



East, Central and Southern African
Health Community



MANUAL FOR INTERNAL MONITORING OF MAIZE FLOUR IN SMALL SCALE OPERATIONS

(Quality Assurance (QA))

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Foreword

Over the last five years, the East, Central and Southern African Health Community (ECSA-HC) has continued to undertake advocacy and technical assistance to assist member countries to embrace and scale up Food Fortification initiatives as a key strategy to reduce micronutrient malnutrition in the region.

ECSA has been working with partners in direct response to resolutions of the Conference of Health Ministers to scale up Food Fortification initiatives as a critical plank in fighting the devastating effects of micronutrient malnutrition among populations of member states. ECSA partners in the Regional Food Fortification Initiative include the A2Z Project, USAID, UNICEF, Micronutrient Initiative (MI), and ICCIDD, among others.

Part of the outcome of the intensified collaborative initiative, is a series of fortification guidelines developed to guide the Industry during the fortification process of staple foods and provide government food inspectors a reference point in enforcing the standards.

Similarly, food control manuals have been developed for the Industry and the Government to provide technical reference resources that cover the entire fortification process to ensure that the fortified foods are safe and adequately fortified with the required fortificants.

This manual is part of a series of manuals on food fortification and is meant to directly contribute to the overall effort to strengthen food fortification in the region.

It is our hope that the use of this manual will help strengthen food control activities in our countries in order to deliver safe and quality fortified foods to the ECSA population.

Steven Shongwe
Executive Secretary
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The manual is as a result of joint work by distinguished food fortification experts in developing countries. During the drafting of this manual, consultations with senior officers from food control departments of the ECSA member states were made and input incorporated.
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Disclaimer

The content of this manual can be adapted to suit country specific contexts. In such a case, the content of the resulting document will be the sole responsibility of the organization adapting the manual and will not represent the views of the authors and that of the ECSA-HC. The Use of the content of this manual should be duly acknowledged.

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MANUAL FOR INTERNAL MONITORING OF MAIZE FLOUR IN SMALL SCALE OPERATIONS (Quality Assurance (QA))

Maize flour (maize meal) is a major staple food in many developing countries. It is the main source of energy in many communities and it is processed in the communities using very simple mills. Because of its extensive reach into vulnerable communities, a number of institutions are attempting to fortify maize flour at this level. However this task poses serious challenges in terms of sustainability, management, quality control and supervision. Despite the challenges, fortifying maize flour at small scale level still demands that the premix is added in a manner consistent with local standards if it is to be safe and of benefit to the targeted consumers. This calls for adherence to basic quality assurance procedures by the mill operators although not to the extent of large scale millers. In small scale operations, quality control tests are not practical and so only quality assurance practices are advocated. These practices include storage and management of the premix, use of suitable packaging and labeling, and the use of simple forms for recording the use of the premix in relation to flour produced. Small scale mills are typically defined as those productions of less than 1 metric ton of fortified flour per hour¹.

Some small scale mills add the premix to the flour or grain as it is fed into the mill feed hopper and utilize the milling process to ensure proper mixing. Other operators would collect the flour in batches and using volumetric measures or weights, add specific amounts of premix followed by blending of the flour and premix. Depending on the level of sophistication, the blenders are hand operated or electric operated. In more sophisticated small scale operations, automatic feeders may also be utilized to add the premix at a specific rate in line with the flow of the flour produced.

Whatever the situation is, in terms of premix addition and mixing procedures, some basic quality assurance procedures need to be adhered to. Government inspectors should visit the mill operations to perform both quality control as well as inspection duties. Quality control is normally the responsibility of the millers but due to limited capacity by small scale millers, the government should take up the obligation of collecting and testing flour samples. Auditing and Inspection work still remains the duty of the government.

The premix used for small scale operations is sourced from the same manufacturers as the larger operations and in the same form. However, the operations at small scale require preparation of *preblends* which are a dilution of the fortificant with the maize flour. The preblend may be produced by the mill on site or by one central mill and distributed to other mills within the area ready for use. Premix here refers to the vitamin and mineral mix provided by serious manufacturers.

This short manual describes the steps to be taken by the miller in order to ensure that the fortified maize flour is produced in a safe manner and contains adequate amounts of micronutrients for the benefit of the consumer.

¹ Philar, R., Johnson, Q. (2005). "Small Scale Mill Fortification Manual." The Micronutrient Initiative, Ottawa, Canada.

QUALITY ASSURANCE OF THE PREMIX AND PREBLEND RECEIPT, STORAGE AND USE

I. Objectives and Accountability

- The purpose of the quality assurance of premix and pre-blend receipt, storage and use is to ensure that:
- The maize mill always has enough premix/pre-blend inventories for at least 2 months of operation.
- The premix (or pre-blend) is stored under appropriate conditions and is used based on the “first-in, first-out” basis.
- Those directly responsible for achieving these objectives are the people in charge of the mill operations.

II. Procedures

a. Receipt and Storage of Premix (or pre-blend)

1. Every time a new lot of premix/pre-blend is received at the mill from the supplier, the mill operator shall check that the containers are sealed and a certificate of analysis is available. Both premixes and preblends should specify the amounts and types of vitamins and minerals per kilogram, as well as the addition rate. If the mill prepares its own pre-blend from premix, operator should record information in **Table A-1** and **Table A-2**. If however the mill uses ready-to-use pre-blend record information in **Table A-2**.
2. Mill operators shall record details directly into a form presented in **Table A-1** indicating the amounts of premix that is received, the lot number, and the name of the supplier. When the mill receives or produces ready-to-use pre-blend, record the information in **Table A-2**. Whenever pre-blend is produced or received, use different rows for recording data and immediately transfer preblend figures to **Table A-2**.
3. Store the premix or the preblend in a clean dry area and away from chemical products or other potential contaminants.
4. Stack premix or preblend in such a way that the first that arrived is used first, following the “first-in, first-out” system.
5. Order premix or preblend when the balance is only sufficient for 2 months of normal flour production capacity.

b. Production of preblend (diluted premix)

Preblends are produced for the purpose of increasing addition rates and hence facilitate proper mixing of fortificant with flour. Large scale maize fortification operations purchase concentrated premix from suppliers which requires addition rates ranging from 100 and 400 g per ton. This is equivalent to an addition rate of 0.1 g to 0.4 g premix per kg of maize flour (i.e. dilutions of 1:4,500 to 1:10,000). This amount of premix is too small to weigh out accurately and ensure uniform mixing in conditions typical of small scale operations. As a result it is advisable to dilute the premix with the maize flour to produce a preblend that can be added

at higher addition levels and reduce errors due to dilution. Experiences in countries where small scale fortification takes place indicate that addition rates ranging from **10 g and 30 g preblend per kilogram of maize flour** are manageable and produce acceptable products.

This addition is equivalent to dilutions of 1:33 to 1:100.

If a micronutrient premix is provided with an addition rate of 200 g per metric ton (equivalent to 0.2 g per kg or a dilution of 1:5,000), it has to be diluted to increase the amount to use. To achieve a 1:5000 dilution a two-step dilution of 1:50 and 1:100 is used. A convenient procedure used in small scale operations is to make preblend dilutions in quantities that are easily manageable within a typical mill such as in 50 kg or 250 kg batches. The details for dilution of 1:5000 at small scale may be achieved as presented in the table below

	Procedure	Equivalent Dilution	Notes
1	Make a preblend by adding 1 kilogram of premix to 50 kilograms of maize flour to make 51 kg of preblend.	Dilution = 1:51	<i>Similar dilution may be achieved by adding 400 g premix to 20 kg to make 20.4 kg of preblend</i>
2	Using preblend from (1) above, add 2.5 kg preblend to 250 kg flour (or 5 bags of 50 kg) ² . This is the same as adding 0.5 kg preblend to 50 kg of fortified flour.	Dilution = 1:101	<i>The final dilution is equivalent to that in a large mill of 1:5000, but achieved in two steps (51 x 101 = 5,151 ≈ 5,000)</i>

² An accurate addition should be 2.5 kg in 247.5kg of flour for a dilution 1:100. However, it is easier to measure 250 kg of flour, and the final concentration of nutrients is within acceptable levels.

6. When pre-blend is produced locally, update figures in **Table A-1 and Table A-2**

7. Store the preblend in 50 kg or 20 kg polypropylene bags and label appropriate as described in (c) below.

c. Packaging and Labeling of Preblend:

The preblend production and distribution is crucial for the quality of the final product. The preblend has to be properly labeled, distributed and stored appropriately. The following should be adhered to.

8. **Packaging:** the packaging should comprise materials that will safeguard the quality of the nutrients. Polypropylene bags of 50 kg (or 20 kg) may be used with appropriate lining to keep out moisture.

9. **Labeling:** The labels should be visible and contain the following:
- (i) Name of the product (MAIZE FLOUR PREBLEND),
 - (ii) Addition rate (grams preblend per kg fortified flour),
 - (iii) Date of manufacture or expiration date,
 - (iv) A warning note stating that “PRODUCT NOT FIT FOR HUMAN CONSUMPTION”

d. Use of Preblend (Weighing and mixing)

10. Add the preblend to the flour following two mixing options:

- **Batch Mixing after Milling:** Sachets of previously weighed preblend are added to specific amounts of flour, or weighed preblend is added to specific quantities of maize flour. For example, if a container full of maize flour weighs 20 kg, and the preblend dilution is 1:101 (as in the example described above) then 200 grams of preblend should be added for that amount of flour. If the sachets are prepared to contain 100 grams of preblend, then 2 sachets will be required to adequately fortify the 20 kg of flour.
- **Addition while Milling:** The fortificant may also be added continuously to the maize mill feed hopper as the grain is being milled. The operator adds the premix at a rate consistent with the flow of the maize grain, taking care that the expected dilution is followed, i.e. to add 200 grams of preblend per each 20 kilograms of product. The flour may require further mixing after milling.

11. The amount of preblend that is used and the flour produced should be recorded accurately in **TABLE A-3** on a daily basis, irrespective of the method used for addition of the preblend. Information should be kept secure for review by inspectors.

e. Packaging of fortified flour

12. Fortified maize flour, when packaged for sale, shall be labeled according to local labeling standards. The label shall indicate that the flour is fortified, show the name of the fortification mill/center, address, brand, micronutrient levels, and date of production.

III. Records and Reporting

Keep updated the records in Table **A-1**, **A-2** and **A-3** and have them available for the food inspector when required.

FORTIFIED MAIZE FLOUR - QA IN SMALL SCALE OPERATIONS - TABLE A-1 INVENTORY CONTROL LOG OF PREMIX IN STOCK

Year: _____

Page No. _____

DATE	PREMIX RECEIVED				AMOUNT USED (B)	PREMIX IN STOCK (C) ³	AMOUNT OF PREBLEND PRODUCED ⁴ (kg)
	Supplier Name	kg (A)	Lot #	Notes			

³ Use Separate rows for receipt and use; **RECEIVING:** C= Previous(C) + (A) when **premix is received** from supplier; **USE:** C= Previous) – (B) when premix has been used to **produce preblend** on site.

⁴ Note information **immediately into Table A2**

**FORTIFIED MAIZE FLOUR - QA IN SMALL SCALE OPERATIONS - TABLE A-2
INVENTORY CONTROL LOG OF MAIZE FLOUR PREBLEND IN STOCK AND FLOUR PRODUCTION**

Harvest year: _____

Page No. _____

DATE	PREBLEND RECEIVED/PRODUCED LOCALLY				AMOUNT ⁶ USED (B)	IN STOCK (C) (C) = (A) – (B) ⁷	AMOUNT OF FLOUR PRODUCED (kg)
	Supplier Name	kg (A)	Lot #	Notes			

⁵ Preblend refers to DILUTED premix comprising fortificant from supplier and maize flour.
⁶ Make separate row entries if preblend is produced or received and when preblend has been used.
⁷ When **preblend is received** from outside C= Previous(C) + (A) ; C= Previous(C) – (B) when **preblend is used** to FORTIFY flour

**FORTIFIED MAIZE FLOUR - QA IN SMALL SCALE OPERATIONS - TABLE A-3
DAILY PREBLEND USE AND FLOUR PRODUCTION**

Mill Name:

Location:

Page:

Date	Preblend Used (g)	Flour Fortified (kg)	Date	Preblend (g)	Flour Fortified (kg)	Date	Preblend Used (g)	Flour Fortified (kg)
TOTAL			TOTAL			TOTAL		

FLOUR PRODUCED =		(kg)	PREBLENDUSED =		(kg)	PREBLEND/FLOURRATIO =	
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