



MAIZE FORTIFICATION STRATEGY WORKSHOP FOR AFRICA

Dar es Salaam, Tanzania, October 2016

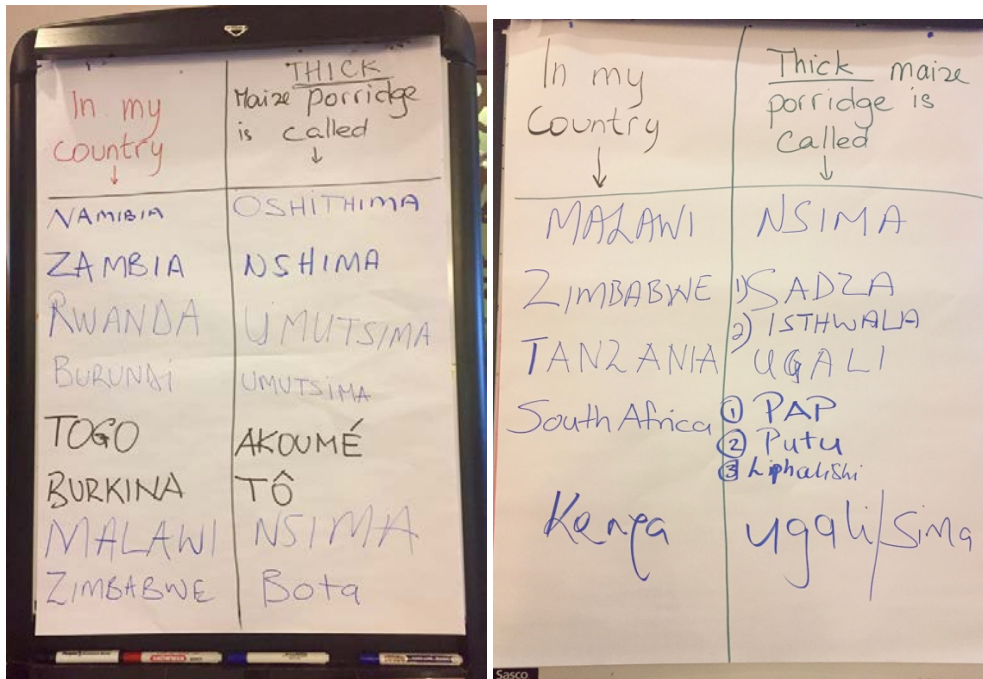
Venue: Double Tree Hilton

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INTRODUCTION

In many countries in Africa people eat maize as a staple. In Eastern and Southern Africa, maize is largely consumed in the form of a thick porridge or a thin gruel, without any yeasting or fermenting. For example, in Tanzania the thick porridge is common known as “Ugali” while in Zambia and Malawi it is commonly known as “Sima”. The photo’s below show the names given to this food in the different countries present.



In West Africa some countries will ferment their maize product, like the *Kenkey* in Ghana. This involves wet processing and is outside the scope of this workshop. In other West African countries, e.g. Benin, Burkina Faso, Togo, larger maize mills are present that produce maize flour.

In some of the Eastern, Central and Southern African countries, e.g. Tanzania the preferred form of maize-flour is de-hulled hammer-milled very fine and white flour, while in other countries people use roller milled flour that has been de-hulled to different degrees. This flour tends to be coarser.

Currently, less than 30% of maize flour is already fortified, mostly that produced in large scale roller mills, in South-Africa, Tanzania, Uganda, Kenya, Namibia. In the medium-scale mills, fortification has been introduced to some degree especially in the ones that use a roller mill. Technology is also available for fortification in commercial hammer-mills.

Generally, fortifiable flour is defined as flour processed in mills with a capacity of > 20 MT per day. In the case of maize flour this cut-off point needs to be clarified based on official status of mills (registered or not with national regulatory bodies). There is a clear divide between commercial “packaging” millers (millers that buy grain and package flour in their own bags for sale) and millers that process maize that people bring to the mill while taking home the flour. These latter operations (toll mills or fee-for-service mills) were not within the scope of this meeting.

Maize is largely produced locally and can be processed at various levels of capacity in roller or hammer mills (Table 1). Table 2 provides a comparison of the mill process flow for the different mill sizes

Table 1. MAIZE MILL PROCESSES

Mill Size	Rated capacity MT per day	Development Partners
Large Mill	50 and higher	FFI
Medium Mill	20 - 50	FFI, HKI, PHC, Sanku, WFP
Small Mill	Less than 20*	WVI, Sanku

* In the case of maize milling the cut-off point needs to be clarified based on the official status of mills (registered or not with regulatory agencies such as Food and Drug Authority, National Bureau of Standards, Taxation).

Table 2. MILL PROCESS FLOW (including fortification process)

	Large Scale	Medium Scale	Small Scale (information purposes)
1	Maize cleaning	Maize cleaning	Maize cleaning (by hand)
2	Dehulling (degermination)	Dehulling (degermination)	Dehulling (degermination)
3	Roller Milling	Roller mill and or Hammermill(s)	Single hammermill or single roller mill
4	Sifting	Sifting	-
5	Fortification (conventional feeder conveyor system)	Fortification (conventional feeder/ conveyor system or Sanku dosing system)	Fortification (scoop and bucket method)
6	Packaging & labelling	Packaging & labelling	No packaging/labelling. Toll or service milling fee

OBJECTIVE OF THE MEETING

The aim of this meeting was to

- examine the patterns of maize production in countries
- share maize fortification experience across countries
- identify country fortification legislation and QA needs
- disseminate existing fortification QA tools
- build capacity of industry and government in effective ways of maize fortification using different techniques of production and the latest WHO recommendations for fortificants and fortification levels to ensure good quality products on the market.

EXPECTED OUTCOME

The **outcome** of the meeting deliberations was that millers are able to effectively fortify maize flour using the right technology for their type of milling process, with the right fortificants at the mandated levels, and for the government to be able to set appropriate standards and carry out effective QA/QC to ensure quality products are available for their populations.

FORMAT OF THE MEETING

The meeting started with Plenary sessions, based on [a Maize Scoping Analysis](#) that has been carried out by Smarter Futures to get an **overview of maize production and fortification**:

- a. Production patterns (by countries/regions),
- b. Milling/fortification technology (for all three milling scales),
- c. Regulatory/legislation environment (national laws mandating maize flour fortification as well as WHO recommendations,
- d. Gaps and way forward

Participants reviewed the Maize Scoping Analysis document and translated its findings into opportunities and challenges for fortification of maize in their own countries. Missing information on the Maize Scoping Study was added.

Field visits were made to both a large scale roller mill and a set of commercial hammer mills that package and label their product.

Practical demonstrations showed various ways of fortifying and also placement of the equipment to be used as well as equipment components and types of feeders. Spot-tests and hand held testing equipment to measure iron fortification levels were demonstrated.

Country teams were invited to share their current standards and regulations for maize fortification as well as information and formats of their food-control systems.

The workshop participants were introduced to the new WHO recommendations for Wheat and Maize flour fortifications and discussed the implications for their current standards, regulations and legislation.

PARTICIPANTS

Participants to the workshop were drawn from National Fortification Alliance members, notably maize millers, representatives from Bureaus of Standards and regulatory bodies from maize consuming countries in Africa that are already fortifying or plan to start fortifying maize flour in commercial production entities. Others were members of regional economic/health bodies; international organizations, NGO's, donors; and premix-suppliers, providers of milling technology for large and smaller scale operations and providers of QAQC testing technology.

The participants present were from the following 14 countries: South-Africa, Malawi, Zambia, Zimbabwe, Rwanda, Burundi, Tanzania, Kenya, Uganda, Mozambique, Namibia, Burkina Faso, Benin and Togo and sent in information about the milling practices and industry structure in their country.

Milling companies, government authorities and others involved in National Fortification Alliances were invited to review the Maize Scoping Analysis which was performed by Smarter Futures for their countries and provide copies of their current maize flour fortification standards.

Facilitators	10
Participants (government)	32
Participants (industry)	20
Partners	17
TOTAL	79

On the last day of the meeting, group-working sessions were organized. In the first part of the group sessions, participants joined a group according to their background or profession:

At the second stage, people gathered in country groups to develop a Road Map, timeframe and recommendations for maize fortification in their country. The roadmap was developed according to a provided template.

A multi-sectoral drafting committee selected from the participants prepared a [Statement of the maize fortification strategy workshop for Africa held from 3-7 October 2016 in Dar es Salaam,](#)

Tanzania, a Declaration to accelerate maize flour/meal fortification in Africa which ended with the words:

**“Maize fortification in Africa,
let us now all do it”**

This [summary of the workshop](#) includes hyperlinks to all presentations.

MAIZE FORTIFICATION STRATEGY MEETING REPORT

DAY 1, REGISTRATION, WELCOME AND PARTICIPANT INTRODUCTIONS, BACKGROUND AND OVERVIEW OF MAIZE PRODUCTION AND SUPPLY

Registration of participants was done as and when they arrived and they were also provided with workshop packages which included a programme, notepad and pen.

Anna Verster 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. A total of 14 countries were represented in the workshop, either through country teams or through partner organisations and the facilitator team.

Official Opening:

Anna Verster introduced Smarter Futures and then welcomed Erin Smith from Hellen Keller for an opening statement. Finally, the Guest of Honour, the Permanent Secretary of the Ministry of Health, Community Development, Gender, Elderly and Children, Dr Mpoki M. Ulisubisya opened the workshop officially.

Introduction and overview of maize production and supply chain – moderator: George Kaishozi, Hellen Keller

Purpose and outcomes of workshop- Anna Verster, Smarter Futures

The goals of this workshop were to:

- examine the patterns of maize production in countries
- share maize fortification experience across countries
- identify country fortification legislation and QA needs
- disseminate existing fortification QA tools
- build capacity of industry and government in **effective** ways of maize fortification
 - ✓ using different techniques of production
 - ✓ based on the latest WHO recommendations for fortificants and fortification levels to ensure good quality products on the market.

The expected outcomes of the workshop were:

- that millers are enabled to effectively fortify maize flour using the right technology for their type of milling process, with the right fortificants at the mandated levels
- that governments are enabled to set appropriate standards based on WHO recommendations for fortificants and fortification levels
- that governments and millers together are enabled to carry out effective QAQC to ensure quality products are available for their populations to make them stronger, smarter and healthier

Maize scoping study: key findings – Dr. Enzama Wilson, Smarter Futures consultant

Dr. Wilson reported on the maize scoping study which was requested by Smarter Futures. The report highlights that, maize accounts for 54-65% of the energy intake in different countries and thus is an important vehicle for fortification. The study was performed to get an overview on the different processing systems and structures for maize producing countries. The goal of the study was to obtain data on supply and processing of maize and maize products. The region under study was East and Southern Africa. Ultimately, the study aimed to identify the potential of maize fortification in Africa. Maize meal is mostly consumed as porridge. Over 80% of the maize is produced by large number of smallholders except in Zimbabwe and South Africa where large farms are present. Trend in maize production is, however, decreasing from 2014 onwards. Households grow their own maize (65-88%). Maize trades between countries in Africa are limited. Milling is performed in roller and hammer mills. Up to 80% of the maize grains end up in small hammer mills.

Discussion:

- Timeframe of giving input and updates on the maize scoping report
 - Further input could be given on the report during the meeting, later information can be given through Smarter Futures
- Impact of pests on production tonnage?
 - Reason for declining production is by weather conditions, but also pests cause crop losses
- Consumption going down: why?
 - Availability going down, so consumption
- Criteria for choosing to visit 5 countries:
 - No criteria for visiting countries. Ronald also visited some countries to validate the report; feedback was also given during the QA/QC meeting in Kampala for the countries present at the meeting; available resources was also another for limiting visits to 5 countries
- How to support smallholders to fortify?
 - This will be discussed in the session of tomorrow. We need to introduce the term 'fortifiable flour': it needs to be cost-effective and you need to be able to perform QA/QC on the product. We do not need to force small millers into fortification if it is not sustainable (so that when donor leaves, the system does not collapse).
- Mozambique: how market information systems can help smallholder farmers to get information about market price and sales places?
 - Internal trade and commodity exchange and challenge for smallholder trade is real; no information is available on internal trade.

FACT tool: highlights on maize in Uganda and Tanzania – Enock Musinguzi, GAIN

A summary of the GAIN FACT study in Tanzania (2015) was presented concerning maize flour consumption. The study assessed the coverage and consumption of maize flour, analyzed the levels of the selected nutrients and estimated the contribution of maize flour in total nutrient intake. The findings were linked to health indicators. In Tanzania, 93% consumes maize (1036 households),

however, only 2% consume fortifiable maize and most of the households do not know the flour is fortified. Urban households consume more maize (95.4% of households) and more fortifiable maize (68.4%) because they purchase it in the supermarket but the consumers don't know it is fortified (64.2%). Maize is consumed by poor and non-poor households but non-poor households consume more fortifiable maize. When looking at iron levels in maize flour, only 3.3% is adequately fortified according to the Tanzanian standard. It was concluded for Tanzania and majority of the African countries that, coverage by fortifiable maize flour is lower than other vehicles due to high levels of home production. Fortification quality remains a challenge. Small scale milling needs further investigation. Similar trends were observed for the Uganda FACT survey. Recommendations for future work were presented: quality control needs to be enforced; which fortifiable maize is coming from mandated producers; potential to small scale fortification needs to be investigated; monitoring eating patterns in population; investment is needed in regulatory monitoring to improve the fortification program.

Discussion:

- Other reports from Kenya and Nigeria will follow.
- Fortifiable maize flour is defined as purchased from a shop. Do sales directly from a mill are also included in this? YES, whatever is bought is included.
- Fortifiable: commercially available flour is fortifiable? this should be discussed: what is fortifiable flour in every country?
- Have you identified what is the reason of non-adequately fortified flour?
 - Problem is systems in milling company self, not-adequate training
- Did you identify what is the cause not fortifying the fortifiable flour?
 - Only mandatory for large scale millers in Tanzania
- What is the role of intrinsic iron in the over-fortified flour?
 - Indeed, different across varieties and
- Analytical methodology: Samples were flow to Germany for analysis

Maize flour fortification in Africa: markets, feasibility, coverage and costs – Ronald Afidra, FFI

Mass food fortification started in the early 1980s in USA, UK and Switzerland, however maize flour fortification growth was slow. The characteristics of the maize flour market were discussed: overage, supply, interaction, premix and economies of scale. The details of a scope study on maize flour in Kenya, Tanzania and Uganda was discussed.

Discussion:

- Tsh10 per kg extra for fortified flour; price increase limits sales of fortified flour, however very small amount
- Fortifiable flour: not at small scale milling
- Terminology: hammer mill – roller mill: sometimes difficult
- When 10 hammer mills are combined: is this still small scale milling?
- What is the cost of fortification?

Small group discussions: Maize supply chain: opportunities and challenges - all

Groups were formed to discuss the maize supply chains and to identify opportunities and challenges along the chain. Discussion points:

- INFORMATION AND SOURCES
 - ✓ WHERE ARE OTHER SOURCES?
 - ✓ WHO TO APPROACH? OTHER PARTNERS, COMMERCIAL, NATIONAL, INTERNATIONAL, ETC.
 - ✓ WHAT ADDITIONAL INFORMATION IS NEEDED AND AVAILABLE?
- OTHER OPPORTUNITIES
- LIST CHALLENGES
 - ✓ HOW TO OVERCOME CHALLENGES
 - ✓ WHAT SUPPORT IS NEEDED

Group reports: feedback, additional information and recommendations on maize scoping study findings - all

TANZANIA

Source of data

- National bureau of statistics
- National Food Reserve Agency
- Ministry of Health
- Ministry of industry and trade
- Grain Millers Association for small millers
- Non-government Organization both local and foreign such as Helen Keller International, USAID, Research and Higher Learning Institutions
- Small scale industry development organization
- Producer association, consumer association
- Commercial Maize Flour Millers associations

Additional information

- Identification of maize millers according to their capacity-large, medium and small
- GIS mapping to assess the distribution of millers across the country
- Assess the purchasing power of consumers

Opportunities

- Tax exemption on importation of premix and fortificants.
- Existence of National Food Fortification Alliances

Challenges

- Negative attitude of population towards consumption of fortified foods
- Limited capital for small millers, therefore, not meeting quality standards
- Poor infrastructure such as roads, electricity and railways

Strategies to overcome the challenges

- Creation of awareness of consumers on the health benefits of consuming fortified foods
- Provision of incentives such as loans and subsidies for small millers to fortify
- Building capacity of small millers to through government support to fortify maize
- Develop appropriate infrastructure for areas with poor road and rail networks

Support required

- Technical and financial support from government and development partners
- Enhancing monitoring and surveillance capacity of government regulators.

ZIMBABWE, ZAMBIA AND MALAWI GROUP

More Sources of data

- Ministry of agriculture- for production and trade related data
- Ministry of industry and Trade- Trade related information
- Ministry of health-for policy and monitoring data
- National Statistical authority
- Millers Associations
- National Surveys

Additional Information

- Population disaggregated data by gender and rural-urban divide
- Post-harvest losses
- Subsidies on inputs vs those who do not access inputs

Opportunities for data collection and management

- Presences of academia in assisting in collection of data
- Local research institutions
- Engagement of other institutions

Challenges of data collection and management

- Time allocated for the scoping study was too short
- It was not easy to follow protocols of obtaining data from government
- Difficulty in accessing information from stakeholders
- Information dissemination to stakeholders for validation in workshop
- Contacting informal traders and yet a lot of maize goes through the information business sector

Gaps in data to be filed

- Current knowledge, attitude in uptake of fortified foods
- Production data which includes productivity, losses, quality of soils
- Nutritional quality of the maize produced

SOUTH AFRICA AND NAMIBIA GROUP

Source of data

- South Africa and Namibia have the same classes for maize meals
- AMTA
- South Africa Grain Information Services
- Namibia millers' association
- South Africa national chamber of milling
- South Africa National Statistics Authority
- Namibia Economic Board
- Individual millers
- Namibia Agronomic Board and ministry of agriculture
- Grain producers' association

Challenges

- Lack of information on death rate by the government
- No mandatory legislation on maize fortification for Namibia (only voluntary legislation)
- How to find the very small millers so as to target them with support
- How to train and educate the millers and consumers on benefits of fortification for the population (consumers from government side)
- The cost implication of feeders and fortificants for small millers (who can fund them?)
- Enforcement of compliance is one of the key challenges

UGANDA, KENYA, RWANDA AND BURUNDI GROUP

Sources of data

- Cast the net wider to include government ministries
- There are different mandates along the value chain of ministries such as Ministry of Health, Ministry of agriculture, ministry of trade and industries, office of prime minister, national bureau of statistics in the different countries
- Research institutions
- Chambers of commerce
- Development partners
- Feed the future projects
- FAO, WFP, DSM

Challenges

- Unwillingness of stakeholders to share data
- Lack of proper data
- Government red-tape in obtaining data from public sector

See presentations from:

[BENIN, TOGO, and BURKINA FASO](#)

[MOZAMBIQUE](#)

DAY2: MAIZE MILLING INDUSTRY STRUCTURE AND MAIZE FLOUR FORTIFICATION – MODERATOR: ANNA VERSTER

Maize milling structure: national and regional levels – Enzama Wilson, Smarter Futures

The introduction to maize structure is provided. According to FFI, following classification is used: >50 Mt = large scale; 50-20 Mt is medium scale and <20Mt is small scale. Enzama proposes 4 categories of mills: small, medium and large mills + small informal toll mills. Different countries use different sizes for the categories. We need to know what the share for all the different categories per country. Some mills act partly as small commercial mills and partly as toll mills.

Maize milling structure country presentations - All

All countries participating in the workshop presented the structure of their maize industry

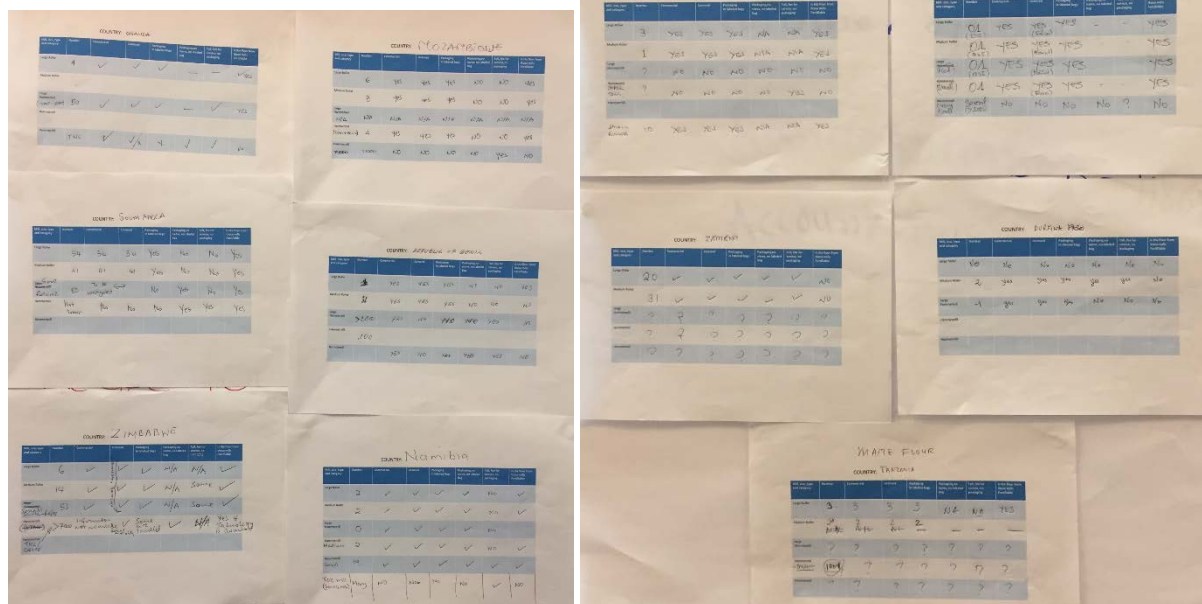
- [Kenya](#): 40% is fortified,
Q: roller and hammer mill? -> mix
Q: criteria for categories large/small? -> FFI criteria (not sure)
- [Rwanda](#)
- [Uganda](#)
- [Zambia](#)
Q: When suspension of law will be lifted? not known, roadmap is developed
Q: mandatory? This is the work of parliament
- [Zimbabwe](#)
Q: which type of technology? Commercial maize milling: roller milling technology because of the consumer perspective... 7000 small hammer mills: only for own farming:
Q: which type of mills for mandatory fortification?
Q: millers regulated, and for which products and who is in charge? 4 different government institutions
- [Malawi](#)
Q: distribution does not go to rural areas? No, people grow own maize and let it mill in small hammer mill
Q: 3 large companies; small: 20t/day
- [Mozambique](#)
- [Namibia](#)
Q: standard micro-feeder on each roller mill, hammer mills in the north: not fortified but they need it most! They consume millet over there, but this is not fortified

- **Burundi:** 3 large mills – small millers: no details yet
- **South-Africa**
- **Benin:** only one maize milling industry
Q: what is the staple food in Benin? Maize
- **Togo:** one large mill; 90% export; main maize dish: fermented or not
- **Burkina Faso:** only medium size mills

Mapping the opportunities: where is the flour fortifiable? - All

Blank tables were handed out and every country present completed the overview table concerning the maize industry structure and indicated which flour is fortifiable.

Mill, size, type and category	Number	Commercial	Licensed	Packaging in labeled bags	Packaging, no name, no labeled bag	Toll, fee for service, no packaging	Is the flour from these mills Fortifiable
Large Roller							
Medium Roller							
Large Hammermill							
Hammermill							
Hammermill							



Maize milling technologies: small, medium and large scale – Quentin Johnson, Smarter Futures

Q: If too much dehulling -> endosperm is purer but less rich in vitamins and minerals: overdehulling: loss of endosperm but also less germ/pericarp in the flour. More losses when uncontrolled dehulling

Q: is there a positive effect of dehulling on aflatoxins? Indeed, can be reduced but aflatoxins remain in the grain even when dehulling!

Maize flour fortification technologies: methodologies, feeders – Philip Randall/Felix Brookes-Church/Walter von Reding

Philip Randall: different addition techniques are discussed: direct addition, batch mixer (timing problem), egg blender, ribbon blender, rotation mixers, collection conveyer, (basket mixing). Microfeeders need to be positioned on the right spot, easily accessible for putting premix in the feeder. Continuous mixers are more sophisticated. Premix feeder questions: how much, how accurate (linearity, stability). Vibrating in mills can cause premix compaction, which is not wanted for volume based micro-feeders.

Walter introduced Buhler technologies, different types of dosers and the technical restrictions involved.

The Sanku dosifier is a small scale dosifier for use at small scale hammer mills. The dosage rate is automatically adjusted to the flow rate of the maize. The machine is easy to install and training need is limited. The machine fits on the existing equipment, in the existing grain hopper. Together with the operation of the Sanku dosifier, production rates are recorded and reported, so also data are recorded from the rural areas on production.

Q: How do you deal with spare parts? Team is on the ground

Q: differences in performance of the feeder? Robust machine (maintenance low), flexible (in middle of working range): right machine on the right place is needed

Q: affordable? How long do the equipment lasts? Together with partners it is affordable, some programs deliver technology for free. Service teams are on the ground. Service is included when purchasing bags and premix.

Q: sustainable methodology of Sanku? Yes, we work together with other organisations, and once the mindset is shifted to fortification, this will be sustainable.

Maize flour fortification premixes – Quentin Johnson, Smarter Futures

Q: does the premix have an expiry date? Storage time of maize is low (within three months' consumption of most of it). The shelf life of the premix should cover that shelf life period.

Q: which Fe-source is recommended when Zn is included in premix? Anyone of the list. However, ferrous sulphate can porridge make turn green.

Maize flour fortification: quality control at the mill – Philip Randall

Quality control is important for process monitoring and surveillance. Best practices in flour quality control in flour fortification are discussed: sampling, premix quality, control tests, ... An important task is also the visit of an inspector.

Maize milling structure country presentation Tanzania and introduction to mill visits – George Kaishozi

The maize industry structure of Tanzania was presented. Maize from rural provinces is mainly transported towards Dar es Salaam for processing. It is estimated that 150,000 small scale mills exist throughout the country for milling maize for home use. The milling operation and challenges of small, medium and large mills were discussed.

DAY3: FIELD VISIT TO LARGE SCALE MILLS AND MEDIUM SIZE MILLS

Mill visits were organized to get a better view on the maize milling industry structure in Tanzania.

A first visit was organized to small hammer mills in the city region of Manzese. This region contains a large number of small scale hammer mills. Since some years, a milling association has been set up to unite and represent the small millers. The chairman of the milling association first made an introductory statement on the small millers' situation, after which three small mills were visited. The different production steps could be seen: grading, cleaning, conditioning, dehulling, milling and fortification (SANKU), packaging in labelled bags, storage.

The second visit was to a large maize mill (Basic Elements). This large mill processes especially maize into maize grits for the brewery industry. All parts from the mill were visited: intake zone, storage bins (4*5000Mt), cleaning, quality lab and milling. Quality test were shown (for maize and wheat) and also the I-Check for micronutrient analysis was demonstrated.

Acknowledgement to



DAY4: MAIZE FLOUR FORTIFICATION STANDARDS AND REGULATIONS; FOOD CONTROL – MODERATOR: SCOTT MONTGOMERY

Mill visits feedback – All

Manzese hammer mills with Sanku fortification unit

- Packaging and labelling is possible on small scale also
- Quality check possible with I-check
- A lot of woman are involved in the milling industry
- Training in grading is needed to prevent inferior products to be processed
- Food safety rules are not in place but product looks fine in quality
- Typical milling structure is in place and will remain in place in the future, population likes this type of processing. Millers want to be near the customer. No incentive to move outside the city.
- Incentives should be given to improve GMP (good manufacturing practices)
- Fortifying can be done even if no labels are on the bags.

Basic Elements visit: large mill

- Doser was not easy to reach, a platform is needed to reach the micronutrient feeder
- Quality inspection at place at the intake of maize grain
- Quality lab is present

Technical considerations for maize flour and corn meal fortification in public health: a joint consultation – Dr. Maria Nieves Garcia-Casal, WHO

It is recognized that there is much more variability in maize flour processing than in wheat flour and the same principles that apply for wheat flour fortification may not necessarily apply for maize flour fortification. WHO, in collaboration with the Sackler Institute for Nutrition Science and the Flour Fortification Initiative, performed a consultation on Technical considerations for maize flour and corn meal fortification in public health in 2013. The goal of this meeting was to review the industrial and regulatory technical considerations in maize flour and corn meal fortification. The presented papers were published in the Annals of the New York Academy of Sciences in a focus issue on maize processing and fortification. [<http://onlinelibrary.wiley.com/doi/10.1111/nyas.2014.1312.issue-1/issuetoc>] April 2014, Volume 1312 Technical Considerations for Maize Flour and Corn Meal Fortification in Public Health, Pages 1–112, Issue edited by: Juan Pablo Peña-Rosas, Maria Nieves Garcia-Casal, Helena Pachón.

WHO guideline: fortification of maize flours and corn meals with vitamins and minerals in public health – Dr. Maria Nieves Garcia-Casal, WHO

To set a new WHO-guideline on maize flour fortification, first a review on relevant publications regarding fortification on public health was made. Especially the impact of iron fortification was

assessed. Around 5700 Studies were inventoried from all over the world and in cooperation with different international partners: around 70 studies were identified as relevant and out of those only 5 were suitable to be used for the meta-analysis. Details of these studies were presented. A lot of information is not useful to only see the effect of maize fortification as wheat and maize fortification are usually started together. It could be concluded that fortification of maize flour reduces the risk of deficiency in children. There is a lack of evidence for adolescents and adult woman. No studies are available for men and pregnant woman.

Finally, the draft proposal for micronutrient levels to use in maize flour fortification was presented.

General remarks:

- Wheat and maize fortification work together in reducing micro-nutrient deficiencies, but it is difficult to separate the effect of only maize fortification on this.
- The Table is a guidance for countries, it is not necessary to change the regulations in your country based on the guideline if your fortification program is already working well
- How come to these guidelines if only limited studies are present? Not a lot of studies are known on maize meal but general things are known on micronutrient fortification which can be used in the guidelines.
- Every country needs to check themselves what is necessary in their country. You should make sure that you have evidence on the country situation. If no data are available, please check information from neighbouring countries which have similar nutritional status.
- If the standard is not leading to changes, you can change but you need evidence to support changes.
- WHO: global picture but some remarks:
 - ferrous sulphate: discoloration can but does not happen in every situation
 - indicate that problems can occur in footnote
- Biscglycinate shall also be included in the Fe-sources
- A table for the combination of wheat and maize needed: NO! not necessary;
- The table intends to have a table for the maize processing alone
- A fortification program is working as you know that the food product is consumed and has an impact on health.
- If food fortification is not feasible, you need to look for other options: example bio-fortification or sprinkles.

Discussions

Qn1: Different regulations of international organizations from country regulations. WFP has some standards that are being used by millers supplying flour to them. When will the standards presented on the tables be published for use by countries and how does it related to WFP standards?

A1: Use country adopted and adapted regulations. The table is a guide for new countries who are going to commence fortification. But is there is something working there is no need to change. These standards and regulation are not mandatory.

WFP standards could be based on the amount of food that is rationed to vulnerable people which may be less than the normal portion sizes for human consumption.

It is often good to do a pilot for the standards before adopting it as a national standard. Otherwise, resources could be invested in developing standards when they will not work for the country. Long-time observations

Qn2: you mentioned lack of monitoring data for adults except for children, but how did you come to the conclusion you presented.

A2: There was no randomized control trial group for fortified flour based on baseline information pre and after intervention.

Qn3: Do you give feedback to researchers when the quality of findings is low and through them out just like that. 5,000 records reduced to 5?

A3: It is true that working with 5 of 5,000 is not a good idea. The challenge is that there was an agreement to only look at maize separately on which very few studies had been done. This reduced the amount of targeted research

Q4: Some caveats to be place on the table because people tend to look at the table without details. Because people will not argue with WHO as the global health organization.

A4: It is true

Qn5: We have two tables for maize and wheat. Countries often use the tables as it is. Will there be a table that combines both?

A5: No

Qn6: In your view when can we say a fortification programme has working?

A6: Not the industry level. But important to measure impact.

Q7 We have known in Africa 80% of maize consumed by people come from small mills. How will WHO come with a guideline to countries for small scale mill fortification?

A7: the possibilities are there for small scale fortification and I think this meeting is going in that direction except there is need to control and guidance based on the realities on the ground.

Comments:

WHO still have a role to play in coming up with standards for maize fortification. At the moment some millers depend on standards by WFP and in the event that WFP pulls out what will be left. Standards can be conventionally applicable no matter where they are developed in the region.

Comment: the small mills are located in remote areas and monitoring and enforcement of standards may prove difficult. In this case some simple guidelines need to be developed to help them provide micro-nutrients for them.

It is important to know that we should deal with what is reality and doable. Otherwise, in such programme there is always going to be some sectors of the population not be covered.

Country presentations: maize flour standards - All

[South-Africa process](#) and [new standard being gazetted](#)

[Mozambique](#): Iron is 40 ppm for the industry but the range is 20-117 ppm

- ➔ High maximum: safe level needed for the upper attorney, so a safe level was set below the upper level
- ➔ Intrinsic Fe-content ranging between 20 and 110 ppm !!!=> range is for inspections
- ➔ Labelling on iron: within this limits and based on own quantity testing

[Malawi](#)

[Kenya](#)

[Namibia](#): draft is being made at this moment

[Tanzania](#)

[Benin, Burkina Faso, Cote D'ivoire, Guinee-Bisseau, Mali, Niger, Senegal, Togo \(UEMOA Zone\)](#): draft is being made at this moment for iron and folic acid, but you can include other fortificants. Benin, Burkina Faso, Cote D'ivoire, Guinee-Bisseau, Mali, Niger, Senegal, Togo

[Zimbabwe](#): levels are lower for maize than for wheat flour: why? Only a minimum! Why no max limit? East African standard: only a minimum, only for vitamin A because fat soluble, upper limits for some other because of trade issues. Standards need to meet also constraints of trade and WHO guidelines on minimum intake. Zimbabwe focusses on the fact that the premix is correct. Sugar similar as East-African standard.

[Rwanda-Burundi](#): not mandatory -> EAS 768 is recommended. Remark: total iron should not be added to the standard as this is not done for any other component.

[East African standards were also made available.](#)

[Maize fortification programmes: an online fortification data centralization system](#) – **Erin Smith/George Kaishozi, HKI Tanzania**

HKI Tanzania has developed an online computer system for data monitoring which connects all stakeholders for monitoring. The system contains a data entry module, a data quality module and a data security module. Reports can be automatically generated (example oil tonnage which is fortified). Data have been used for coverage studies, advocacy to government and monitoring. TFDA puts data in, TFNC puts in trainees' reports, HKI can summarize on the data and industries can follow the data changes. Currently, the government has taken over the guidance of the system from HKI to make it a sustainable system.

Q: is this program available for other countries?

HKI did develop this program with a computer expert. The platform can be shared with other countries.

Q: something for use on a smartphone by using apps?

This is a great idea, this should be developed

[Maize fortification: update on organoleptic studies of various types of maize flours and cooked maize porridges](#) – Filip Van Bockstaele, Ghent University

Sensory properties of fortified foods are very important to get those foods generally accepted by consumers. Several factors determine the quality of a maize meal porridge: maize meal composition and particle size; processing conditions and storage conditions. According to WHO guidelines, Fe-sources are the most likely to cause differences in product properties. Own research currently being conducted, shows that Fe-sources at concentrations according to WHO-guidelines do not impact porridge colour and pasting properties. Sensory trials conducted in Tanzania and Kenya also showed that fortified maize meal porridge was evaluated as acceptable by consumers. More research is needed on impact of storage conditions (high temperature/humidity)

At the end of the presentation, a sensory test was carried out by serving three portions of maize meal ugali to all the participants. They had to answer three questions:

- Q1: Do any of these samples differ? If yes, which one?
- Q2: Which one did you like most?
- Q3: Why?



The outcome of the sensory trial was that around 1/3 of the participants indicated no difference among the samples was present. So, of the other 2/3, preference to fortified/unfortified was 50:50. Comments on sensory differences are summarize in the table below.

	Q1	Q2 - like	Q2-dislike	Q3
1	yes	3		slightly sweeter
2	yes	3		texture, colour (whiter), good taste, sweeter
3	yes	3	1	smoother, very slightly
4	yes			3 is not fortified
5	yes	3		fine and more sweet
6	yes	3		1 and 3 have a bit more after taste
7	yes	3	1	sample 1 was bitter; sample 3 more sweet and round flavour
8	yes	1 and 3		n°2 is different sample 1 and 3 similar: coarsness 2 and 3 are the same, 2 tastier sour, sample 1 is saltier and texture is slightly smoother
9	yes	2		(different in colour - lighter) taste of 2 is better
10	yes	2		2: the taste is the same like in my country
11	yes	2	3	
12	yes	2	1 and 3	1 and 3 are whiter and ohter texture, 2 better taste
13	yes	1		sample 2-3 differs from 1 -> sample 1 more soft en smooth
14	yes			1 and 3 taste similar

'Premixes' -Presentations and Q&A with suppliers

Mühlenchemie, DSM and AkzoNobel

Can you use the premix beyond expiry date?

- ➔ You still can but the amount of micronutrients may not meet the required level when consumption

How sensitive are the B-vitamins for cooking?

- ➔ In the premix formulation an overage is taken in consideration to account for losses during transportation and cooking
- ➔ Not all is lost during cooking, they are far more stable than you think, temperature of the porridge does not go over 100°C

Price of folic acid has increased 10-fold

- ➔ Price fluctuates, premix suppliers stress that they perform strategic purchases when price is low

Panel discussion on sustainable ways of sourcing premix and other supplies for maize milling operations:

How to go forward with flour fortification in the future – sustainable fortification?

- Walter: Good partners and partners with feet on the ground
- Andrew Cihntala (miller): equipment, cheaper premixes?
- Percy (AkzoNobel): financing of SME's through possibly micro-financing options or through development banks?
- Enzama Wilson (consultant): small scale milling should go on, but is a challenge. Role of association for acquiring premix and equipment is important: small scale millers can invest in SANKU equipment.
- Comment Philip Randall: I tried to set up a small milling association in SA. Not easy, starting point is difficult: donorship needed but not really visible for a donor.
- Comment Dr. Eduarda: indeed, support associations for small millers. Business is important, this should be supported.
- Anna: maize milling is more complicated than salt production. They managed fortifying, thus maize millers can also do. Look for similarities.
- Comment: Vincent (Tanzania): sustainability is very important. Government needs to support further. For salt the government gave responsibility to the salt association for purchase, so they could get acquainted to purchasing and price setting. They need experience in this. Advocacy is really important, that people are aware of the goals and importance.
- Comment Zimbabwe: people need to know what fortification is for and what is its importance.
- Comment Enzama: creating demand is really important for making it sustainable; projects very important to start with, also taking into account the sustainability of the solution.
- Comment Percy: try to inform through social media / internet, everybody has a smartphone also in Africa. Easy way to inform people and manage the business.

- Comment Andrew: the people should be able to buy and invest themselves. We should leave the thought that they cannot buy it themselves. We need to inform also better. Lowering taxes is something which can be lobbied.
- Comment Walter: like the idea of cooperation. Business is important and you need to strengthen every individual in the company.
- Anna: SANKU was here because it is just an example, Africa should try to develop their own solutions
- Anna: premix suppliers take ingredients from over the world and mix together, it is not economical to mix in every country which is fortifying. Trade is necessary and important.

DAY 5: DEVELOPING THE ROADMAPS

Technical Working Groups: roadmap and recommendations

On the last day of the meeting, group-working sessions were organized. In the first part of the group sessions, participants joined a group according to their background or profession:

WG 1: Maize flour fortification at the Mill – Roller Mill

WG 2: Maize flour fortification at the Mill – Packaging hammer mill

WG 3: Maize flour fortification at country level - QA/QC

WG 4: Maize flour fortification Standards – National and Regional levels

At the second stage, people gathered in country groups to develop a road map, timeframe and recommendations for maize fortification in their country. The roadmap was developed according to a provided template.

Country group presentations:

- [Tanzania](#)
- [Togo-Benin-Burkina Faso](#)
- [Mozambique](#)
- [South-Africa](#)
- [Namibia](#)
- [Zimbabwe](#)
- [Zambia](#)
- [Malawi](#)
- [Rwanda-Burundi](#)
- [Kenya](#)
- [Uganda](#)

Official closing of the workshop:

Anna Verster (SF), Ronald Afidra (FFI), Andrew Chintala (Zambia, Millers), Raymond Wigenge (Tanzania, government) and Maria-Garcia (WHO) made final statements and thanks before closing this meeting.

Finally, Gerda van Schalwyck (South-Africa) read the [Statement of the maize fortification strategy workshop for Africa held from 3-7 October 2016 in Dar es Salaam](#), Tanzania, a Declaration to accelerate maize flour/meal fortification in Africa which ended with the words:

“Maize fortification in Africa,

let us now all do it”