REGIONAL TRAINING WORKSHOP ON QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC) FOR FLOUR FORTIFICATION

Makerere University, Kampala, Uganda, May 2016

Venue: School of Food Technology, Nutrition and Bio-Engineering

Supported by

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INTRODUCTION

Many countries in Africa are implementing (mandatory) maize and wheat flour fortification or are considering the adoption of this intervention at their national level. The success of the fortification programme hinges on industry participation and good quality assurance and quality monitoring systems by which the private and public sectors collaborate to produce quality-fortified food that ensures that the consumers get all the nutrients they are supposed to get from the food. The need for a smart partnership and collaboration between government, industry, academia and the civil society is imperative for each has a key role to play in the success of food fortification and the fight against malnutrition.

To foster these smart partnerships and ensure effective quality assurance and quality control, training on quality assurance and quality control, based on the WHO and FAO *Guidelines on Food Fortification with Micronutrients* (*2006*) is an essential requirement for countries that are implementing or planning to embark on flour fortification. Since 2009, Smarter Futures, a Partnership for Africa of FFI, The International Federation for Spina Bifida and Hydrocephalus (IFSBH), AkzoNobel, Helen Keller International (HKI) with co-financing from the Dutch Government has offered technical training in quality assurance and quality control of fortification programmes for millers, food control regulatory personnel and public health laboratory personnel from countries in Africa. Such Regional Training workshops have been held in Senegal (Dakar, 2009), Tanzania (Dar Es Salaam, 2011), Morocco (Casablanca, 2014) and Zimbabwe (Harare, 2015).

The QA/QC concept has been proven to be very effective and is the basis for this year's meeting in Kampala, Uganda. A novelty this year is the presence of a group participants from academic partners (students and lecturers) from the target countries supported by project funding of VLIR-UOS (Belgian development cooperation) and Ghent University. This support allows to enhance contacts between research institutions and industry/government in the target countries and to raise the new generation of fortification experts in Africa.

OBJECTIVE OF THE WORKSHOP

The overall objective of the Training on Quality Assurance and Quality Control in Flour Fortification was to provide training to those that have been identified by the national stakeholders in countries in Central and Eastern Africa (government food control officials, regulatory inspectors, milling industry personnel, academia) as responsible for the key components in the national maize and wheat flour fortification programme.

EXPECTED OUTPUTS

The workshop expected to achieve the following outputs by the end of the training sessions:

- Maize and wheat flour millers will have increased capacity and commitment to implement adequate quality control and quality assurance systems in order to consistently produce a safe and quality product that meets national standards and specifications.
- Regulatory authorities will have increased capacity and commitment to monitor fortified food production in an effective, efficient and sustainable way. For most countries this is expected to include a greater emphasis on monitoring the quality and safety of premix/fortificant, production/fortification and internal quality assurance systems and the fortified food at production level as opposed to market and retail level surveys.
- An improved dialogue between maize and wheat flour millers, government authorities and universities; and an improved understanding of requirements, roles and responsibilities of the national stakeholders.
- Documentation of existing national regulatory monitoring systems and practices and proposals for improvement from selected countries
- Those trained in the workshop will provide training on the components of national flour fortification programmes for other personnel and employees in their respective countries and stakeholder organizations.

WORKSHOP FORMAT

The meeting followed the WHO/FAO schematic for regulatory monitoring as published in the WHO and FAO Guidelines on Food Fortification with Micronutrients, 2006. The workshop was separated into sessions covering (i) food fortification legislation, regulations and standards, (ii) internal monitoring, and (iii) external and commercial monitoring. There were presentations by international experts, and national experts from participating countries. There was a day set aside for practical exposure and training on fortification of both maize and wheat flour at Bhakresa Mills and the Ugandan National Bureau of Standards (UNBS). Participants then worked in groups by background and area of interest before reconvening into their respective countries to prepare a presentation on the inventory of what is currently available in their countries and develop recommendations and next steps which were then presented on the last day of the meeting. The academic group (students and lecturers) had some additional days of training in which they had to perform a group task with a more in depth evaluation of the fortification status of their country.

PARTICIPANTS

Participants to the workshop were drawn from the region with the following countries being represented: Uganda, Burundi, Rwanda, Kenia, Mozambique, Tanzania, South-Sudan, Kenya, Zambia. The countries were represented by their food industry, universities, government nutrition and regulatory monitoring staff from Ministries of Health, and Trade and Industry. The following is a summary of attendance of workshop:

Facilitators	9
Participants (government/industry)	32
Participants (academia)	21
Partners	17
TOTAL	79

See the agenda. On this website, all presentations are in linked in the order that they were presented during the workshop.

QA/QC MEETING SUMMARY

Day 1, Registration, Welcome and Introductions

Registration of participants was being done as they arrived and they were also provided with their workshop package which included a programme, notepad, pen and a small bag from one of the partners.

Anna Verster, Ronald Afidra and prof. Achileo Kaaya opened the workshop and launched a welcome statement on behalf of Smarter Futures, the organizing committee and the supporting organizations. All facilitators, partners and participants introduced themselves. Pre-test questionnaires were handed out to participants to get a view on the current knowledge of the participants and their expectations towards the training. A total of 18 countries were represented in the workshop, either through country teams or through partner organisations and the facilitator team.

Official Opening:

The participants were welcomed by Ronald Afidra and Anna Verster on behalf of Smarter Futures, the organizers. Filip van Bockstaele spoke on behalf of VLIRUOS and the University of Gent, Belgium about the cooperation with the academia in this training and Gregg Garrett from GAIN gave an overview of GAIN work in the ECSA countries, many of which were present in the workshop. Prof. Kaaya, the workshop's host welcomed the group to Makerere University and then welcomed the Guest of Honour, the Permanent Secretary of the Ministry of Health to open the workshop officially.

See a summary of the speech.

Plenary Session 1: Rationale for fortification

Faces of Anemia - Ronald Afidra, FFI

The prevalence of anemia, its consequences, and fortification as an intervention was provided. Evidence of effectiveness of fortification in reducing anemia and iron deficiency from Costa Rica was presented. Successful fortification programs are, 1) well implemented and monitored, 2) optimize coverage and consumption, 3) use recommended iron compounds and concentrations.

Discussion:

Ferrous Fumarate was the iron fortificant used in Costa Rica for decades before effectiveness was assessed and results of effectiveness may take years to see significant benefits.

Folic acid and neural tube defects: what do we actually prevent? - Anna Verster, Smarter Futures

Neural tube defects (NTDs) were explained, including prevalence, causes and their link with folic acid deficiency. NTDs are preventable with adequate folic acid intake pre- and peri-conceptionally. In 1991, a study done in the United Kingdom showed that 400 microgram of folic acid daily taken from 8 weeks before conception till 12 weeks into the pregnancy can help reduce the risk of NTD's by up to 70%. This provided impetus for folic acid fortification. Use of folic acid supplements by pregnant women is low, and prevention of NTDs needs to occur early in pregnancy. Countries that made fortification mandatory have experienced between 31 and 78% reductions in NTD prevalence. Globally an estimated 38,417 birth defects were prevented in 2012 where flour was fortified with folic acid. That is an average of 105 a day. Countries can avert millions of dollars in healthcare expenditures when spina bifida is prevented

Discussion:

The prevalence of folate deficiency is able to be linked to the prevalence of NTDs through modeling techniques. CDC can provide additional information to countries that have a known prevalence of folate deficiency.

Economic consequences of deficiencies – Potential economic benefit of fortification - Quentin Johnson, FFI

"One of the most compelling investments is to get nutrients to the world's undernourished. The benefits from doing so – in terms of increased health, schooling, and productivity – are tremendous." The Copenhagen Consensus reported in 2012 that micronutrient fortification is one of the important strategies in the fight against malnutrition. Folate deficiency can result in higher incidences of spina bifida and other malformation health issues. The cost of this can be calculated and in Chile, the cost to benefit ratio for prevention of spina bifida is 12 dollars saved for each dollar spent on spina bifida. In the US, this is as high as 48 dollars for every dollar spent on prevention.

Discussion:

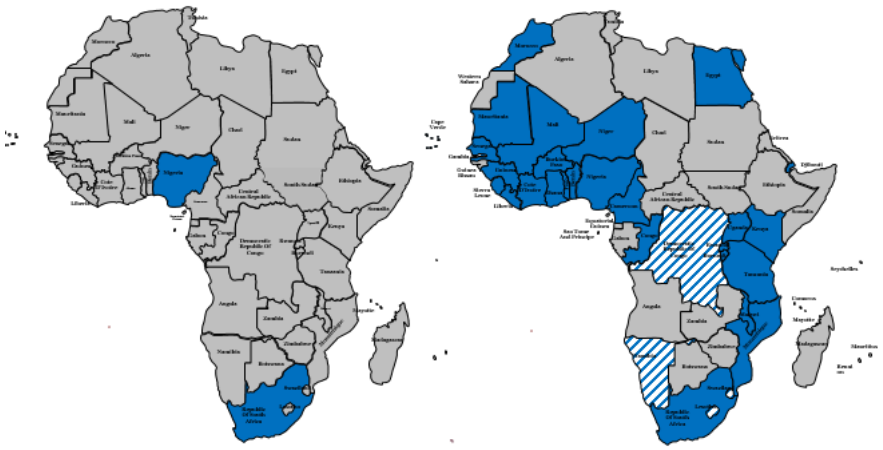
An extensive cost-benefit tool is available in the report of a Cost and Economic Benefit workshop, held by Smarter Futures in Dar es Salaam, Tanzania in December 2013:
http://www.ffinetwork.org/about/calendar/2013/CostBenefit2013.html

Flour Fortification Overview- Global and Regional Update - Ronald Afidra, FFI

Ronald provided an introduction to the Food Fortification Initiative (FFI). FFI supports national partnerships as they work toward grain fortification. FFI supports their advocacy efforts and provide technical assistance for planning, implementing, and monitoring programs. Provided an overview of the wheat, maize and rice fortification legislation globally and for the Africa region. In 12 years time, 27 countries across Africa implemented mandatory flour fortification.

Discussion:

West Africa has mandatory wheat and maize fortification, yet populations in many of these countries consume a large proportion of yam and cassava flour products which are not fortified.



2004
Mandatory in two countries: Nigeria and the Republic of South-Africa

May 2016
Mandatory in 27 countries across Africa, 5 countries do voluntary fortification

<u>Monitoring and Surveillance of Food Fortification Programmes (FORTIMAS)</u> - Anna Verster, Smarter Futures

FORTIMAS is a monitoring and surveillance tool that helps track trends in the effectiveness of a flour fortification programme over time in populations known to regularly consume fortified flour however it doesn't provide statistically representative estimates of the prevalence or incidence of micronutrient deficiencies. The tool uses sentinel data collection and purposive and convenience sampling approaches. Soft copies can be found on www.smarterfutures.net/FORTIMAS .

<u>The primary aims of the proposed FORTIMAS approach are to:</u>

1. Determine if close to 80% or more of the population is covered by the flour fortification program in a given geographic area over time, based on the quantity of fortified flour produced and imported, and household purchases of fortified flour in sentinel communities.

2. Answer the question, "is the micronutrient status of those who regularly consume sufficient quality fortified flour improving?"

Plenary Session 2: Food fortification legislation

Food Fortification legislation and standards: theory - Quentin Johnson, FFI

An overview of why a country need food standards, regulations and laws was presented. Laws create the legal framework for both standards and regulations. The presentation provided insights in the development of standards and legislation, how they differ with standards being voluntary while compliance with legislation is mandatory. It is however encouraged that countries develop technical regulations and standards that are based on product performance requirements rather than on design requirements as this creates fewer obstacles to trade. Countries should stipulate the minimum amount of a micronutrient that must be present in a food vehicle (WHO recommendations 2009) rather than a specific process for the addition of that micronutrient. Regulations provide the food control authorities to be able to inspect and monitor the production of fortified foods to a standard. Regulations provide the authorities with the mechanism to enforce the standards through inspection and corrective actions

TABLE: WHO Recommendations 2009

Nutrient	Type of flour (extraction)	Fortificant	Level of nutrient to be added (parts per million) By per capita wheat flour intake (g/day)			
			<75 g/day	75-149 g/day	150-300 g/day	>300 g/day
Iron	Low	NaFeEDTA Sulfate/Fumarate Electrolytic	40 60 NR	40 60 NR	20 30 60	15 20 40
	High	NaFeEDTA	40	40	20	15
Zinc	Low	Zinc Oxide	95	55	40	30
	High	Zinc Oxide	100	100	80	70
Folic Acid	Low or High	Folic Acid	5.0	2.6	1.3	1.0
Vitamin B12	Low or High	Cyancobalamin	0.04	0.02	0.01	0.008
Vitamin A	Low or High	Vitamin A palmitate	5.9	3.0	1.5	1.0

Food Fortification legislation and standards: in practice - Philip Randall, P Cubed

Factories should aim at fortifying the products at the recommended factory level to ensure the product conforms to the regulatory levels throughout the distribution chain. Standards and Regulations are being written (or rather cut and paste) with little or no knowledge of the food production process, its variability, critical control points etc. and even less knowledge of fortification. What the law does not say or take into account: (1) how well can mills mix fortificants, (2) what the intrinsic nutrient content is, (3) how the laboratory is supposed to distinguish between added and intrinsic content when it actually measures total content, (4) how much uncertainty at 95% confidence in laboratory analysis, (5) how the Regulatory minimum and maximums were calculated (sometimes why we even have a maximum), (6) how they determined that the recommended factory level do ensure the product conforms to the regulatory levels throughout the distribution chain, (7) how a sample is to be taken – or what to do if methodology does not meet international standards.

Plenary Session 3: Monitoring and evaluation of food fortification programmes

FACT (Fortification Assessment Coverage Tool) – Laird Ruth, CDC

In 2015, the MOH Uganda, GAIN, Makerere University, CDC and partners developed and operationalized the FACT tool to assess program coverage and utilization of staple food consumption and food fortification including maize flour, wheat flour, oil and salt fortification programs. The FACT survey used a large representative sample stratified by factors that might modify coverage, utilization, and risk of inadequate diet such as poverty, region of residence (urban/rural), dietary diversity.

The Uganda FACT survey results – Laird Ruth, CDC

There is potential for important contributions to dietary intake of vitamin A from fortification of oil but further efforts are required to improve quality control and enforcement. Household wheat flour consumption is lower than other vehicles but quality is good indicating potential for impact among a subset of the population, particularly in urban areas. Household wheat flour consumption is lower than other vehicles but quality is good indicating potential for impact among a subset of the population, particularly in urban areas. Nearly universal coverage of iodized salt; however, salt intakes are above recommended amounts resulting in high dietary contributions of iodine above recommended nutrient intakes (RNI).

Enable laboratory assessment results for the region - Sarah Ngalombi, Ministry of Health, Uganda

ENABLE was implemented by GAIN with funding from USAID to address the policy and regulatory impediments to accessing nutritious therapeutic products for IYC, OVC and PLWHA. Regional intervention in East Africa (Uganda, Kenya & Tanzania) and national intervention in Mozambique. Key objectives were creating and enabling environment for local production of a range of fortified products typically used in the context of nutrition assessment, counseling and support (NACS) programs.

General observations made: (1) variable testing expertise, (2) generally expertise in some areas is strong; e.g. microbiological testing, (3) expertise exists in micronutrient analysis in some labs but in general there are gaps in this area, (4) few laboratories accredited to ISO 17025; scope limited. In most cases micronutrient analysis not covered, (5) limited training opportunities, (6) lack of equipment but maintenance or setting aside budgets to maintain equipment even a bigger issue, (7) EAC proficiency testing scheme in place. Recommendations: (1) building testing expertise in micronutrient analysis (foods and premixes), food safety - mycotoxins, pesticides in foods, veterinary drugs in foods of animal origin, (2) accreditation for micronutrient analysis, (3) strengthen the EAC Proficiency Testing scheme as important QA/QC tool for EAC and other laboratories in the region (links with ECSA, SADC, COMESA etc.), (4) use workshops after PT rounds as a training platform, (5) build capacity to accredit the EAC PT scheme to ISO17043:2010, (6) need to ensure food control agencies commit to maintenance budgets.

Day 2: Plenary Sessions

Plenary Session 4: Fortification in practice: production and distribution

Milling technology for cereals - Filip Van Bockstaele, Ghent University

To be able to process cereals into edible products, they need to be milled to produce flour or meal. In this presentation the wheat and maize grain were discussed and their quality characteristics. The milling process itself is presented and the different steps in the milling process were discussed: reception of the grain, storage, cleaning, conditioning, milling (roller milling and hammer milling) and the end product characteristics.

Discussion:

The terminology 'extractions rate' is used to indicate the amount of flour that has been milled (extracted) out of the cereal and thus separated from the bran and germ. A usual extraction rate is around 75%. A 100% extraction rate means the flour is composed out of the whole grain.

Why do you need to dry the grain and then put again water in for milling? The drying is necessary for adequate storage over long time periods to prevent deterioration (moulds). The addition of water

during conditioning is needed to get the bran layer leathery to remain one whole and not breaking up during milling.

When the mycotoxin testing should be performed? Before intake as you cannot accept a batch of cereal exceeding the limits in the legislation. You however need to be careful with storage conditions to prevent post-intake mould growth.

Flour fortification at the mill – Premix and feeders - Quentin Johnson, FFI

This presentation goes into detail on the process of fortifying flour in a mill. Information was presented about the premix, possible fortificants in the premix, premix feeders and costs of fortification. Best practices regarding premixes and premix feeders are discussed and possible problems are indicated. Especially attention was given to the fact that premix feeders can work gravimetically or volumetrically.

Discussion:

When the premix has a shelflife of 9 months, and is only used after 8 months (end shelf life), is this a problem? The shelf life period of the premix does not influence the shelf life period of the flour, as it only indicates the premix retains its guaranteed stability and specifications during the indicated shelf life period. After the expiry date, it can still comply but it can not be guaranteed (depending on storage conditions). If premix has expired, you may let it have re-certificated. Always do FIFO (first in – first out).

Industry wants longer shelf life (18 months), however this depends on type of fortificants in the mix

Plenary Session 5: Quality assurance in the milling industry

Milling industry quality assurance principles and practices - Philip Randall, P Cubed

Industry processing requires to setup a system of quality assurance and quality control in the company. The basic principles of QA/QC were explained: QA, QC, traceability, GMP, … . If it cannot be measured, it cannot be controlled. QA/QC principles are applied to the specific case of fortification processes.

Milling industry and Quality assurance: Belgian or EU case study – Filip Van Bockstaele, Ghent University

The food safety system en law regarding food safety in EU is explained. Further, the system in Belgium regarding food safety and inspection is handled. EU and Belgian law indicate the use of autocontrol system and traceability to ensure food safety throughout the food chain. The autocontrol system for the milling industry is explained with examples from the autocontrol guide for the millers.

Quality control at the mill (general) - Quentin Johnson, FFI

Quality control is important for process monitoring and surveillance. Best practices in flour quality control in flour fortification are discussed: sampling, premix quality, and control tests. An important process is also the calibration of the premix feeder which is explained.

Discussion on session 5:

Is overdosage a risk to be taken into account? Mostly no problem on nutrition but can have impact on technological quality (color, taste, vitA can cause bad flow). Make sure your do not rely on only 1 vehicle for fortification. The small amounts of micronutrients do not pose ricks for health. How to do the risk analysis: take all the vehicles and take the top intake values for all: count the amounts together and check if the daily intake exceeds the max level intake.

More explanation was given on the feeder calibration: check if accurate, agitation device is working, good sizing of the feeder, weighing of samples (depending on type of feeder: volumetric, gravimetic). The feeder should operate in the linear area. Calibration: repeated sampling during increase of screw speed.

Does the premix has a major influence on the price? No, the wheat price is more determining on the price of the wheat flour. Price graph is shown.

When setting standards, industry and other stakeholders should be able to comment.

Should you set a fortificant concentration range? No, only set a minimum and implement a tolerance range (taking into account analysis error and mill variation)

Plenary Session 6: National food control systems

Opportunities and Constraints that affect national food control systems effectiveness in Africa - Philip Randall, P Cubed

Standards and Regulations on fortification are often being written with little or no knowledge of the food production process, fortification practices and its variability and critical control points. Legislative tools tend to be work in progress or amendments or patches to a new problem. Best practices for establishing effective national food control systems were discussed.

Laboratory requirements for external monitoring - Quentin Johnson, FFI

Performing external monitoring needs to meet certain requirements to obtain valid results. In this presentation, information is provided on external monitoring concepts and requirements. First, the issue of sampling is discussed as sampling is a main cause for analytical error. Next, requirements and conditions for good chemical assays are discussed.

Performing audits - Philip Randall, P Cubed

Performing audits is part of industry inspections by the government in order to check if industry complies to the set regulations and standards. Different types of audits are discussed and best practices in auditing are provided. Using up to date checklists and asking the right information is crucial for performing good audits.

Plenary Session 7: Premix suppliers

Q&A session for Premix suppliers

Four premix suppliers introduced themselves: Muhlenchemie, Hexagon, DSM and AkzoNobel (only producer NaFeEDTA). Muhlenchemie indicated the importance of not mixing fortification premix with ascorbic acid. At high temperature and high relative humidity (>75%) it can react into dark color components. AkzoNobel explained their role in the fortification industry and highlighted the work been done on I-Check and detection of Fe from NaFeEDTA.

Market Place: exhibition of materials by partners from public and private sectors, discussion corners, getting acquainted. Industry and organizations (ECSA) present their material and have discussions with the participants.

Day 3: Visits and Plenary Sessions

Mill and government laboratory visits

PARTICIPANTS from GOVERNMENT/NGO's: Visit to Flour Mill (Bakhresa Mills): In 3 or 4 small groups rotating through the mill, QA/QC laboratory, covering the following areas:

- Premix storage
- Feeder calibration
- Fortification Process
- Check weighing or computer control system
- QA/QC procedures in the laboratory and Premix utilization and reconciliation calculations

PARTICIPANTS from MILLING INDUSTRY/PREMIX SUPPLIERS: Visit to a government analytical laboratory (UNBS), covering the following topics:

- Briefing on government regulatory system
- Facilities and equipment
- Guidelines/ protocols

Both visits include practical demonstrations of spot test, iCheck and other testing methods

Reporting back from the visits: what have we learned?

Visit to Bakhresa mills (group1+2):

Overall impression

Company capacity: 1100 tons of grain/day – type of fortificants – different types of flours (same premix) – premix always from same supplier – Logo not present? QA/QC: every two hours; moisture and protein in lab; quantitative tests outside lab (mycotoxins) – an inhouse bakery is present for quality control

Challenges

Difficult to standardize the raw materials because of different sources of wheat

In process flow: no labelling of the safety rules and critical safety points!

Recommendations:

Split wheat per country? More labelling? Fortificant logo? Verification analysis on premix (external lab)? Labels on the bottles of chemicals? Head covered for the workers? Premix is low -> no signal ()? Good pest control?

Plenary discussion:

Spot test: you should provide a picture of compliant sample to check other samples with.

Remark on sensor of premix feeder with the premix

Feeder calibrated every two hours? Is this a real calibration: NO-> every two hours a sample is checked with spot test -> QC-check! Not a calibration; good GMP for every 2 hours a check

Visit to UNBS (Ugandan national bureau of standards): group one (presented by Millicent (Kenya))

Overall impression

Lab is accredited by SANAS, tests in 14 matrices, mainly tests for compliance

Well-equipped lab (ICP-HPLC-AAS-…)

ICheck and spot test demonstration

Neat lab, competent analyst, good laboratory practice

Tasks of the lab: analysis; tender evaluation, quality control of import/export; internal samples, inter-laboratory samples and trainings

Goal: consumer safety

Challenges:

Difference in procedure for followed for Icheck: (incubation or not?)

Rapid if a 6-24h incubation period?

Is the method cheaper?

Calculations: confusion (g and mL)?

Suggestions

expand the lab, aflatoxins (get accreditation)

Poor ventilation; no eye wash; no accreditation for micronutrients

Plenary discussion:

analytical lab: Temperature for incubation for I-check? -> Room temperature for 6-24h; time depends on the temperature (speed of reaction is T-dependent) and on the type of iron (FeEDTA is slower reacting). Fast method is being developed by AKZO NOBEL

Day 4: Working groups and Plenary Session

On the last day of the training, group-working sessions were organized. In the first part of the group sessions, participants joined a group according to their background or profession: (1) production and distribution, (2) national food control systems and (3) standards and technical regulations. The '**profession groups**' had to elect a chairman and secretary to prepare a report/presentation. The task of each working group was to make a brief overview on current status, drawbacks, strengths, weaknesses, improvements and challenges on flour fortification specifically in their field.

In the second part of the group sessions, participants were regrouped to form '**country groups**': 5 groups were formed: Kenya, Ethiopia, Uganda+South-Sudan, Mozambique, Rwanda+Zambia+Burundi+Tanzania Each country group was formed with participants from the first three working groups by profession. Every country had to summarize the findings from the profession groups specifically for their own country situation and then put together a review and plan for fortification. Each country was required to make a presentation on the plan of activities to be accomplished to make food fortification a reality. This was based on the status of the country in the implementation of food fortification and those priority activities that require urgent measures. The presentations focused on 3 elements of food fortification: (i) Food Control Systems, (ii) Standards and Technical Regulations, and (iii) Production and Distribution.: Where are we now? Where do we want to go to? How are we going to get there?

The reports of the working group can be found at the end of the presentations listed here.

Questions/Remarks:

- *Burundi fortifying maize meal from March16, cassava, wheat flour and oil on the list.*
- *To Mozambique: a few years ago, bread price was frozen by government. Fortification had a cost. How did this influence millers to start on fortification?*

  No, effect because they had subsidies for premix

- *Is price of wheat flour controlled to a constant level: yes flour price is still controlled.*
- *Mozambique is going to fortify maize flour with iron. Why not adding folic acid and zinc? Not in legislation, only Fe: Zn, folic acid and B12 are added because of guidelines, inspectors only check Fe*
- *You started fortification in 2012; only recently is became mandatory, why?*

  2009: National fortification program started; from 2014 day started in mills with fortification; in between day started all up

- *Tanzania: what is the experience with small scale millers for maize? Premix in small mills is not common; use calibrated scopes in set amount to bring amount of premix in set amount of maize meal.*
- *Kenya: 65% compliance: what does it mean? Number of brands that are fortified. However, it is mandatory.*

  Remark: why not fortifying, what is the problem? Organize visits and start discussions. -> Kenya is getting back to this…

- *Ethiopia: discussion on iron. In the diet certain amount of iron. Absorption into body: type of iron + interaction with other food components (thea (block), vitC (enhances), …). Not all is absorbed. Also, how much is absorbed depends on need of the body. If you don't need, you less efficiently absorb. Only 1 to 5% percent (max. 10%) ends up in the body. A survey shows that there is a high intake of iron in Ethiopia but this is skewed by the high meat consumption by men. The problem is the iron intake by women.*

  Reply: aneamia is indeed high but surveys showed low iron deficiency. Delay in fortification program.

  Reply: WHO should clear on the data.

- *Zambia: there is a standard for fortification, in the act is the standard mandatory. If you change the standard for nutritional reasons; you need to change it in the law by parliament or you change the guidelines?*

  Reply: salt iodization survey: changes needed -> law is not changes, only change the regulation on salt iodization. -> change a law is very difficult.

- *Communications is very important; make good communication with industry. Have you gone back to the industry and saying 'good job'.*
- *Your control lab should be ready for it. Do not wait with analysis, inspection is not only analysis.*

- *Do not rush to fast in nutrition survey (long term monitoring is needed); Bahrein: 8 years to lower deficiencies; Oman: 10 year; Kuweit: no reduction in aneamia after 5 years because of wrong iron components*
- *Issues remaining:*
    - *I-check: syringes not suitable for maize flour -> what can be changed? Question will be send to Anna (Bioanalyt)*
    - *Presentation results in ranges: a lot remains unclear: does a premix supplier give a result or a range in a certificate of analysis. Question will be send to premix supplier.*

Plenary Session 8: Fortification quality control

Quality control test for iron, vit A and folic acid: theory – Tom Hellemans, Ghent University

An overview is provided of standard methodologies for use to determine minerals and vitamins: AES, AAS, ICP en HPLC. Also the spot test is explained for iron and vitC qualitative determination.

Questions:

Experience Bakhresa Mill (Dar el salaam) with vit. C addition; vit. A is also included in de premix -> and will react with the reagent with the chemicals of the vit. C test (pecar test) -> AA is solubilized and reaction (redox) -> acid condition -> vit. A can also react then!

Chemical assays for fortificants: method validation and examples - Anna Zhenchuk, Bioanalyt

Methods for determination of micronutrients require a validation before use in routine testing. In this presentation, validation protocols are explained and terminology is introduced: precision, trueness, accuracy, bias, confidence interval. Examples are shown of quality control data in function of time related to the confidence interval together with interpretation of compliance.

Discussion:

How do you go on after validation, who? best analyst you put on this test because he is trained best to do the test

-> Validation: ten times on one diluted sample or ten times from the original sample? Method variation (10x same dilution) and then sample variation (10x same sample)

25 ppm measured; 30 ppm is wat you want; +- 20% bias: 25+- 5ppm-> range 20-30 ppm -> sample compliance

Concentration of flour in I-Check? Flour does not solubilize, it makes a suspension but 10g of flour does not add 10 mL on the sample volume, however you can also note that 10g/100 mL water -> 10g/ 100 g water

Other factors that contribute to uncertainty: reagents and equipment are included -> look at validation scheme

Cost implications: what is the minimum amount of repetitions? Validation scheme is not used on every sample -> measurement uncertainty known then take on sample which is analysed one, two, three times

Why are industry not using better analytical techniques? Each equipment does need maintenance, reagents have shelf life, breakdown cost => better send to an official laboratory which is well equipped. Industry has no HPLC in Canada but use external labs -> sets requirements stated in GMP or HACCP (certified institutions): have good experience, high number of samples tested, good accurate

Fortified whole wheat flour: Fytate added during bran addition: which fortificant -> WHO guidelines: high extraction flour: FeEDTA is recommended!!

Is it possible to determine intrinsic iron with the I-check? Yes possible

End product quality: baking trials - Filip van Bockstaele, Ghent University

Fortified wheat flour and maize meal are not consumed as such but processed into edible foods. This is necessary to make the starch digestible. Adding a micronutrient premix may cause interactions with the food components resulting in food defects (mostly color defects). Results are shown of the study of 'fortification of wheat flour and maize meal with different iron compounds: results of a series of baking trials'. Recommendation of how to set up a food quality check and sensory analysis were provided.

Closure of the QA/QC workshop

After the presentation of the working group, all participants were given a post-test.

During the closing session, certificates of attendance were handed out to all.

EXTRA Workshop days for the student group

Day 0: Sunday 22-05-2016

The student group already gathered on Sunday 22-05-2016 for the start of the VLIR-UOS/Ghent University 'Short Training Initiative' (STI).

Prof. Kaaya, Anna Verster and Filip Van Bockstaele introduced themselves and the organizing organisations (Makerere, Ghent Univerisity, VLIR-UOS and Smarter Futures). The workshop format was explained and goals and expected outcomes were explained. The student participants introduced themselves and explained on their food technology or nutrition background.

To measure the learning effect of the workshop, an intake knowledge test was performed by the students. The introduction session was followed by a welcome dinner at Makerere University.

Day 5: Friday 27-05-2016

This day was dedicated to the student task. Taking into account all the knowledge gained during the previous days, an in-depth description was executed per country giving following information on:

- Current nutritional status (food intake averages, disease/malnutrition prevalence, consquences due to nutritional status)
- Desired nutritional status: which goals have been set
- Running interventions (national programmes, performance, follow-up)
- Food foritification status (vehicles, fortificants, challenges, constraints); if not fortifying: suggestions are made for the programme.

The task was presented by each country (Uganda, South-Sudan, Kenya, Tanzania, Rwanda, Ethiopia, Mozambique) after lunch.

The reports of the task presentation can be found with all the presentations here.

The outtake knowledge test on fortification was performed by all the students on the online tool.

Certificates of attendance were handed out to all student participants.

Day 6: Saturday 28-05-2016

On Saturday, time was taken to make some visits around Kampala with highlight: the Namugongo Shrine, which was in full preparation for the yearly pilgrimage. The workshop for the student group was ended with a farewell dinner.