Improving Young Child Feeding in Eastern and Southern Africa

Household-Level Food Technology

Proceedings of a workshop held in Nairobi, Kenya, 12-16 October 1987
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Editors: D. Alnwick, S. Moses, and O.G. Schmidt

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Abstract

The weaning period, that is the period in a young child's life when supplementary foods are introduced to complement breast milk, poses great nutritional risk to children in developing countries. By the end of the second year of life, one-third of children in eastern and southern Africa are chronically malnourished. The following factors contribute to the growth faltering commonly observed in weaning-age children: low nutrient intake, high incidence of diarrheal disease (often caused by contaminated weaning foods), and recent declines in duration and intensity of breastfeeding.

Food scientists, nutritionists, and health planners working in Africa and South Asia met in an international workshop to examine household-level food technologies that hold promise for improving nutrition of infants and young children. After reviewing current knowledge of breastfeeding and weaning practices in eastern and southern Africa, participants discussed the use in weaning diets of fermented foods and germinated flour, for both improved nutrient intake by young children and decreased risk of food contamination. Research that should be conducted into the effectiveness of the food technology was identified and its diffusion at the community level discussed.

This publication contains the proceedings, conclusions, and recommendations of the workshop. It is directed at scientists and health planners who are involved in nutrition research and developing programs to improve feeding of infants and young children in developing countries.

Résumé

Le sevrage, c'est-à-dire la période où l'on commence à donner des aliments solides à un jeune enfant en complément du lait maternel, présente de graves risques nutritionnels pour les enfants dans les pays en développement. Dès la fin de leur deuxième année, le tiers des enfants en Afrique orientale et australe souffrent de malnutrition chronique. Les facteurs suivants sont à l'origine du retard de croissance que l'on retrouve couramment chez les enfants en âge d'être sevrés : carence nutritionnelle, forte prévalence des maladies diarrhéiques (qui s'expliquent souvent par la contamination des aliments) et diminution récente de la durée et de l'intensité de l'allaitement maternel.

Des spécialistes des sciences de l'alimentation, des nutritionnistes et des planificateurs de la santé travaillant en Afrique et en Asie du Sud se sont réunis dans le cadre d'un atelier international afin d'examiner des technologies alimentaires applicable au niveau des ménages qui semblent prometteuses pour améliorer la nutrition des nourrissons et des jeunes enfants. Après avoir examiné les connaissances actuelles en matière d'allaitement au sein et les pratiques de sevrage en Afrique orientale et australe, les participants ont discuté de l'utilisation, au cours du sevrage, d'aliments fermentés et de farine germée, tant pour améliorer l'apport nutritionnel chez les jeunes enfants que pour diminuer les risques de contamination des aliments. Ils ont également discuté des recherches qu'il y aurait lieu d'entreprendre sur l'efficacité des technologies alimentaires et sur leur diffusion dans la collectivité.
Esta publicación contiene las actas, conclusiones y recomendaciones del taller. Está dirigida a científicos y planificadores de la salud que participan en la investigación nutricional y en programas de desarrollo para mejorar la alimentación de lactantes y niños en los países en desarrollo.
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WEANING FOODS IN RWANDA AND THE POTENTIAL OF SPROUTED SORGHUM

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Abstract

The persistence of child malnutrition in Rwanda is attributed largely to a lack of time and money on the part of the mothers. In the northern parts of the country, women spend nearly 10 h in the field and so can prepare the family food only once or twice each day; this food is usually high in bulk but low in nutritional value and is, therefore, inadequate for feeding young children. At present, the high nutritional value of sprouted or fermented flours is recognized neither by the mothers nor by the nutrition personnel who educate them. Although traditional fermented porridges, made from corn or cassava, are consumed in some regions, they are not universally regarded as good weaning foods. Sprouted sorghum flour is used in most households, not to improve the plain porridge of unsprouted sorghum, but for making beer. The United Nations Children's Fund should, in its 5-year program of cooperation with the government of Rwanda, support further research on the use of sprouted or fermented sorghum flour in weaning food.

Over the last 10 years, the situation with regard to child malnutrition in Rwanda has not greatly improved. Because mothers have neither the time nor the money to prepare special meals, their young children receive complementary foods that are nutritionally inadequate. Particularly in the northern regions of the country (Ruhengeri, Gisenyi, and Byumba), women spend nearly 10 h/day in the fields; with little time left to prepare food, they generally cook only once, preparing sufficient quantities for the entire day. Their young children are, therefore, fed the stodgy adult diet based on tubers (potato, cassava, and sweet potato) and beans, both of which are difficult to digest. Moreover, because this food is served only once or twice daily, the quantity consumed by the child does not provide adequate nutrients and energy. Also of significance is the fact that the child's portion, kept at a moderately high temperature throughout the day, is subject to bacterial contamination that can lead to diarrheal infections.

It is logical, therefore, to look for infant foods with the following characteristics: adequate energy content, resistance to bacterial contamination, and ease of digestibility and of
preparation. Porridges based on sprouted or fermented sorghum flour and on other traditional fermented foods may answer these needs.

Traditional Fermented Porridges and Weaning Foods

Fermented maize porridge ("umutsimawibigori") is made from maize that has been dried and stored for gradual use over the year. To initiate fermentation, the maize is left to soak in water for 1 week. The kernels are then gently dehusked by pounding and the inner grains are dried for several hours. These grains are poured together with some crumbly stones ("imonyi") that facilitate grinding and sifted to produce flour. Mothers prepare the porridge by gradually stirring hot water into the fermented maize meal with a wooden spatula until the desired consistency is reached. Porridge of fermented maize meal, accompanied by a green sauce or other foods, is also eaten by adults.

Fermented cassava porridge, despite its lower nutritional value, is an important food during the between-harvest period when little else is available. Most rural families prepare fermented cassava flour ("umutsimawimyumbati") by leaving the tubers to soak for 4-5 days in slightly muddy water until they ferment. The fermented cassava is then dried in the sun for 1-2 days, after which it is peeled, dried again, and pounded into a powder. This flour is made into a porridge by stirring it into boiling water. The family eats the porridge with haricot beans, peanut sauce, or green sauce with peanuts.

Mothers often give their children diluted sorghum porridge ("igikoma") to drink. A preliminary investigation of 20 samples of sorghum porridge that mothers had brought to nutritional centres in Sovo/Butare showed that the porridges contained a mean of 7.44 g of solids per 100 g wet weight (standard deviation, 2.4; range, 3.9-14.6). This would result in a mean density of 0.26 kcal/g of porridge. This soft drink is also given to lactating women who are breastfeeding. The children also drink fresh banana juice before it is fermented.

In banana-growing regions such as Kibungo and Cyangugu, boiled and mashed plantains may be mixed with crushed peanuts ("umububi") or with haricot beans (usually eaten unshelled in rural areas) and given as a weaning food to children who are about 1 year old or to those with teeth. Infants already able to hold an object are given ripe bananas to eat. Ripe, sweet bananas ("umuneke") are considered fit for women and children but not for adult men.

Banana beer, using roasted sorghum seeds to initiate fermentation, is very popular among rural families and constitutes a major household expenditure. In such households, one usually finds the large reserve calabash ("igicuma") and the smaller one ("agacuma") (fitted with its traditional spout or "umuheha") that is passed to each person in turn. As the calabash makes its rounds, it is not unusual for children to be given a taste of the beer by their mothers. If the child is very young, the mother sips some beer into her mouth and spits it into that of the baby. Older children drink directly from the spout. Among these families, it is believed that strong drink dispels discomfort and calms worms ("gucurica inzoka").
The changes that occur in germination and fermentation are produced by the enzymatic activity of microorganisms during the metabolization of sugar; this process is responsible for the higher energy content of fermented foods. In addition, the pH of fermented foods inhibits the development of those pathogens that cause diarrheal diseases. Porridges made from sprouted or fermented cereals may contain more energy and vital nutrients per unit volume than those made from unsprouted or unfermented grains.

**Preparation of Sprouted Sorghum and Fermented Sorghum Flour**

Sprouted and fermented sorghum flours are prepared by most Rwandan families in the course of making sorghum beer. Three to four pitchers of homemade sorghum beer are always available in Rwandan households to quench the thirst of those who have been working in the fields. When marriage is proposed, the future husband's family brings along one pitcher of sorghum beer and one of banana beer; because sorghum beer is usually a woman's drink and banana beer a man's, this custom symbolizes the union of man and woman. During the celebration of the start of the rainy season in August, children offer their parents a pitcher of sorghum beer to show their appreciation. The beer is also drunk at wakes. When a person is given a cow, sorghum beer is offered in return as an affirmation of friendship.

The preparation of sorghum beer in rural households is as follows. The sorghum is soaked in water in a wooden trough for 2-3 days, after which it is spread on a mat and left for 1 day, covered with green banana leaves. It is then mixed with the ashes of dried banana leaves (to initiate germination) and dried. The young shoots are carefully removed, and the kernels sifted out. These kernels are milled with a grindstone into a brownish flour that, mixed with water and boiled, produces a sticky porridge. The porridge is diluted with water, left to cool, and poured into pitchers with malted sorghum flour and yeast from banana wine. The beer is fermented at room temperature and is ready in 12-23 h.

**Studies on Sorghum**

Although figures on home consumption are not yet available from the National Survey of Rural Household Income and Expenditure (Rwanda 1986b), it is, nevertheless, useful to look at the place occupied by sorghum in the annual household expenditure of Rwandan families (Table 1). As can be seen, sorghum has an important place in Rwandan households, both as a cereal and as a base for drinks.

According to the 1984 National Agricultural Survey (Rwanda 1984), the first agricultural season in 1984 yielded 28,252 t of sorghum, harvested from 189,443 planted fields, i.e., 149 kg/field. Millet appears to be less widely cultivated than sorghum. The survey also indicated that Byumba, Ruhengeri, and Gisenyi are the major sorghum-producing areas. Women are the primary agricultural workers in these northern regions. In sorghum cultivation, the men may assist in clearing the land, but it still remains for the women, often with small children strapped to their backs, to plant, hoe, reap, and dry the grain. Men may also take a hand in threshing, but winnowing and storage in the family granary ("umutiba") is again the women's responsibility.
Table 1. Annual household expenditure on foodstuffs in Rwanda.

<table>
<thead>
<tr>
<th>Foodstuff</th>
<th>Average annual expenditure (RWF)&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Percentage of budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereal grains</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sorghum</td>
<td>280</td>
<td>2.6</td>
</tr>
<tr>
<td>Rice</td>
<td>300</td>
<td>2.8</td>
</tr>
<tr>
<td>Corn</td>
<td>75</td>
<td>0.7</td>
</tr>
<tr>
<td>Others</td>
<td>63</td>
<td>0.6</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>718</strong></td>
<td><strong>6.8</strong></td>
</tr>
<tr>
<td>Tubers and bananas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cassava</td>
<td>356</td>
<td>3.4</td>
</tr>
<tr>
<td>Sweet potatoes</td>
<td>272</td>
<td>2.6</td>
</tr>
<tr>
<td>Potatoes</td>
<td>358</td>
<td>3.4</td>
</tr>
<tr>
<td>Bananas</td>
<td>80</td>
<td>0.8</td>
</tr>
<tr>
<td>Others</td>
<td>32</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>1098</strong></td>
<td><strong>10.4</strong></td>
</tr>
<tr>
<td>Legumes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haricots</td>
<td>1485</td>
<td>14.1</td>
</tr>
<tr>
<td>Peas</td>
<td>80</td>
<td>0.8</td>
</tr>
<tr>
<td>Peanuts, etc.</td>
<td>69</td>
<td>0.7</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>1634</strong></td>
<td><strong>15.8</strong></td>
</tr>
<tr>
<td>Fruits</td>
<td>179</td>
<td>1.7</td>
</tr>
<tr>
<td>Animal products</td>
<td>1466</td>
<td>13.9</td>
</tr>
<tr>
<td>Drinks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Banana beer</td>
<td>2576</td>
<td>24.4</td>
</tr>
<tr>
<td>Sorghum beer</td>
<td>696</td>
<td>6.6</td>
</tr>
<tr>
<td>Primus beer</td>
<td>808</td>
<td>7.7</td>
</tr>
<tr>
<td>Others</td>
<td>90</td>
<td>0.9</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>4170</strong></td>
<td><strong>39.5</strong></td>
</tr>
<tr>
<td>Other foods</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Palm oil</td>
<td>449</td>
<td>4.3</td>
</tr>
<tr>
<td>Salt</td>
<td>491</td>
<td>4.7</td>
</tr>
<tr>
<td>Sugar</td>
<td>104</td>
<td>1.0</td>
</tr>
<tr>
<td>Others</td>
<td>244</td>
<td>2.3</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>1288</strong></td>
<td><strong>12.2</strong></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>10553</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

<sup>a</sup>In 1988, 80 Rwanda francs (RWF) = 1 United States dollar (USD).
In 1977, a team from the Rwandan Institute of Agricultural Science (ISAR) comprising Emmanuel Twagirumukiza, an agronomist specializing in microbiology, and Charles Iyakarémye, a chemical engineer specializing in industrial agriculture, wrote: "In Rwanda, sorghum is the principal cereal, cultivated in all regions. Many local varieties exist, of which the most common are 'kebo' (SVR 157), 'nyiragimoli' (SVR 101), and 'karuguma'." From 1975 to 1984, sorghum produced 121,100 t at 149 kg/field, with an average yield of 9-11 q/ha (1 q = 100 kg).

The ISAR team noted that homemade fermented sorghum wort (used to make a beer based on sprouted and fermented sorghum flour) has a higher nutritional value than that of sorghum porridge (made with nonfermented wort): numerous yeast cells develop in the wort, producing animal proteins and vitamins, especially those in the B group. In 1977, ISAR's Technology Division worked on improving the suitability of sorghum for breadmaking; they went no further, however, in studying its nutritional potential. In another study in 1982, Jo Laure, a nutritional expert of IMSEA (Institute of Statistics), found that, on average, infants in Nyabishongo were weaned at 12 months; 76% of the mothers reported giving sorghum as the traditional weaning food.

World Bank consultant Dick Heyward, who worked with the Centre for Nutrition Training (CNFR) in Ruhengeri from February to April 1985, conducted trials on the taste acceptability to children of sprouted and unsprouted sorghum porridge enriched with haricot or pea flour. The trials, involving 28 children and their mothers, took place at the Applied Nutrition Centre (CNA). CNA workers prepared four different porridges before the mothers arrived: sprouted sorghum with shelled haricot beans, unsprouted sorghum with shelled haricot beans, sprouted sorghum with peas, and unsprouted sorghum with peas. In this week-long experiment, separate groups of mothers rated the porridges according to taste, smell, etc. The mothers then fed the mixtures to their children, whose reactions were noted by CNA personnel.

The tests concluded that because of their slightly sweet taste, porridges based on sprouted sorghum flour were preferred. The more aromatic porridges made with roasted sprouted sorghum were the favourite. The results of this experiment were unfortunately not published. To date, no effort has been made to introduce sprouted sorghum as a weaning food.

The 1986 National Nutrition Survey, conducted on 2995 children, provided the information contained in Table 2 on the status of children up to 5 years of age (Rwanda 1986a). The average length of time for which children were breastfed was 18.6 months. Out of 1332 children under 24 months of age, only 424 were fed porridge. In over 46% of households surveyed, porridge was prepared less than 7 times per week. Daily preparation of meals was as follows: 1 meal/day in 292 households (14.6%), 2 meals/day in 1486 households (74.5%), and 3 meals/day in 218 households (10.9%).

A study on the feeding of children aged 6-24 months, conducted by the United Nations Children's Fund (UNICEF) and the National University of Rwanda (UNR), is currently in progress. A random selection of 100 cards containing data taken in one sector of Butare showed the
Table 2. Distribution (%) of children aged up to 5 years on the basis of weight-for-age, 1986.

<table>
<thead>
<tr>
<th>Child's age (months)</th>
<th>0-12</th>
<th>13-24</th>
<th>25-36</th>
<th>37-48</th>
<th>49-60</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of children</td>
<td>650</td>
<td>682</td>
<td>684</td>
<td>559</td>
<td>420</td>
<td>2995</td>
</tr>
<tr>
<td>Ratio (weight/age)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Above 80%</td>
<td>82.2</td>
<td>69.3</td>
<td>73.2</td>
<td>68.2</td>
<td>66.9</td>
<td>72.4</td>
</tr>
<tr>
<td>Below 80%</td>
<td>17.8</td>
<td>30.7</td>
<td>26.8</td>
<td>31.8</td>
<td>33.1</td>
<td>27.6</td>
</tr>
</tbody>
</table>

frequency with which complementary foods are given to young children (Table 3).

Conclusions

Sorghum is found throughout Rwanda. Nearly all rural Rwandan families prepare sprouted sorghum flour that is later fermented to make beer. This flour - one that produces a higher energy porridge than unsprouted - is, therefore, available in most households; mothers need only be encouraged to use it for preparing weaning foods for their young children. To our knowledge, however, no serious study has been undertaken in Rwanda on the use of fermented sorghum porridge, either as a weaning food or as a food for children who, having been ill, are anorexic. At present, neither the flour's energy value nor its resistance to spoilage is recognized by mothers or by nutrition personnel.

Large-scale studies should be conducted to investigate those problems that interfere with the year-round feeding of sprouted sorghum-based foods to young children. Included in such studies would be the palatability of the flour and its effectiveness in preventing malnutrition. Many unknowns still exist with respect to the use, particularly for infant feeding, of sprouted sorghum and traditionally fermented foods. It is important that an undertaking to support

Table 3. Frequency of complementary foods given to children aged 6-24 months, 1987.

<table>
<thead>
<tr>
<th>Age of child (months)</th>
<th>Number of children</th>
<th>Number of meals per day apart from breastfeeding</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>6-8</td>
<td>17</td>
<td>2</td>
</tr>
<tr>
<td>9-12</td>
<td>17</td>
<td>-</td>
</tr>
<tr>
<td>13-18</td>
<td>29</td>
<td>-</td>
</tr>
<tr>
<td>19-24</td>
<td>17</td>
<td>-</td>
</tr>
<tr>
<td>Over 24</td>
<td>20</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>2</td>
</tr>
</tbody>
</table>
further research on sorghum and infant feeding be included in UNICEF's 5-year program of cooperation with the Government of Rwanda; this program is operating concurrently with the country's fourth 5-year plan.

References

