East, Central and Southern African
Health Community

MANUAL FOR INTERNAL MONITORING OF SUGAR PREMIX CONTAINING VITAMIN A

(Quality Assurance and Quality Control, QA/QC)

FIRST EDITION – 2007

East, Central and Southern Health Community (ECSA-HC)

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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 strategy 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
ECSA Health Community

Acknowledgement

This Manual has been developed by the ECSA Health Community Secretariat with technical and financial assistance from the Academy for Educational Development through A2Z: The USAID Micronutrient and Child Blindness Project (GHS-A-00-05-00012).

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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ECSA is deeply thankful to the above authors for preparing this manual.

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MANUAL FOR INTERNAL MONITORING OF VITAMIN A SUGAR PREMIX
(Quality Assurance and Quality Control, QA/QC)

Sugar is fortified using a vitamin A premix, which is prepared by attaching vitamin A beadlets to sugar through a layer of vegetable oil ontaining an antioxidant. The premix is diluted into the unfortified sugar either at sugar factories or packaging centers. The quality of fortified sugar depends on the quality of the premix. Therefore, it is essential to carry out internal monitoring (Quality Assurance/Quality Control, QA/QC) of the premix to guarantee that the product meets the specifications such as vitamin A content, lack of segregation, homogeneity and fluidity.

Usually, premix production is seasonal and estimations of the amount of premix based on the sugar production goal for the next harvest season is the first step to assure premix availability and continuous supply of it to the sugar factories in order to fulfill the demand. In situations where premix in a country is prepared at a central point and distributed to other factories, premix production starts before the harvest season to have premix in stock to supply the factories. Even factories that prepare premix for internal use should have a plan to prepare premix in advance to have enough supply for the first month of the harvest. Key steps in premix production, storage and distribution are presented to standardize the
process and decrease the probability of error that would result in low quality premix. Finally, quality control of vitamin A premix is important to verify that it meets the specifications required.

The quality of the processes and the product is determined based on the defined criteria of success, which support any corrective or preventive actions to solve non-compliances. Results obtained in each stage are recorded and reported to the factory manager, who is the main person responsible for the whole process.

This manual includes a series of minimum activities for carrying out quality assurance and quality control of premix production, as well as procedures to confirm that the final product, vitamin A premix, satisfies technical specifications.These actions are based on four main stages:

- General performance of Good Manufacturing Practices (GMP)
- Preliminary preparations for premix production
- Quality Assurance of premix production, storage and distribution
- Quality Control of vitamin A premix

Sections A to D describe each one of these stages, and Section E includes the protocol of the analytical method for determining the content of vitamin A in the premix.

A. GENERAL PERFORMANCE OF GOOD MANUFACTURING PRACTICES

I. Objectives and Accountability

The purpose of this section, about the general performance of good manufacturing practices, is to ensure that:

- Factory facilities meet the sanitation and housekeeping requirements established in national regulations to authorize the operation, such as assuring cleanliness, controlling pest infestations and introducing adequate sanitary practices.In general, it means following the principles of Good Manufacturing Practices.
- Personnel use adequate clothing and other equipment to work on premix production, such as coat, hairnet or hat, gloves and mask for fine particles and dust[1].
- Every time new personnel are hired, they should receive training on the activity they will perform. Personnel should be constantly trained supervised. The day-to-day activities should be carried out by the *factory employees*, who should report weekly to the *factory manager*, who is the one responsible for the overall performance of the production unit, from the supply of materials and equipment to the planning of the training sessions.

[1] Gloves and masks are used so as to avoid contamination of premix and to protect personnel from absorption of excessive amounts of vitamin A from fine premix particles.

II. Procedures

a. Daily cleaning task

1. At the end of the day, clean thoroughly the remnants of premix from the blender with a brush. **Never** use metallic brushes, because they will damage the blender's walls.
2. Wash the blender with water and soap and let it dry.
3. Ensure the blender is completely clean and dry before the next use.
4. Clean the other devices used in premix production such as carts, scales, balances and spatulas.
5. Use **Table A-1** to record the daily cleaning activities and any problem and corrective actions taken.

b. Monthly check up and clean up of equipment and devices

6. Every month, plan a general check up of the performance of the equipment and devices.
7. Use checklist in **Table A-2** to perform the examination and record the results of it.
8. In the V-blender pay attention to

- The differential and axle gear lubrication and oil levels
- Oil aspersion system

For other type of blenders, check the critical parts where maintenance should be performed periodically and include them in the checklist.

9. Clean accessible parts of all machine components.
10. Replace any part that is damaged or take the necessary actions to correct or prevent any problem.

c. Annual maintenance and calibration

11. At the end of each harvest season, perform maintenance of the equipment and devices used in vitamin A premix production. The maintenance program should include at least the following:

- Blender
- Heating bath and electric stirrer
- Carts
- Scales and balances
- Nitrogen-bubbling device
- Sewing machine for bags

12. In the V-blender to check the blender's engine carbon electrodes and bearings to ensure that they are operating properly.
13. After maintenance is finished, calibrate the equipment as required.
14. Record the dates of maintenance and calibration for each equipment and device, name of the person who carried them out and the date for the next maintenance and calibration. **Table A-3** provides an example.

III. Records and Reporting

Factory operators should keep up-dated all the records of the routine checking activities, as well as the measures taken when needed. Tables A-1 to A-3 are useful for keeping systematic records of all these actions. Copies should be filed both in the production site as well as in the office of the factory manager.

B. PRELIMINARY PREPARATION FOR PREMIX PRODUCTION

I. Objectives and Accountability

The purpose of the preliminary preparations for premix production is to ensure that:

- Sufficient amounts of ingredients and materials for manufacturing vitamin A premix are available two months prior to the beginning of the sugar harvest season.
- The equipment is ready and calibrated to start on time the production of the premix.

The main responsible person for this component is the *factory manager* in collaboration with the *finance department* and the *factory employees*.

II. Procedures

a. Estimating amount of the premix

1. Based on the sugar production goal for internal consumption for the coming sugar cane harvest season, calculate the quantity of premix (P) needed using the equation below:

$$(P)\ Quantity\ of\ premix\ (MT) = \frac{Sugar\ production\ goal\ (MT)}{1000}$$

b. Estimating amount of ingredients for the premix production

2. Calculate the quantity of ingredients and materials that will be required in order to produce the quantity of premix calculated. Reference values (R) for specified units and amounts of ingredients required to produce 100 MT of premix are provided in Table B-1. Based on these, the individual quantities (Q) required for producing (P) are calculated as follows:

$$(Q)\ Quantity\ required = \frac{(P)\ Amount\ of\ premix\ x\ (R)\ reference\ quantity}{100}$$

3. Complete column for (Quantities required), column Q of **Table B-1**.

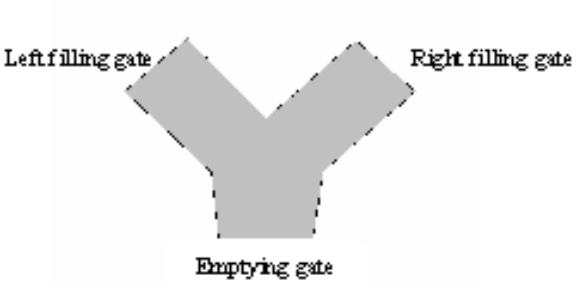
4. Complete column **I** of **Table B-1** with the quantities of each ingredient and material in the inventory.
5. Subtract the quantities in the inventory (I) from the quantities required (Q) for each ingredient and material. The resulting quantity is the amount to be purchased (S).
6. In column U, write down the cost per unit (as specified in each row) of each ingredient and material.
7. Calculate the total cost (T) multiplying the quantity to purchase (S) by the cost per unit (U). Sum the total cost of ingredients and materials in column (T) to obtain the total cost of ingredients and materials to prepare the premix for the whole harvest.
8. Purchase the ingredients and materials in advance, or make a planned purchasing schedule, to start preparing the premix at least one month before the harvest starts. Take into account that purchase and delivery of vitamin A fortification compound might take about 3-4 months.

c. Validation of mixing time in the blender

9. Validation of mixing time should be done at least once a year, and after any repair is performed on the blender or when any change is introduced to the formulation, procedure for premix production, or when a new mixer is installed.
10. Mix the sugar and vitamin A fortification compound in the blender for 5 minutes as indicated in the procedure for premix production.
11. Add the oil with Ronoxan A and mix for three minutes.
12. Stop the blender and
    a. if you are using a V-blender leave it in the upright position. Take three premix samples from the right and left filling gates, and three more from the emptying gate, as shown in **figure B-1**.

    b. for other types of blenders, be sure to leave it in a position where it can be opened and take ten random samples.

Figure B-1. Sampling points in the V-blender



13. Close the gates and continue mixing. Stop the blender at 6, 9, 12 and 15 minutes and repeat the sampling in step 12. At the end, 45 samples will be collected from the V-blender and 50 samples from other blenders.
14. Determine the retinol content of each sample using the "*Spectrophotometric determination of vitamin A (retinol) premix"* described in **Section E** of the analytical method.
15. For each mixing time, calculate the retinol average of the samples taken then calculate the **average** and **standard deviation** of the mean values of each set of samples.
16. Calculate the coefficient of variation as follows:

$$CV\ (\%) = \frac{Std\ deviation\ (SD)}{Mean}\ x\ 100$$

17. Perform the same calculations described in steps 14 and 15 for every mixing time.
18. *Interpretation*: The optimum mixing time is the one showing that sugar crystals are not broken and with the lowest coefficient of variation of the vitamin A content, which must be lower than 10%. The optimum mixing time is usually between 9 and 15 minutes.

III. Records and Reporting

Table B-1 is useful for the factory manager to estimate amounts and cost of the production of premix for the harvest season.

C. QUALITY ASSURANCE OF PREMIX PRODUCTION, STORAGE AND DISTRIBUTION

I. Objectives and Accountability

The purpose of Quality Assurance of premix production, storage and distribution is that the premix:

- Is manufactured as recommended.
- Is stored under adequate conditions.
- Is used following the “first in, first out” system
- Inventory is kept updated.

The day-to-day activities should be completed by the *operator* in charge of the factory, who should send weekly reports to the *factory manager*.

II. Procedures

a. Receipt, storage and use of ingredients for the premix production

1. Every time a new lot of ingredients or materials are received, check the specifications to determine whether it meets the specifications of the purchase order.
2. Record the date of receipt, quantity received, lot number, expiration date (if applicable), supplier, and name of person who is receiving the delivery. A record sheet with the information contained in **Table C-1** should be prepared for each ingredient (e.g. oil, vitamin A, antioxidant, others).
3. The supplier or manufacturer must include a certificate of analysis for every lot of vitamin A fortification compound, vegetable oil and antioxidant received in the premix factory.
4. Store the ingredients as indicated by the supplier, in a cool dry place on top of palettes, made of a suitable material, to maintain their quality and safety until they are used.
5. Storage should be done in such a way that ingredients and materials are used following the “first in, first out” system (FIFO). That is, the first lots received must be the ones used first to prepare the premix, buy always within the time of expiration (best used by date).
6. Keep updated inventories of ingredients and materials. **Table C-2** presents a general form to keep inventories daily. This table should be filled as part of the closing activities of each day. At the end of the working week, a copy of the table should be sent to the factory manager.
7. Avoid storage of surplus ingredients for the next harvest, as much as possible.

b. Premix production

8. Check that equipment and devices are clean to start the work.
9. Measure 2-L oil and weigh 9 g Ronoxan. Dissolve the Ronoxan in the oil with a mechanical stirrer and heat the oil to 60°C, while nitrogen is bubbled continuously until it is used.
10. In a 150-kg polypropylene bag, add half of the sugar, followed by the vitamin A fortificant and then the rest of the sugar. This addition forms three layers with the vitamin A fortificant "sandwiched" between two sugar layers.
11. Place the contents of the bag (dry ingredients) into the blender and mix for about 5 minutes.
12. Add the oil containing the antioxidant to the dry ingredients[2].
13. Continue mixing for the required time as obtained during the validation of the mixing time (about 10-15 minutes).
14. Stop the blender and open the emptying gate to unload the premix into the transporting cart. Premix should flow freely and lumps must not be observed. A uniform pale yellow color should be observed and it should be free of any unpleasant or rancid odor.

[2] This can be done automatically if the blender has an oil compartment incorporated through the oil aspersion system; or manually, stopping the blender, opening one of the gates and pouring the oil into the mixing chamber.

(c) Premix packaging, labeling and storage

15. Pack the premix in five 25-kg black polyethylene bags covered by a labeled polypropylene bag or equivalent material.
16. Sew the bags several times to seal the bags as tightly as possible.
17. Each bag should carry the following information in the label:
    - Lot number[3]
    - Date of production
    - Minimum guaranteed retinol level: e.g 15 g/kg
    - Warning statement "THIS PRODUCT IS NOT SUITABLE FOR DIRECT HUMAN CONSUMPTION"
18. Stack the premix bags on top of palettes, made of a suitable material, in a cool dry place, following the "first-in, first-out" system.
19. Record the quantity of premix produced during the day in **Table C-3** in column labeled as "Production".
20. At the end of the week sum the total quantity of premix produced in number of bags and weight expressed in kg. The quantity expressed in kg (A) will be used to calculate the weekly final balance (C_{n+1}).

[3] Sequential number can also be used in the premix bags to identify them.

d. Premix distribution [4]

21. When distributing premix to the sugar factories, record the date of distribution, destination[5] (sugar factory name), quantity of premix dispatched, lot or bags numbers. **Table C-3** presents a practical way to record this information.

22. Every day, record the quantity of premix dispatched in **Table C-3**, column “Distribution”.

23. At the end of the week, sum the total quantity of premix dispatched and express it in number of bags and weight (kg). The quantity of premix in kg (B) will be used to calculate the weekly final balance (C_{n+1}).

e. Premix weekly inventory

24. At the end of the working week, calculate the premix balance using the cell labeled “Weekly Final Balance” (C_{n+1}) in **Table C-3.**

25. To the balance from the prior week (C_n), add the amount produced (A) and then subtract the quantities of premix delivered to sugar factories (B). The result is the Weekly Final Balance (C_{n+1}) for the week to be carried forward to the next week.

III. Records and Reporting

Factory operators should keep up-dated all the records of the routine checking activities, as well as the measures taken when needed.

Copies of the records should be sent to the factory manager every week.

[4] This section also applies to sugar factories producing premix for their internal use only.

[5] For factories preparing premix for internal consumption destination is the FORTIFICATION SITE.

D. QUALITY CONTROL OF SUGAR PREMIX

I. Objectives and Accountability

The purpose of Quality Control of sugar premix is to ensure that the premix:

- contains vitamin A levels above 13.5 g/kg.
- 80% of samples are within the required standard: 15-18 g/kg vitamin A as retinol.

This activity is a direct responsibility of the *factory manager* with the support of the *factory operators* and *the laboratory*[6] where samples are analyzed.

II. Procedures

1. Every day that premix is produced take 50 g premix from every batch[7] produced (contents of the mixer).
2. When 8 premix samples have been taken from 8 different batches, prepare a composite sample by mixing and homogenizing the eight 50-g samples (240 g).
3. Take duplicate 50-g samples of the premix from this composite and package it in opaque airtight containers or black polyethylene bags. Combine the remaining premix from the composite sample with that being packaged.
4. Label the samples with the lot or bags numbers used to prepare the composite samples, plus date of production.

[6] The recommended laboratory where samples are analyzed should be reliable and report timely results.
[7] In this context, batch refers to the amount of premix produced per blender's load based on its capacity.

5. Send the samples to the factory manager, who in turn will send some of them to a laboratory to determine the vitamin A content (see **Section E**. The Manager selects 5 samples at random every week and sends them to a reference laboratory, and records result in **Table D-1.**
6. When vitamin A results reported by the laboratory are outside specifications, investigate the causes, review the process and take the necessary corrective actions. Keep the composite sample in storage up to a month.

IV. Records and Reporting

Factory manager will keep the daily record of premix production, lot identification, and quality control data.

E. SPECTROPHOTOMETRIC DETERMINATION OF VITAMIN A (RETINOL) IN PREMIX

I. References

Dary, O. and Arroyave, G. (1996*). Sugar Fortification with Vitamin A. Analytical Methods for the Control and Evaluation of Sugar Fortification of Vitamin A. Part 3.* 2nd edition. INCAP/OMNI/USAID. pp 9-11.

Henninger, H. Determination of Vitamin A in Dry Vitamin Premixes by Spectrophotometry. In Hofstetter, J*. Analytical Methods for Vitamins in Food/Pharma Premixes*. Vitamins and Fine Chemicals Division, ROCHE. Switzerland. pp 6-7.

II. Principle

This method entails solubilizing water-miscible retinyl palmitate beadlets in hot water, followed by dilution in 2-propanol. The concentration of retinyl palmitate is determined by its spectrophotometric absorbance at 326 nm. Retinyl palmitate is extracted in hexane and its concentration is determined by the absorbance of the extract at 326 nm. This method does not require irradiation with UV light, because the absorbance of the solution at 326 nm is essentially only due to the retinol in the premix.

III. Critical Points and Cautions

Once retinyl palmitate has been solubilized in 2-propanol, the analysis should not be interrupted. Based on the experience at the Institute of Nutrition of Central America and Panama (INCAP) laboratory, if the variability between replicates of the same premix solution is greater than 5 percent, the results should be rejected and the solubilization/extractions repeated. In addition, the results of two independently weighed replicates of the same extract should not differ on average by more than 10 percent. If the variation is greater than 10 percent, the complete procedure should be repeated.

IV. Equipment and Materials

- UV Spectrophotometer
- Water bath (50-60°C)
- Beakers (150-200 mL)
- Glass rods
- Spatulas
- Test tube rack
- Volumetric flasks (100 mL)
- Watch glasses
- Vortex mixer
- Aspiration bulbs for Pasteur pipettes and graduate pipettes
- Black clothing
- Pasteur pipettes
- Spectrophotometer UV-cuvettes
- Test tubes with screw caps (20 mL)
- Volumetric or serologic pipettes (to measure 1, 2, 3, 4, 5, 8 mL)

V. Reagents

- 0.1-N HCl solution [Hydrochloric acid (AR). (HCl), purity=37%, FW=36.46 g/mol, d=1.19 g/mL]
- Hexane (AR). (C_6H_{14}), purity=99%, FW=86.18, d=0.66 g/mL - 2-propanol (AR) (($CH_3CH(OH)CH_3$), purity=99.7%, FW=60.10, d=0.78g/ mL

VI. Procedure

(a) Solubilizing vitamin A from the premix

1. Homogenize the sample mixing it within a medium-size container (providing sufficient space for mixing) with gentle rotary movements.

2. Weigh in duplicate 1.25 g of premix, recording the exact weights to three decimal places. Dissolve the sample with 60-80 mL of distilled hot water (about 80°C) in a 100 mL beaker. Use a glass rod to completely dissolve the sample. Cover each beaker with a watch glass.

3. Incubate in a water bath at 50-60°C for 15 min. Cool at room temperature.

4. Transfer to a 100 mL volumetric flask. Rinse the beaker with small amounts of distilled water; transfer the washings to the volumetric flask, mix well and make up to 100 mL with distilled water and mix. This solution is cloudy.

b. Diluting and extracting vitamin A from the premix solution

5. Measure 2 mL of the solution prepared in step 4 into a 20 mL tube and add 8 mL of 2-propanol (to give a 2:10 dilution). Mix vigorously in a Vortex mixer.

6. Measure 1 mL of the solution prepared in step 5 into a 20 mL tubes and add 9 mL of 2-propanol (to give a 1:10 dilution). Mix using a Vortex mixer for 5 seconds.

7. Transfer in duplicate 3 mL of the solution from step 6 and place in a 20 mL tube. Add 3 mL of 0.1-N hydrochloric acid and 4 mL of hexane. Mix in a Vortex mixer for 30 seconds. After mixing and settling, the organic phase is at the top.

c. Recording absorbance of the extracted vitamin A

8. Adjust the zero of the spectrophotometer with hexane. As soon as possible, transfer the organic phase, using a Pasteur pipette to a 1 cm light path spectrophotometer cuvette and read the absorbance at 326 nm.

VII. Calculations

Retinyl palmitate concentration in the premix sample is calculated using the following equation:

$$retinyl\ palmitate\ \ (g/kg) = \frac{Abs}{a} x \frac{V_{org}}{V_{al}} x \frac{V_i}{w} x\ DFxCF_{spec}$$

Equation parameters are:

SUGAR PREMIX: TABLE A-1

DAILY CLEANING OF BLENDER USED IN VITAMIN A PREMX PRODUCTION

Page No._____

DATE	CLEAN (YES/NO)	OBSERVATIONS	RESPONSIBLE

Date of reporting: _____ **Name/Signature:** _____

PARAMETER	EXPLANATION	VALUE
a	Retinyl palmitate absorption coefficient in hexane (g^{-1} $cm^{-1} \cdot L$)	92
V_{org}	Volume of the organic phase (mL)	4.0
Val	Volume of the aliquot analyzed from the premix solution (mL)	3.0
V_I	Volume of the initial solution of the sample (mL)	100.0
w	Weight of the sample (g)..... .	data from weight
DF	Dilution factor (point b.5 and b.6 above)	50
CF_{spec}	Correction factor of the spectrophotometer	1[1]

To express the results as unesterified retinol, the ratio of the molecular weights of retinol/retinyl palmitate (286.46/524.84 = 0.546), must be taken into consideration. A simplified equation to estimate the unesterified retinol is:

$$retinol(g/kg) = Abs_{corrected} \; x \frac{39.57}{w} x \, CF_{spec}$$

[1] If the spectrophotomer is in good condition this value should be 1.0.

SUGAR PREMIX: TABLE A-2

MONTHLY CHECK UP AND CLEANUP OF EQUIPMENT AND DEVICES FOR VITAMIN A PREMIX PRODUCTION

EQUIPMENT/DEVICE	CONDITION[1] (√)/(X)	OBSERVATIONS
1. Blender		
1.1 General cleanup		
1.2 Lubrication and oil levels		
1.3 Oil aspersion nozzles		
1.4 Other		
2. Scales		
2.1 General cleanup		
2.2 Calibrated		
3. Balance		
3.1 General cleanup		
3.2 Calibrated		
4. Heating bath		
4.1 General cleanup		
4.2 Temperature calibrated (60°C)		
....continue in next page		

[1] Condition: Adequate (√)/Inadequate (X)

EQUIPMENT/DEVICE	CONDITION[1] (√)/(X)	OBSERVATIONS
5. Electric stirrer		
5.1 Performance		
6. Nitrogen-bubbling device		
6.1 Performance		
7. Carts		
7.1 General cleanup		
7.2 Mobility		
7.3 Integrity		
8. Sewing machine for bags		
8.1 Performance		
9. 2000 mL graduated cylinder		
9.1 Cleanup		
10. 4-L flat-bottom flask		
10.1 Cleanup		
11. Spatula		
11.1 Cleanup		

Date: _____ **Name/Signature:** _____

SUGAR PREMIX: TABLE A-3

MAINTENANCE AND CALIBRATION PROGRAM RECORDS

EQUIPMENT/ DEVICE	MAINTENANCE			CALIBRATION[1]			OBSERVATIONS
	DATE	RESPONSIBLE	DATE OF NEXT MAINTENANCE	DATE	RESPONSIBLE	DATE OF NEXT CALIBRATION	
1. Blender							
2. Scales							
3. Balance							
4. Heating bath							
5. Electric stirrer							
6. Nitrogen bubbling device							
7. Carts							
8. Sewing machine							

Date: _____ Name/Signature: _____

[1] If calibration of equipment or device is necessary.

SUGAR PREMIX: TABLE B-1

INGREDIENTS AND MATERIALS REQUIRED FOR VITAMIN A PREMIX PRODUCTION

Harvest: _____ **Sugar Production Goal (MT):** _____ **(P)**

Quantity of Premix Required (MT): _____

INGREDIENTS AND MATERIALS	REFERENCE FOR 100 MT (R)	QUANTITY REQUIRED (Q) (Q)= (P)x(R)/100	CURRENT INVENTORY (I)	QUANTITY TO PURCHASE (S) (S)=(Q)-(I)	COST PER UNIT (in US$) (U)	TOTAL COST (in US$) (T) (T)=(S)x(U)
Sugar	75 MT				/ M.T.	
Vitamin A fortification compound	22,030 kg				/ kg	
Antioxidant (Ronoxan)	8 kg				/kg	
Vegetable oil	2,000 L				/liter	
Polyethylene black bags	4,500				/thousand	
Polypropylene bags	4,500				/thousand	
Nitrogen	2 cylinders (100 lb each)				/cylinder	
TOTAL (US$)						

Prepared by _____ Date _____ Approved by _____ Date _____

SUGAR PREMIX: TABLE C-1

RECEPTION RECORD OF VITAMIN A FORTIFICANT COMPOUND

Ingredient: _____ Page No.: _____

DATE RECEIVED	QUANTITY RECEIVED (KG)	LOT NUMBER	EXPIRATION DATE	SUPPLIER	CERTIFICATE OF ANALYSIS (YES/NO)	RECEIVED BY	OBSERVATIONS

SUGAR PREMIX: TABLE C-2

DAILY INVENTORY OF INGREDIENTS AND MATERIALS FOR VITAMIN A PREMIX PRODUCTION

Week Start date: Last date: Page No.:

INGREDIENT/ MATERIAL		INITIAL BALANCE[1] (B)	RECEIVED DURING WEEK (R)	CONSUMED EACH DAY OF THE WEEK							FINAL BALANCE (F) (F)=(B)+(R)-(C)
				1	2	3	4	5	6	TOTAL(C)	
Vitamin A fortification compound	kg										
Sugar	kg										
Vegetable oil	L										
Ronoxan	kg										
Nitrogen	Cylinder										
Polyethylene bags	Units										
Polypropylene bags	Units										
Sewing cotton thread	Units										
OBSERVATIONS:											
Date			Responsible (Name and signature)								

[1] Final balance from previous week

SUGAR PREMIX: TABLE C-3

VITAMIN A PREMIX INVENTORY CONTROL

Week **Start date:** **Last date:** **Page No.:**

PRODUCTION			DISTRIBUTION[1]				
DATE	LOT ID (BAG No.)	# 25-kg BAGS PRODUCED	DELIVERY No.	DESTINATION[2] (SUGAR FACTORY NAME)	LOT ID (BAGS No.)	# 25-kg BAGS DISPATCHED	OBSERVATIONS
Prior balance (C_n)(kg) =							
TOTAL	25-kg bags		TOTAL		25-kg bags		BALANCE FOR NEXT WEEK C_{n+1} (kg) = (C_n) + (A) - (B)
	(A)[3] (kg)				(B)[2] (kg)		

Date **Responsible (Name and signature)**

[1] This section applies when premix is distributed either to sugar factories or when it is produced within the factory and distributed to its fortification site.
[2] This column may be eliminated when premix is prepared within the sugar factory for internal use only.
[3] The premix quantity produced or dispatched weekly expressed in kg. Multiply the amount of 25-kg bags by 25.

SUGAR PREMIX: TABLE D-1

VITAMIN A PREMIX QUALITY CONTROL: RETINOL RESULTS

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LOTS ID (BAGS NUMBERS)	DATE OF PRODUCTION	DATE SAMPLES SENT TO THE LABORATORY	LABORATORY REPORT (# ID)	REPORT DATE	[Vit. A] (g/kg)	OBSERVATIONS

The publication of this manual is made possible by the generous support of the American people through the US Agency for International Development (USAID), through the Academy for Educational Development, A2Z: The USAID Micronutrient and Child Blindness Project (GHS-A-00-05-00012) and the East, Central and Southern African Health Community (ECSA). The content of this document is the responsibility of the authors and does not necessarily reflect the opinion of USAID or the government of the United States