

**Rwanda Industry Assessment Report**  
**Measuring the capacity of flour, sugar and oil industries to begin fortification**

**Rwanda Bureau of Standards and Ministry of Health**  
**With support from Project Healthy Children**  
**September 2009**

## **Executive Summary**

This assessment, conducted by the Ministry of Health (MOH), the Rwanda Bureau of Standards (RBS), and with support from Project Healthy Children (PHC), was completed in September 2009 over a period of four weeks. The goal of the assessment was to measure local industry's capacity, willingness and needed technical assistance to begin fortification. All operating producers of sugar, oil and flour identified by a registry within RBS were interviewed and industries assessed according to set criteria including production level and capacity; management structures; status of equipment, production lines and procedures; human resources; quality assurance and control structures including on- and off-site testing; market share; and willingness/knowledge around food fortification.

Rwanda's sugar and flour sectors are responsible for the majority of sugar and flour sold and consumed in the country (foreign imports account for less than 35% of sugar and less than 25% of flour). The oil sector, however, accounts for only a small portion of the domestic consumption (around 5%) with the majority of oil coming from Uganda and Kenya.

Based on the data obtained from the nine industries assessed, it is recommended that, with support from the MOH, RBS and PHC, fortification efforts begin in industries that a) show the greatest reach in terms of market and consumption and b) have the greatest capacity to scale-up allowing fortification to be adequately incorporated into existing processes. Although improvements are needed in all industries before fortification can begin in addition to the dissemination of best practices, technical assistance and funding support, this assessment identified the sugar and oil industries as having the greatest potential in terms of first staple product industries to begin fortification due to their widespread consumption among women and children and due to the current industry capacity to introduce fortification.

Adequate external quantitative testing will be critical for all industries that begin fortification and it is recommended that a central laboratory is establishment with the ability to test final products on a timely and reliable basis to ensure proper dosing of vitamins and minerals.

The results obtained from the assessment are heterogeneous among the different industries, both in term of technical capabilities and willingness to fortify. The data suggests, however, a series of common actions that could bring all industries to the required level to begin fortification. These actions include:

- Improvement of on- and off-site testing facilities;
- Assisting industries in purchasing and/or improving on appropriate equipment and production processes;
- Identifying appropriate sources for needed machinery and premix;
- Training on proper use of vitamins and minerals;
- The establishment of a central laboratory that has the ability to test final products on a timely and reliable basis to ensure proper dosing;

- Advocacy around health and cost benefits of fortification with the goal of increasing knowledge and awareness;
- Government backing to ensure a level playing field for all industries.

Through fortification, private industry has the potential to play an important role in addressing Rwanda's high rates of malnutrition and micronutrient deficiencies. With a committed effort from government and private industry, identified technical assistance provided, and a strong will and determination on the parts of all to take the next critical steps, Rwanda's flour, sugar and oil industries have the potential required to scale-up processes and procedures that would produce quality, fortified products.

## **Introduction**

In 2007, Project Healthy Children, in collaboration with the Ministry of Health (MOH) initiated a project to introduce a national food fortification program in Rwanda. The program started with a food consumption survey to identify potential vehicles for food fortification according to dominant consumption patterns among vulnerable populations, namely women and children. Staple products identified as potential vehicles and therefore assessed here included cassava flour, maize flour, wheat flour, rice, sugar, oil and salt. The current assessment evaluated the readiness of these industries to begin fortification on two main dimensions:

1. Capacity to implement food fortification: including an analysis of plant and production processes, workforce skills, quality control systems and procedures already in place and/or the capacity to establish them; and
2. Willingness of the owners and management team to fortify their products: including the thoughts of decision makers on fortification, their opinions on the issues that need to be overcome for a successful implementation and their willingness to participate in such program.

Defining the status of these industries will inform the program design by identifying gaps in the current industry situation that will need to be addressed in order to properly initiate fortification.

## **Methodology**

Information was collected from nine companies in Rwanda that produce foods which represent the best prospects for fortification vehicles due to the large percentage of population who consume them and ease with which vitamins and minerals can be added to them.

Data was collected from seven flour producers that process different grains, primarily cassava, maize and wheat, one oil producer and one sugar producer. An interview guide developed by the MOH, RBS and PHC was used to direct the ninety-minute long interviews conducted with each industry's management teams, usually consisting of the company's CEO and production manager. In addition to interviews, inspections, documented through photographs and drawings, were conducted for each facility's production process. A list of all interviewed industries assessed including location and contact information can be found in Annex 1. A summary table of information for each industry based on established criteria is presented in Annex 2.

Additionally, a market assessment was completed that consisted of visits to five different markets and shops in order to observe the kinds of products that are available including brand name, price, origin, and whether the product was labeled as fortified. The markets and shops included two street markets (Kimisagara and Kimironko), one local shop Nyabugogo, one local supermarket (Seven Eleven), and two high- end supermarkets (Simba and Nakumatt).

## Findings

### **Sugar Industry**

Rwanda's only sugar industry, Kabuye Sugar Works, currently covers approximately 60% of the domestic market with a single product/line of brown sugar (producing approximately 8,500 tons per year). Although they have the production capacity to cover 100% of Rwanda's sugar market, a lack of sugar cane from local farmers prevents them from reaching whole market coverage.

#### *Equipment and Production*

The sugar industry in Rwanda has state of the art equipment requiring little needed intervention to add fortification as an additional step in the production process. Kabuye is highly automated indicating a capital-intensive business model within which additional fortification equipment will not present a significant investment and ensures industry experience in the use of automatic equipment. A mixer is used to mix sugar cane with milk of lime. Sugarcane is stored outside and the final product is stored in a room inside in 50kg bags, according to RBS standards.

#### *Quality Assurance and Control*

A functioning internal laboratory exists allowing for continuous tests to be run (every hour during production) on final products to ensure consistent quality over time. Samples are sent to external labs for microbiological testing, although this is not done on a regular basis.

#### *Human Resources and Training*

The most quantifiable dimensions we gathered to evaluate the level of the human resources in each industry were the type of training provided to managers and employees and the qualifications required for new hires. We believe these to be good proxies of the overall quality and skills of the people in any specific industry.

Within Kabuye, there are no requirements for most workers yet there is an expert leading every section of the process. Workers are exposed to on-the-job learning by working side-by-side with senior employees.

#### *Marketing and Views on Fortification*

The financial controller is responsible for Kabuye's marketing. This industry has not considered fortification and did not appear open to adopting it due to an increase in price for which customers are not willing to pay for (the scarce importance of food fortification when there are still people starving) and sugar being a luxury item and therefore not consumed regularly by all people. Additionally, Kabuye quoted the failure of sugar fortification in Uganda, where the fortifying production line had to be closed because the product did not get sold (customers were not willing to pay the additional price for benefits they did not see).

## **Oil Industry**

The only oil industry in the country, Palmalac Oil Company, covers a small percentage (around 5% or 2000 tons per year) of the total market, which is dominated by international players from Uganda, Kenya and Tanzania. Palmalac, producing vegetable oil, is a new industry to Rwanda (operating since January 2009) still only reaching 20% of its capacity but growing.

### *Equipment and Production*

Like the sugar industry, Palmalac has state of the art equipment where there will be little intervention needed to add the fortification steps in the production process. They also are highly automated indicating a capital-intensive business model within which the additional fortification equipment will not represent a significant investment. Palmalac currently has a mixer and a dosifier.

### *Quality Assurance and Control*

Palmalac has internal laboratories that allow them to run continuous tests every hour during production on their final products to ensure a consistent quality over time. Additionally, they regularly send sample to RBS for external testing. Although this industry stated they have a quality manual, they do not have any quality assurance or quality control standards that they could indicate are being followed. It should also be noted they reported that RBS has never inspected their facility.

### *Human Resources and Training*

Staff members are trained internally on hygiene and conduct. Qualifications include degree requirements for specific positions.

### *Marketing and Views on Fortification*

Currently, Palmalac only sells in Kigali but they plan to expand into other areas. Although this assessment found that Palmalac never thought about fortification, a subsequent visit inspired their interest in starting fortification and identified the need to provide technical assistance and equipment. Although costs were a concern for the industry, if support was provided they would be willing.

## **Flour Industry**

The flour sector, representing seven different industries, holds a great degree of variation including a big international player (Pembe Flour Mills producing wheat flour) operating at full capacity (producing around 28,000 tons per year), a big local player (Minimex producing maize flour) operating at only 8% of its capacity due to lack of incoming maize (producing around 1,700 tons per year), and a few small local industries with different degrees of sophistication<sup>i</sup>. Three of these industries (Minimex, Nyagatare Enterprize producing maize flour and COVEPAR producing cassava flour) produce a single product, while the other four (Sosoma Industries producing a combined maize, sorghum and soya flour, Pembe Flour Mills, Shekina

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<sup>i</sup> Sosoma Industries (2,000 tons per year), Nyagatare Enterprize (340 tons per year), Shekina Enterprises (120 tons per year), COVEPAR (900 tons per year), COAMV (2300 tons per year)

Enterprises producing sorghum, wheat, and millet flour and COAMV producing maize flour) have experience in producing and selling multiple products.

### *Equipment and Production*

Pembe and Minimex operate with advanced technology, mostly automated and computerized while the remaining industries<sup>ii</sup> operate with old machineries and predominantly manual processes. Like the sugar and oil industries, Pembe and Minimex will need limited intervention in terms of equipment to introduce fortification into their production. Both Pembe and Minimex have mixers and dosifiers.

The remaining flour industries currently do not have the equipment to introduce external elements into the flour<sup>iii</sup>, and given their small size and minimal and old equipment, they do not have the financial capital for such investment. In order to ensure proper fortification from these industries, some financial incentives (e.g. tax deductions, loans, grants, etc.) are required to allow them to invest in the necessary equipments.

### *Quality Assurance and Control*

Although Minimex has internal laboratories that allow them to run continuous tests (every hour or so during production) on their final products to ensure a consistent quality over time, their current internal laboratory is used only to test brews (used for beer production in Europe) and not flour. Additionally, they regularly send sample to external laboratories.

Although Shekina Enterprises and COVEPAR don't have an internal laboratory, they regularly (once a month) send samples of final products to external official laboratories for the appropriate tests. Two external laboratories are used by industries in Rwanda, the RBS laboratory of recent construction and the National University Laboratory. It should be verified, though, that these external laboratories are capable of performing the required tests to ensure appropriate levels in addition to ensuring that these laboratories have the necessary equipment to perform these tests.

Sosoma Enterprises, Pembe Flour Mills, Nyagatare Enterprize and COAMV do not have an internal laboratory and do not send regularly samples of finished products externally to be tested. Pembe, however, uses a lab in Mombasa, Kenya to check for the inputs (wheat) characteristics in order to know how much premix to add to their fortified flours and to check the quality of what they are buying. According to the size and capital availability of each industry, internal laboratories could be constructed or formal procedures to send regular samples to an authorized external laboratory for the proper testing could be established.

### *Human Resources and Training*

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<sup>ii</sup> Sosoma Industries, Shekina Enterprises, COAMV, Nyagatare Enterprize and COVEPAR

<sup>iii</sup> With the exception of Sosoma Industries who has a manual dosifier and mixer (it is questionable, however, how accurate and reliable this system can be)

Sosoma, Nyagatare Enterprize and COAMV have similar staff qualifications. Those hired for top management positions are required to have college degrees while technicians are required to have working experience. Pembe and Minimex require technical or secondary schooling and work experience while Shekina Enterprise and COVEPAR have no requirements or qualifications for their workers, although COVEPAR hires external consultants when needed.

In terms of training, Sosoma, Pembe, Shekina Enterprise and COAMV all have some basic internal on-the-job training while external training is provided for specializations (usually management training through RBS or, in Pembe's case, in their other factory locations). Minimex, Nyagatare Enterprize and COVEPAR provide internal on-the-job training only.

#### *Marketing and Views on Fortification*

Minimex, COVEPAR and COAMV had not heard about food fortification or thought about implementing it. In this case there is the need for some knowledge transfer and advocacy around the program underlining the beneficial trade off between cost and impact and potential competitive edge.

Nyagatare Enterprize and Shekina Enterprises would like to fortify their products but have financial and knowledge constraints that prevent them from implementing. They specifically lack the capital required for the investment on new equipment, the technical knowledge on how to fortify and the market knowledge on where to purchase the proper vitamin and mineral premix. Training is therefore needed on fortification processes in addition to connections with vitamin and mineral premix producers and assistance finding capital required for the investment (grants, loans, government subsidies etc.).

Sosoma Industries and Pembe Flour Mills<sup>iv</sup> are already fortifying some of their products. Sosoma is adding to one of its six flours a premix of vitamins and minerals imported from South Africa. Pembe is adding to both its two flours a premix of anti-oxidants and enzymes imported from Turkey. The accuracy and equipment used for fortification is, however, very different between the two industries. Pembe has an automatic dosifier and mixer and Sosoma performs all processes manually with a lower degree of accuracy. In this case they both have the knowledge on how to implement fortification and there is only the need to share with them the best premix that needs to be added to the flour and the sufficient processes and quality control measure required to meet appropriate standards. Sosoma plans to export once certified by RBS.

In terms of market coverage, Pembe sells within Rwanda and exports to the Congo and Burundi. Shekina Enterprises produces predominantly for Rwanda but does export some product to Belgium, UK and US. COVEPAR exports 100% of its

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<sup>iv</sup> For the current fortification Pembe has in place, the fortifier is too concentrated and they need to manually mix it with the flour before to include it in the automatic process to dilute it - this manual operation is done with a small scale and a separate mixer and performed by the chief mill officer.

production to France selling it to one wholesaler who then manages the distribution in France. Sosoma plans to export once certified by RBS and sells mostly to NGOs and the Ministry of Health within Rwanda. Minimex, Nyagatare Enterprize and COAMV produce only for Rwanda.

### **Market Assessment**

From the markets and shops visited, 47 vegetable oil products, 6 wheat flour products, 5 maize flour products, 2 mixed flour products, 12 'other' flour products, 5 white flour products, and 5 brown sugar products were found. It should be noted that the same brand sold in different quantities were counted as separate products.

Vegetable oils were found from Rwanda, Uganda, Kenya and the UAE; wheat flour was found from Rwanda and Turkey; maize flour was found from Rwanda and Uganda; mixed flour was found from Rwanda; 'other' flours were found from Rwanda, Uganda, Kenya and the UAE; white sugar was found was Thailand, Uganda and Malawi; and brown sugar was found from Rwanda, Uganda, Burundi and Zambia.

The following products were labeled as being fortified on the packaging:

- Bul Fortune vegetable oil in 20 liters and 5 liters from Uganda fortified with vitamin A found in the street market Kimisagara and the shop, Nyabugogo respectively.
- Golden Fry and Mukwano vegetable oils of varying liter sizes from Uganda fortified with vitamin A with at least one found in all assessed markets and shops depending on the liter size.
- USAID fortified vegetable oil with vitamin A was found in Kimisagara, Kimironko and Nyabugogo
- SOSOMA 2 (mixed flour of soy, sorghum and maize) from Rwanda fortified with a mix of vitamins and minerals was found in Simba and Nakumatt.

The change in price between fortified and non-fortified products did not follow a consistent pattern. For example, a 3 liter bottle of fortified Golden Fry oil sold in Kimironko is 2800RWF compared to a 3 liter bottle of non-fortified Palmalac oil sold in Simba is 3400RWF, representing a 21% increase. However, a 5 liter bottle of fortified Mukwano oil sold in Kimironko is 4800RWF while a 5 liter bottle of non-fortified Palmalac oil sold in Kimironko for the same price.

Products from all industries assessed were found in the markets and shops except for one maize flour producer in Kigali, Super Miller Maize Flour, who was not found on the RBS registry and was therefore not included in the industry assessment.

## **Recommendations**

For any of the aforementioned sectors, there is need to disseminate best practices, address financial and acceptability constraints, and provide technical assistance and funding support to initiate and scale-up fortification. Based on this assessment, the sugar and oil industries show the most promise in terms of first products to begin fortification due to their widespread consumption among women and children and the current industry capacity.

### *Fortification advocacy*

Most of the industries lack the knowledge or willingness to start such a program and, even if informed and convinced, most of them do not have the necessary equipment and defined procedures to begin such an initiative. With that said, the steps required to ready these industries to begin fortification are generally minimal and might start by

preparing a business-oriented sales pitch highlighting the benefits of food fortification as a critical step needed to prevent micronutrient deficiencies to complement other nutrition interventions being carried out in Rwanda and identifying the costs associated with fortification efforts. This sales pitch should include three elements:

- Data on causes and consequences of vitamins and mineral deficiencies
- Data on how and why fortification will help to address this problem
- Data on the cost-effectiveness for industry, government and consumer.

The overall message should be that fortification is a very cost effective way to provide a significant improvement in the health of Rwandans and that the government is going to mandate and support its introduction. The delivery of this message could be done through a mandatory workshop for all industries operating and selling in Rwanda. Attention should be given to the sugar fortification issue in Uganda that was cited by Kabuye. Here the first step is to gather factual data to prove that sugar fortification can be successful and analyze what went wrong in Uganda proposing solutions to solve those issues.

### *Equipment improvement*

Although the oil, sugar industries and a limited number of the flour industries are automated and equipped enough to need little intervention to introduce fortification in their production, most industries will need financial and technical assistance to acquire the necessary machineries and include them in the production processes. The main obstacle in this step is the lack of the required capital for most of the smaller industries, therefore it is necessary to find and make available a financing solution that can be accessed by all these industries. Some alternatives could be a government subsidy for investments in fortification equipments, a special grant, or a loan.

### *Fortification specific training*

Once industries are able to acquire the necessary equipment, it is critical that their employees know how to properly fortify (e.g. how to mix the product with the premix in the right quantity and at the right production step, how to ensure a constant quality of the output, etc.). This can be done with an initial mandatory training for key

personnel from each industry followed by an annual check/update to make sure capabilities are maintained and updated.

In order to facilitate the change in their process, industries must also be provided with a contact list of recommended vitamin and mineral premix producers and assistance in finding the capital required for the investment (grants, loans, government subsidies etc) in addition to equipment suppliers and repair options. Technical consultants may also be necessary in order to determine what equipment and retrofits may be needed. For industries that are already fortifying, Sosoma and Pembe, support in identifying the best premix to use may also be required.

#### *Frequent and reliable testing of final products*

Most industries have some quality control procedures, but they range from very informal rules followed by low skilled technicians<sup>v</sup> on the floor to formally documented procedures enforced by a specifically trained manager. The key differentiator noticed during the study is the amount of testing done on the final products. Overall, given that most of the analyzed industries do not have capacity for internally testing their final products, the most reliable and cost effective solution to ensure accurate fortification across all industries would be to establish an official laboratory (e.g. RBS or KIST laboratory). It will be critical from a cost and a control point of view to ensure the official laboratory has the necessary equipment and trained personnel to perform appropriate tests on fortified products and establish an enforced protocol whereby each industry must send a sample of all finished products once a month to this laboratory. This will allow the government to control the proper execution of the program and to intervene if something is not going as planned.

#### *Government mandate*

No matter how small the additional cost of fortification, it will require either an increase in the price of the final product or a decrease in the margins for the industry, potentially harming its competitiveness. For this reason, without expensive market researches and pilots to prove that Rwandans are willing to pay extra for fortified food, to have a country wide implementation of the program it would be prudent for the government to mandate its introduction once it has put in place all the actions to allow the industries to successfully execute the mandate.

In addition to mandatory regulation, in order to support the industries both within and outside of Rwanda, the government should develop a consumer awareness campaign as part of other nutrition education efforts to develop demand and preference for fortified products in the market. The government is an authority on aspects of health and a message from the President, Minister or other officials will be extremely influential. In addition, because the marketing effort in the analyzed industries is minimal, focused mainly on operating the distribution network to reach the local market and some of the industries do not have a manager responsible for this area exclusively<sup>vi</sup> or at all,<sup>vii</sup> this function should be supported by the government and consumer organizations.

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<sup>v</sup> Nyagatare Enterprise and COVEPAR

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<sup>vi</sup> Kabuye Sugar Works and Sosoma Industries have the role of marketing manager blended with other management functions

<sup>vii</sup> Pembe Flour Mills and COVEPAR do not have a manager responsible for marketing

Annex 1: Industries Assessed

Industry name	Location	Contacts
Kabuye Sugar Works	Kigali	V. Sreenivasa Rao, Production manager, +250 0750509049
Palmalac	Kigali	Santosh B. Pawar, Production manager, +250 0783771041 <a href="mailto:palmalac2006@yahoo.ca">palmalac2006@yahoo.ca</a>
Sosoma Industries	Kigali	Thaddèee Musabyimana, General director, + 250 08304189 <a href="mailto:thaddemu@yahoo.fr">thaddemu@yahoo.fr</a>
Pembe Flour Mills	MUSANZE	Hakim, Accountant, +250 788307072 <a href="mailto:hakim@pemberwanda.com">hakim@pemberwanda.com</a>
Minimex	Kigali	Ngamije Lambert, Marketing manager +250 0788304627 <a href="mailto:klingamije@yahoo.fr">klingamije@yahoo.fr</a>
Enterprize Nyagatare	Kayonza	Nkurunziza Jean de Jien, General manager, +250 0788673683 <a href="mailto:nkurujede@yahoo.fr">nkurujede@yahoo.fr</a>
Shekina Enterprises	Shyorongi	P. Damien Mbatezimana, Managing Director, +250 0788592198 <a href="mailto:sheki05@yahoo.fr">sheki05@yahoo.fr</a>
COVE-PAR	Huye - Butare	Basonere Yvette, Secrétaire comptable, +250 0788864717 <a href="mailto:steveloyvette@yahoo.fr">steveloyvette@yahoo.fr</a>
COAMV	MUSANZE	Nibishaka Thaddie, President, +250 0788584691 <a href="mailto:coamv@yahoo.fr">coamv@yahoo.fr</a>

Annex 2: Industry Summary by Assessed Criteria

Industry	MT/day	% time idle	MT/yr <sup>viii</sup>	Products	QA/QC status	HR status	Equipment	Marketing personnel /Reach	Fortification Knowledge/ Willingness	Comments
Kabuye Sugar Works	27	50%	8,500	Brown sugar	- Internal lab, testing final produce every hour - Regularly sends samples to external lab <sup>ix</sup>	- Most employees hired without specific requirements - Simple internal training provided	- State of the art equipment - Automated systems	- Marketing manager is combined with the roles of production and finance - National distribution	Knows about fortification and is openly against <sup>x</sup>	Covers 60% of domestic sugar market; could cover whole market if sufficient sugar cane was available
Palmalac	30	80%	2,000	Vegetable oil	- Internal lab testing final product every hr - Regularly sends samples to external lab	- Specific education or work experience required - Internal training provided	- State of the art equipment - Automated systems	-Currently, only selling in Kigali but hope to expand	- Willing if assistance is provided	Makes up 5% of total market. Dominated by international players (Uganda, Kenya, Tanzania). Palmalac started in Jan 09.

<sup>viii</sup> Estimate based on average production per day and number of days of operation per year

<sup>ix</sup> External labs include Kigali Institute of Science and Technology (KIST), Rwanda Bureau of Standards lab and National University Laboratory.

<sup>x</sup> Reasons given by Kabuye for being against fortification include: customers not willing to pay increase in price, limited importance of food fortification when there are still people starving, sugar being a luxury item and not something consumed regularly by all people, the failure noted of sugar fortification in Uganda (production line closed because customers not willing to pay increase in price for benefits they did not see)

Sosoma Industries	6	50%	2,000	7 different mixtures of maize, sorghum and soya flours	<ul style="list-style-type: none"> <li>- No internal lab</li> <li>- No samples sent regularly to external lab</li> </ul>	<ul style="list-style-type: none"> <li>- Hire requirements include college degree for top mgmt, 3 yrs working experience for other workers</li> <li>- Internal and external training provided</li> </ul>	<ul style="list-style-type: none"> <li>- Older machines</li> <li>- Manual processes</li> </ul>	<ul style="list-style-type: none"> <li>- Marketing manager is combined with roles of production and finance</li> <li>-- National distribution</li> </ul>	<ul style="list-style-type: none"> <li>- Already fortifying flours using premix from SA</li> <li>- Done manually with little accuracy</li> </ul>	
Pembe Flour Mills	78	0%	28,000	4 types of wheat flour	<ul style="list-style-type: none"> <li>- No internal lab</li> <li>- Samples sent irregularly to external lab (RBS)</li> <li>- Kenya lab is used to test wheat to check quality and to ID how much premix to add</li> </ul>	<ul style="list-style-type: none"> <li>- Hire requirements include technical schools and experience</li> <li>- Internal and external training provided</li> </ul>	<ul style="list-style-type: none"> <li>- Advanced technology, mostly automated and computerized</li> </ul>	<ul style="list-style-type: none"> <li>- No manager responsible for marketing</li> <li>-- National distribution</li> </ul>	<ul style="list-style-type: none"> <li>- Already fortifying both flours with an anti-oxidant and enzymes premix from Turkey</li> <li>- Automatic dosifer and mixer</li> </ul>	

Minimex	11	92%	1,700	Maize flour	<ul style="list-style-type: none"> <li>- Internal lab with ability to only test for breets (for beer production)</li> <li>- Analyzes incoming maize once a month</li> <li>-Buying breweries take samples once a week from each delivery &amp; analyze</li> </ul>	<ul style="list-style-type: none"> <li>- Specific education or work experience required</li> <li>- Internal training provided</li> </ul>	<ul style="list-style-type: none"> <li>- Advanced technology, mostly automated and computerized</li> </ul>	<ul style="list-style-type: none"> <li>- Sells to schools and military barracks.</li> <li>- Sells only in Kigali</li> </ul>	Have not heard about fortification or thought to implement it	Operating at low capacity due to lack of incoming maize
Enterprize Nyagatare	2	53%	340	Maize flour		<ul style="list-style-type: none"> <li>- Specific education or work experience required</li> <li>- Internal training provided</li> </ul>	<ul style="list-style-type: none"> <li>- Older machines</li> <li>- Manual processes</li> </ul>	<ul style="list-style-type: none"> <li>- National distribution</li> </ul>	- Interested in fortifying but have financial and knowledge constraints <sup>xi</sup>	

<sup>xi</sup> Specifically, these two industries lack the capital required for investment in new equipment, technical knowledge on how to fortify and market knowledge on where to purchase vitamin and minerals, premix and equipment.

Shekina Enterprises	0.5	25%	120	5 types of flour including: sorghum, wheat, millet and cassava flour and cassava leaves	- No internal lab - Once a month samples are sent to external lab	Most employees hired without specific requirements - Simple internal training provided <sup>xii</sup>	- Older machines - Manual processes	- Wide distribution throughout the country	- Interested in fortifying but have financial and knowledge constraints	
COVEPAR	2.5	0%	900	Cassava flour	- No internal lab - Once a month samples are sent to external lab	- Most employees hired without specific requirements - Simple internal training provided	- Older machines - Manual processes	- No manager responsible for marketing - Exports 100% to France - No plans to start selling in Rwanda	Have not heard about fortification or thought to implement it	
COAMV	9	28%	2,300	Maize flour	- No internal lab - No samples sent regularly to external lab (once in the last 3 yrs when RBS came to check the facilities they also took a sample to test)	- Hire requirements include college degree from mgmt and secondary technical school for technicians - Internal and external training provided	- Older machines - Manual processes	Wide distribution throughout the country	Have not heard about fortification or thought to implement it	

<sup>xii</sup> It should be noted that Shekina Enterprises' production manager receives external training

### Annex 3: Industry specific improvements needed to begin fortification

Industry	Recommendations
Sosoma	<ul style="list-style-type: none"> <li>• Upgrade equipment and production lines (need for automation).</li> <li>• Increase the frequency of tests on finished products.</li> <li>• Acquisition of a dosifer</li> <li>• Establishment of an internal quality control system</li> <li>• Since RBS can only test general composition of products and not specific elements (e.g. they are not able to see what is inside the fortifying premix they buy from South Africa), there will be need to identify where/how this can be done for all industries. Currently, this capacity does not exist in Rwanda and Sosoma is talking with the Kenya Bureau of Standards to have these tests done. Since the completion of this assessment, it has been found that KIST has the ability to test for micronutrient composition of products.</li> </ul>
Pembe	<ul style="list-style-type: none"> <li>• Introduce an internal laboratory for more frequent and real-time tests.</li> <li>• Establish an internal quality control system/standards.</li> <li>• Increase frequency with which external samples are sent to RBS.</li> </ul>
Minimex	<ul style="list-style-type: none"> <li>• Introduce an internal laboratory and quality assurance/control that can test flour products.</li> </ul>
Nyagatare Enterprize	<ul style="list-style-type: none"> <li>• Upgrade all production processes and equipment (need for automation).</li> <li>• Establish internal and external testing.</li> </ul>
Shekina Enterprises	<ul style="list-style-type: none"> <li>• Upgrade equipment and production lines (need for automation).</li> <li>• Introduce an internal laboratory for more frequent and real-time tests.</li> </ul>
COVEPAR	<ul style="list-style-type: none"> <li>• Upgrade equipment and production lines (need for automation).</li> <li>• Need to develop domestic market (COVEPAR export 100% of its products to France).</li> <li>• Develop internal testing.</li> </ul>
COAMV	<ul style="list-style-type: none"> <li>• Upgrade equipment and production lines (need for automation).</li> <li>• Increase the frequency of tests on finished products internally and</li> </ul>

	externally.
Kabuye Sugar Works	<ul style="list-style-type: none"> <li>• Convince management that fortification can be successful.</li> <li>• Acquire fortification equipment and provide training.</li> <li>• Introduce regular external testing.</li> </ul>
Palmalac Oil Company	<ul style="list-style-type: none"> <li>• Convince management that fortification can be successful.</li> <li>• Acquire fortification equipment and provide training.</li> <li>• Ensure appropriate quality standards are being followed.</li> </ul>

