreadsheet works. An unlocked version can be adapted on a country-by-country basis using specific directions. See the last paragraph of the summary here for links to the materials to download.

Day 1

Opening Ceremony

The workshop commenced with brief welcoming addresses from representatives of Smarter Futures partners, (Anna Verster, Senior Advisor, Smarter Futures; Lieven Bauwens, Secretary General, IF; Scott Montgomery, Executive Director, FFI and Marjon Tuinsma, Country Director Tanzania, HKI)

The workshop was officially opened by Dr Donan Mmbando, Acting Permanent Secretary/Chief Medical Officer, Ministry of Health and Social Welfare, United Republic of Tanzania, on behalf of the Minister who was attending to other state matters at the time of the event.

A word of thanks was given to the Minister's representative by Abdulhakim Bayakub, Chairman, and Rajabu Ismail, Student Ambassador, of the Tanzanian Spina Bifida and Hydrocephalus Association (ASBAHT). A framed copy of IF's 2012 photography contest winner was given to the Minister's representative as a token of appreciation.

Following the official opening of the workshop, roundtable introductions were made by participants and facilitators. The workshop agenda was introduced as a working document for the training sessions.

Workshop Introduction

Jack Bagriansky, consultant for Smarter Futures, opened the workshop plenary sessions with an introduction to the economic analysis of micronutrient deficiencies. He reviewed the reasons why countries should invest in nutrition but also noted that the consequences of nutrient deficiencies are not typically visible until the severe clinical stages. Given the invisible burden, it is difficult for advocates of nutrition-based initiatives to raise awareness and secure support from policy makers, industries and donors. One way to make the invisible burden visible is by modeling the "cost of doing nothing" and comparing that to the benefits of acting to reduce nutrient deficiencies. Based on the cost of the intervention (i.e. flour fortification) and the benefits of the intervention (i.e. the savings measured in the reduced burden) a benefit-cost ratio can be can be derived. This is a simple and easily understood number, which underscores the cost-effectiveness and national development impacts of flour fortification. The ratio sends a valuable message that strengthens the argument for implementing a national flour fortification program.

Assuming the environment is favorable, flour fortification has several strategic advantages within a comprehensive portfolio of interventions to reduce micronutrient deficiencies: it builds on existing industry infrastructure, requires no consumer behavior changes, is relatively low-cost and frees up public spending to focus on the most vulnerable populations. Planning for a national flour fortification program should include a feasibility assessment, taking into consideration the prevalence and distribution of micronutrient efficiencies, the market reach of to-be fortified products, consumer consumption patterns and the level of potential public health impact.

Thinking globally does not always result in acting locally. Jack noted that translating global evidence on the burden of micronutrient deficiencies and the potential benefits of fortification directly into national action is typically problematic if country leaders do not first have a local-level understanding of the problem and potential solutions. Therefore, the modeling tool applies global evidence to local health, industry and consumer data through the following components to derive the benefit-cost ratio:

- Calculation of baseline human and economic losses due to iron, folic acid and vitamin A deficiencies
- Estimation of fortified flour consumption and potential coverage
- Preparation of a fortification profile including selection and level of fortificants based on the World Health Organization's (WHO) recommendations for wheat flour fortification.
- Projection of the potential prevalence reductions in micronutrient deficiencies

and associated human and economic benefits that would likely be achieved through a flour fortification program, based on global evidence.
- Estimation of fortification costs to the milling industry and government based on the selected fortification profile.

The Burden of Micronutrient Deficiencies

Scott Montgomery spoke about the health and economic burden of micronutrient deficiencies and one very practical option for addressing the problem, wheat flour fortification. Vitamins and minerals deficiencies are associated with more than 1/3 of deaths among children under 5 and to stunting of nearly 200 million children in the same age group. Anemia contributes to 20% of maternal deaths, and iron deficiency is the most common cause of anemia. The weakness and fatigue associated with anemia leads to measurably lower productivity in adults. Every year an estimated 300,000 neural tube defects (NTDs) occur, leading to death or lifelong disability. The majority of these cases could be prevented if women of childbearing age had optimum folate levels at the time of conception. Vitamin A deficiency (VAD) significantly increases the risk of severe illness or death from infection and diarrheal disease and is the leading cause of preventable childhood blindness.

Wheat flour fortification, Scott noted, is a technically straightforward and cost-effective option for addressing micronutrient deficiencies. Iron and folic acid are commonly added to wheat flour. Vitamin A can be included as a fortificant too, but is more often added to vegetable oil or sugar. FFI is a partnership of individuals representing the public, private and civic sectors, which supports fortification of industrially milled cereal grains worldwide. As of December 2013, 78 countries had legislation for mandatory fortification of wheat flour with at least iron and/or folic acid.

Introduction to Working Group Session 1: Estimating the Economic Burden of Iron Deficiency Anemia (IDA), VAD and Folic Acid Deficiency

Prior to each working group session, an introductory presentation was shared to explain new concepts and facilitate discussions. This initial session, given by Jack, guided country teams in estimating the economic burden of nutrient deficiencies. The pathways to economic loss are mortality caused by maternal IDA, maternal folic acid deficiency and VAD in children, lost future earnings of children due to IDA, impact of IDA on adult productivity and excess healthcare costs.

Scientific literature has established coefficients of health risks and performance deficits related to nutrition indicators, which when applied to national statistics, enable projections about the magnitude of loss if the status quo is maintained. For example (**Figure 1**), the national prevalence of VAD in children and the global evidence for the relative risk of mortality in children with VAD are used to derive a Population Attributable Risk (PAR). This PAR is applied to national data on the overall deaths in the

at-risk group to project mortality expected from current rates of VAD. In this case, with 22.3% of children with VAD, a PAR of 6.6% is calculated and applied to the nearly 6,000 deaths of children 6-59 months to project that 392 children annually may die as a consequence of their VAD.

Figure 1:

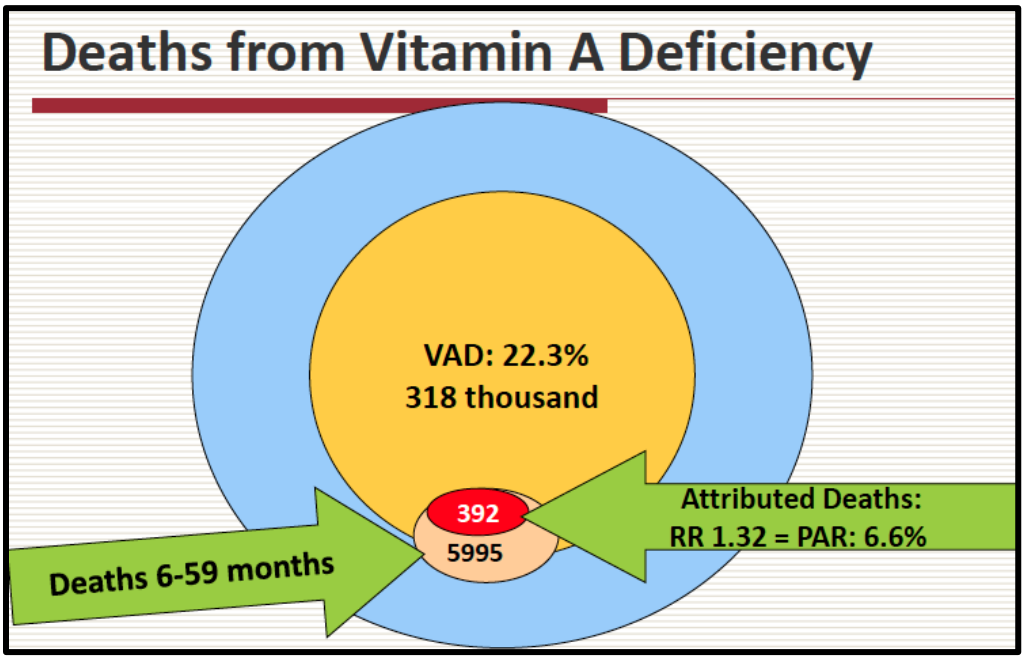


Figure created by Jack Bagriansky

In the modeling exercise, the value of life is translated into economic terms, i.e. lost wages. If countries do not have an official average annual wage available, it is calculated using national GDP and the GDP per working person (economically active adult). To determine the net present value of future productivity losses due to micronutrient deficiencies, a discount rate of 3% is utilized.

Africa Network Event-Smarter Futures

At the end of the first day, everyone gathered for beverages and a light meal on the veranda overlooking the bay. This provided a chance for country teams and facilitators to mingle with one another. Special thanks were given to stakeholders in Tanzania who spearheaded the food fortification program in that country. Additionally, Scott, Lieven and Mawuli Sablah (HKI) spoke about the Smarter Futures partnership and related 2014 activities. Please click here to view more about this event.

Day 2

Evidence for Effectiveness-Wheat Flour Fortification

Ronald Afidra, Africa Network Coordinator for FFI, started the second day with a presentation elucidating the contribution of wheat flour fortified with iron, folic acid and

vitamin A to the reduction of IDA, neural tube defects (NTDs) and VAD in multiple population groups. To substantiate his main points, Ronald utilized the findings of effectiveness studies and national program evaluations from around the world. This evidence points toward the consistent benefits of folic acid fortification at improving folate levels and reducing the prevalence of NTDs. In terms of iron, nine of 11 subgroups that consumed iron-fortified wheat flour had increased serum ferritin levels. Evidence indicating that flour fortified with multiple micronutrients addresses anemia is not as strong. Using hemoglobin as the biomarker, only about half of the subgroups showed significant improvements in anemia. However, these studies did not correct for the fact that anemia may have been caused by something other than dietary deficiencies in iron. WHO estimates that globally about half of all anemia is a result of malaria, parasites, HIV and other micronutrient deficiencies. In these cases, other interventions are necessary because iron cannot prevent or cure anemia caused by other micronutrient deficiencies or non-dietary causes. Very few countries fortify flour with vitamin A at the present time, making it difficult to find effectiveness evidence. A study conducted in Darjeeling, India, found that the prevalence of VAD decreased by 5% in pregnant women, 15% in pre-school children, 46% in school-age children and 58% in adolescent girls after flour fortification was launched.

Measuring Consumption of Wheat Flour

The WHO Recommendations for Wheat and Maize Flour Fortification take into account average wheat flour consumption (g/capita/day) to derive the amount and type of each fortificant to add during the fortification process. Celeste Sununtnasuk, from the International Food Policy Research Institute (IFPRI), provided participants with an overview of possible methods for measuring the consumption of wheat flour, including their strengths and weaknesses. The options covered included: 24-hour food recall, food frequency questionnaires, fortification rapid assessment tool (FRAT), household consumption and expenditure surveys (HCES), food balance sheets and industry data. The 24-hour food recall is the most labor intensive and expensive but is often considered the "gold-standard" for consumption data by nutritionists. At the other end, food balance sheets are easily accessible on the website of the Food and Agriculture Organization of the United Nations (FAO) for no cost. However, they provide supply data for wheat as grain, rather than for wheat flour. Also, per capita supply of wheat is based on the entire population rather than just those who consume the product.

Given that maize still dominates the staple grain portfolio of many African countries, only certain population groups consume wheat flour-based products. Celeste pointed out that for fortification programs to be most effective, stakeholders should set fortificant levels based on a *conditional consumption estimate*. This is the amount of wheat flour consumed on a daily basis by consumers as opposed to an *unconditional consumption estimate*, which is derived using the entire population of a country (like the FAO food balance sheets).

Introduction to Working Group Session 2: Estimating Consumption, Coverage and Setting Fortifcant Levels

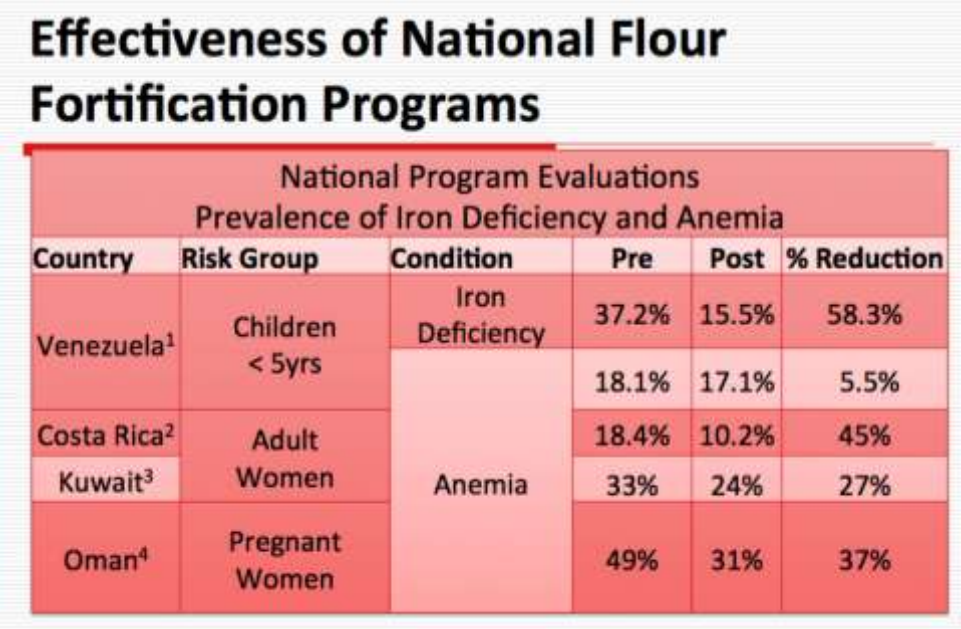
This next presentation prepared participants to estimate wheat flour consumption, approximate the potential coverage of fortified wheat flour and set fortificant levels based on the nutrient needs of their populations. Celeste suggested that HCES are a great source of country-specific information. They are statistically representative at the national and generally at the sub-regional level too, often have detailed findings on food acquisition and are available for many African countries. HCES questionnaires, reports and/or datasets are accessible (some may require fee) through the International Household Survey Network (www.ihsn.org). HCES are typically updated every 3-5 years and can help countries understand dietary patterns, key food sources, regional dietary variations, food security, and food markets. In this way, they enable fortification stakeholders to design and estimate the potential impact of a food fortification initiative alone or in conjunction with other nutrition activities.

The WHO Recommendations, issued in 2009, are suggested for use when setting the standard for the addition of micronutrients to wheat flour. They were derived from scientific reviews and expert discussions that took place at a technical workshop on flour fortification in Atlanta, Georgia (USA) in 2008. Celeste noted that the micronutrient levels proposed in the WHO Recommendations are based on a scenario that involves wheat flour as the sole vehicle for fortification and countries may decide to adjust them if multiple products containing the same nutrient are expected to reach the same population. In countries where consumers do not eat at least 75 g/capita/day of wheat flour, other fortificant vehicles may be considered to achieve the desired public health impact.

Introduction to Working Group 3: Fortification Profile, Nutrition Projection and Objective for Impact

The impact of fortification with selected micronutrients was introduced by Jack. At this time, participants were asked to set an effectiveness estimate, essentially a well-informed projection or “educated guess" for reduction in prevalence of micronutrient deficiencies that might be expected as a result of flour fortification. He noted that this estimate involves some risk-taking because the evidence for impact from food or market-based interventions is much more complex than that of clinical health interventions like vaccines, pharmaceutical supplements or other medical treatments. Thus, it requires critical thinking about the nutrient needs of the consuming population, the quantity of nutrients to be added and a willingness to adapt the evidence available from global studies to national conditions. The results from studies in Kuwait, Costa Rica, Oman and Venezuela were provided as guidance for anemia and iron-deficiency (**Figure 2**).

Figure 2:



1. Micronutrient Initiative. 1998. Food Fortification to End Micronutrient Malnutrition: Symposium Report.
2. Micronutrient Initiative. Success of the Micronutrient Fortification of Cereal Flours in Venezuela.
2. Personal correspondence, Dr. Reynaldo Martorell, Emory University, December 2013.
3. Personal correspondence, Dr. Nawal Al-Hamad, Kuwait Nutrition Department, April, 2011.
4. Personal correspondence, Ms. Deena Alasfoor, Oman Ministry of Health, August, 2011.

Day 3

Components of Choice: Government and Mill Costs of Fortification

Quentin Johnson gave an overview of financial inputs required by flour mills and governments engaged in flour fortification to help participants complete the fortification-cost sections of the modeling tool. At the start-up phase, the primary costs include staff training, the purchase of feeders and their installation, and premix procurement and distribution. The later will be the predominant cost of a fortification program. In most cases, premix is procured by the industry, and the costs are passed on to the consumer. The annual per capita cost fluctuates based on the amount of flour consumed as well as the types and levels of vitamins and minerals added to the flour: an estimated $0.10 in Canada[1] and $0.27 in Jordan[2]. The fortification program in our imaginary country of "Fortifitopia" costs each wheat flour customer approximately $0.10 per year based on data used to populate the modeling tool. Some governments reduce or exempt premix imports from taxes and duties to show support for the program. In

[1] Meeting with President of Canadian National Millers Association and delegation from Armenia, October 2013.

[2] Wirth JP, Nichols E and Mas'd H. External Mill Monitoring of Wheat Flour Fortification Programs: An approach for Program Managers Using Experiences from Jordan. Nutrients 2013;5(11):4741-4759.

terms of mill operations, the costs are related to labor, quality assurance spot tests and incremental packaging costs. Governments need to invest in monitoring and regulation, including mill inspections, sample analyses as well as occasional enforcement, market surveillance and the addition of fortification-based modules to national surveys. These costs usually represent a small fraction of over-all fortification costs.

Introduction to Working Group 4: Estimating Costs and Considering Benefit-cost Ratio
In his introduction to the final working group session, Jack reiterated the expenses related to fortification: premix (based on levels utilized when considering the effectiveness estimate), start-up and recurring mill operation costs, and financial input related to government regulation, inspection, communication and monitoring. After this information is added to the cells, a benefit-cost ratio formulates automatically taking into consideration all inputs and previous calculations.

The modeling tool looks at costs and benefits over a 10-year period. It assumes an estimated 6 months to train mill staff and food inspectors and procure initial premix, meaning there are costs but no benefits since no fortification is happening during that time. Additionally, the tool assumes that it will take 12 months to realize the health benefits once regular consumption of fortified flour begins. Thus, no financial benefits are projected during the first year of the program. In the second year, the return will only reach half of the program's potential. Full benefits follow for years three through nine. Given that benefits are returned the year after inputs are provided, there are no benefits shown in year 10 (because those will not be realized, in theory, until the following year).

Day 4
Country Presentations
As a culmination of all the hard work conducted throughout the week, country teams were asked to give a 10-15 minute presentation explaining their data and findings. This exercise required participants to advance their understanding beyond the numbers in order to thoroughly understand the calculations of the modeling tool. In doing so, they became more comfortable with the results and stronger advocates for wheat flour fortification. After the conclusion of each talk, the facilitators raised questions to get the speakers thinking about what might be asked of them at home by industry and/or ministry representatives. Comments were also provided by the general audience. Though the analysis tool places a heavy emphasis on finances, participants were encouraged to keep the human side of fortification in focus when advocating for fortification.

The benefit-cost ratios ranged from 5 to 15, suggesting considerable benefits for every one dollar spent on fortification. The range of benefit-cost ratios reflects the varying prevalence of micronutrient deficiencies as well as different national health, economic

and labor environments. Most country teams expressed a desire to review the data with other stakeholders for verification purposes prior to announcing a final benefit-cost ratio. The presentations of all country teams were shared with participants but will not be available online for this reason.

Day 5

Reflection

The last morning of the workshop, country delegates and facilitators were asked to speak about what they learned from this experience. Here is a sampling of what was shared (paraphrased):

Mozambique-The spreadsheet was not so easy, but taking it step by step was helpful. Previously in Mozambique, the focus was on food security, but now we know it is important to also be aware of the nutritional value of what is being given, i.e. nutrition security. When we return to our country, we will work on this further together with people who have additional information and then use this for advocacy purposes. At this workshop, we have representatives from diverse sectors, so now it will be easier to push for the initiative. People are aware and can act as leaders in their specific sectors.

Ethiopia-This experience has helped me as a nutritionist to better grasp the economic side of fortification, which will make my story and advocacy efforts better.

Zimbabwe-We came here as nutritionists and task force representatives, but now we leave with an understanding of economics and the budget for fortification. We can calculate the data. The tool will be very helpful for us in the country. Some of the data are still incomplete, but when we go back we can fill in the gaps by talking with other sectors and pulling data from new surveys. The workshop was helpful and it came at the right time.

Other comments:

Given that you need milling data to do the benefit-cost analysis, the tool also helps you practically plan for the fortification program. You have to know the industry landscape before starting the program.

The results may be useful for speaking with donors-convincing them that fortification programming is a good investment. And after donor funding runs out, the results can be used to reiterate to the government that fortification remains a worthwhile use of money.

Conclusion

Based on a workshop evaluation completed by participants, the event was highly successful in terms of being relevant and informative. All the sessions received positive

reviews, but country teams found the hands-on element of the workshop especially educative and engaging. Most noted that they would utilize the modeling tool and their country-specific presentations to further promote wheat flour fortification upon returning home.

Of the countries represented at the workshop, Uganda, Tanzania and Kenya had already passed mandatory wheat flour fortification legislation and standards and launched their programs. For these countries, the results of this modeling tool may be used to reconfirm those of previous analyses, as was the case for Tanzania, or to advocate for the continuation of flour fortification after donor funding has concluded. The remaining countries, Ethiopia, Malawi, Mozambique, Rwanda and Zimbabwe had yet to fully mandate wheat flour fortification at the time of the workshop. This modeling tool will be especially useful for stakeholders working to advance fortification in those countries. To assist with such efforts, Smarter Futures representatives and partners are available for follow-up with participants and additional stakeholders. The Smarter Futures Work Plan for 2014 includes proposed country visits that can be utilized for such follow-up. Given the success of this event, a similar workshop is being planned in Francophone African countries for 2014. Tweaking the spreadsheet for use with other fortificant vehicles, such as maize, or to include different fortificants, will be explored.