Distributing fortified and high energy density gruel to reduce the failure rate and improve nutritional status of Antananarivo schoolchildren

Arnaud Laillou[1], Agnès de Sesmaisons[1], Charlotte Ralison[2], Chantal Monvois[1] and Serge Trèche[3]

[1] Research and Technological Exchange Group (GRET), Antananarivo and Paris;
[2] Laboratoire de biochimie appliquée aux sciences de l'alimentation et à la nutrition, Antananarivo, Madagascar;
[3] "Nutrition, alimentation, société" Research Unit, Institut de Recherche pour le Développement (IRD), Montpellier, France.

Introduction

Poverty and inadequate food habits increase the risk of micronutrient and protein-energy deficiencies. In the highly precarious contexts encountered in developing countries, school-age children are particularly vulnerable. At a crucial stage of their development, they are hit hard by the effects of undernutrition. This both quantitative and qualitative insufficiency of food adds to the difficult school conditions and is an obstacle to successful schooling. Schools are a strategic location to reach these children and School Food Programs (SFPs) have been developed to provide them with food that complements their usual diet and can even reestablish their micronutrient status.

In Madagascar, two out of three people live below the poverty line (Instat, 2003) and malnutrition indicators reach high levels among young children (one out of every two children under the age of five presents with growth delay, one out of every three is underweight, and one out of every nine is grossly underweight – UNICEF, 2005). There is little data available on deficiency levels among school-age children, but the daily intake of energy, protein and micronutrients is obviously insufficient for most children. Immediate hunger, fragile nutritional status and health, and reduced cognitive abilities are all consequences of this undernutrition.

The *Nutrimad Program*, in which GRET (the Research and Technological Exchange Group), IRD (the Institut de Recherche pour le Développement), and Labasan (the Laboratoire de biochimie appliquée aux sciences de l'alimentation et à la nutrition de l'Université d'Antananarivo) collaborate, aims to contribute to the sustainable reduction of malnutrition in Madagascar. The Nutrimad team felt that setting up a SFP in the public primary schools (PPSs) frequented by the poor would be a pertinent strategy to fight malnutrition among school-age children. A key factor is the fact that the intervention is fully anchored within the local institutional framework and the Malagasy government's priority of "school for all".

The Nutrimad SFP aims to set up a sustainable system to distribute school snacks, supported by nutrition education campaigns. The Nutrimad SFP is co-financed by the SIGHT AND LIFE and the Ile-de-France Regional Council within the framework of its cooperation with the Commune of Antananarivo.

More generally, Nutrimad is part of GRET's and IRD's Nutridev Program, initiated in 1994 to reduce malnutrition among the most vulnerable groups of popu-

lations in developing countries. Nutridev also receives the support of SIGHT AND LIFE in Vietnam for producing fortified biscuits for school-age children.

The "Koba Tsinjo", a snack adapted to local constraints

The powder, called "Koba Tsinjo", is a mixture of corn meal, peanut, sugar, salt, a mineral and vitamin premix (MV premix), and BAN (Table 1). Soybean oil is added while it is cooked in water. Only the MV premix and BAN are imported. The manufacturing procedures were transferred to the Taf company, a Nutrimad partner since 2002.

Table 1: Composition of Nutrimad Koba Pas

Ingredients	%
Corn	72.60 %
Sugar	14.00 %
Peanut (roasted)	8.50 %
Soybean Oil*	2.00 %
Iodized Salt	0.65 %
$Ca_3(PO_4)_2$	1.95 %
MV premix**	0.30 %
BAN 800	0.007%

* added when preparing the gruel

**Composition of 100 g premix (incorporation rate 0.30 g/100g)

Iron	4 000	mg
Copper	150	mg
Iodine	9 333	µg
Zinc	4 200	mg
Manganese	103	mg
Selenium	1 667	µg
Vitamin A	333 333	IU
Vitamin C	5 500	mg
Vitamin D	26 000	IU
Thiamin	73	mg
Riboflavin	127	mg
Vitamin B6	73	mg
Niacinamide	1 500	mg
Vitamin B12	333	µg
Folic Acid	48	mg
Pantothenic acid	333	mg
Vitamin E	833	IU
L-Lysine	31 667	mg

The Nutrimad SFP aimed to set up a snack that was:

- accessible for everyone, i.e. inexpensive and made from local raw materials;
- acceptable, i.e. liked by children;
- able to be appropriated and reproduced, i.e. easy to prepare within schools; and
- nutritionally effective, i.e. designed so that the consumption of one portion covers a sufficient share of a child's daily energy and nutrient requirements.

Nutrimad has acknowledged know-how in elaborating high-energy density gruel that has been developed in the framework of its "complementary foods" component. After having verified its acceptability for Malagasy school children, the program chose to develop this kind of gruel.

In Antananarivo, the age range for children in PPSs is 6 to 14 years old. Nutritional requirements and ingestion capacity vary considerably within such a wide age range. Levels of fortification and the size of the portion of gruel were selected in order to meet the requirements of the majority of children as far as possible, while limiting waste and cost.

The nutritional goals were defined based on the recommended daily allowances for 10-year-old boys (two thirds of the school children targeted by the program are under 10). By combining the nutritional deficiency estimates from a preliminary food consumption survey (Ratsito, 2004), national data, and the strategies adopted in other SFPs, the decision was made to cover:

- 75% of the RDA for micronutrients for which there is a major deficiency risk: iron, zinc and vitamin A;
- 60% of the RDA for calcium, and 40% of the RDAs for other minerals and vitamins;
- 25% of the RDA for proteins, amino acids and essential fatty acids;

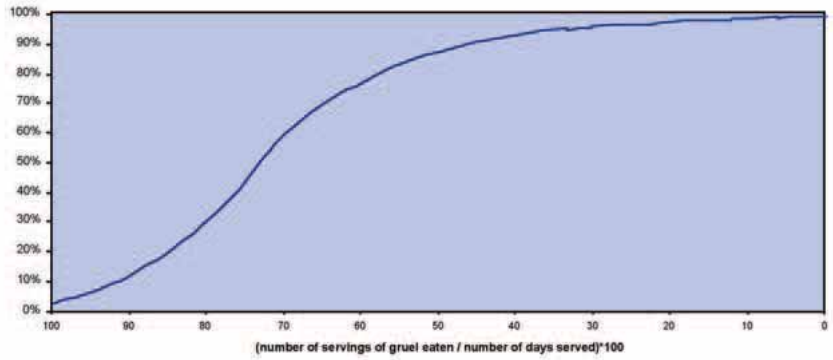

Figure 1: Distribution of children according to frequency of gruel consumption (expressed in cumulated frequency)

- and to provide a minimum of 21% of the energy in the serving in the form of lipids.

In order to determine the size of the portions to distribute, a study was conducted on a sample of 400 children between the ages of 6 and 14. The quantity of gruel that a child can ingest during a recess period is on average 384 ± 135 g, with a difference of more than 100 g between the average amounts ingested by 6-year-olds and 14-year-olds. Based on this, the decision was made to ensure that one portion of gruel (approximately 100 g of flour) would provide 18% of a 10-year-old's energy requirements.

The portions needed to be easy to ingest, and it was therefore imperative to give the gruel a fluid consistency, although its preparation called for a large quantity of flour (100 g) to be incorporated in a small volume (350 ml) of water. To do so, an industrial microgranulate amylase (BAN: Bacterial Amylase Novo) was added.

2004–2005 School Year: The Nutrimad SFP's first "exam"

To ensure the sustainability of the program, Nutrimad is working to identify a municipal system that can be reproduced on the national scale. From March to June 2004, the Nutrimad SFP was present in five PPSs in Antananarivo; it was extended to fifteen PPSs (12,863 children) at the start of the 2004–2005 school year.

Preparation and distribution

Too numerous to attend all at once, the PPS schoolchildren are divided into two groups and attend school in the morning or afternoon. The principle adopted was to sell a serving of gruel during each half-day's recess. A staff composed of several persons in charge of gruel preparation and one manager was set up in each PPS. In the morning, the teachers establish a list of children who wish to eat a snack and send it to the staff manager. The manager calculates the corresponding quantity of gruel, which is then prepared by the staff. The staff distributes the gruel to the children and then cleans and puts away the dishes and utensils used to cook and distribute the gruel. The staff in charge of gruel preparation is recruited from among the disadvantaged families in the neighborhood whose children attend the PPS, giving the project a complete approach to poverty alleviation.

Partnership framework and involvement of the partners

In order to anchor the Nutrimad SFP's approach in the local institutional landscape and sustainably involve local stakeholders and decision-makers, a Steering Committee and a Management Committee were created from the start.

The Steering Committee's vocation is to supervise the proper implementation of the scheduled activities and, if needed, decide to re-orient activities. The Committee members, on whom the sustainability of the project relies, can express their expectations. The Committee members come from seven entities: the Urban Community of Antananarivo, the CISCO (the Ministry of Education authority in charge of a given school district), the Nutrimad team, the NGO Aide et Action, schools concerned (representatives of commune authority, school directors, management committee), and the Ministries of Health and of Family Planning.

To manage the staff in charge of gruel preparation, and notably to designate their manager, a Management Committee involves the bodies active in school life:

- the Director, who chairs the Management Committee;
- two representatives of the Parents' Federation;
- a representative of the School Management Committee; and
- a district, or *fokontany*, representative nominated by the *fokontany* head, who is also a registered auditor.

Nutrition education, a crucial link in the Nutrimad strategy
Nutrimad's nutrition education program for PPS students consists of encouraging food consumption that matches nutritional requirements, stimulating public demand for appropriate foods, and promoting healthy living. The teachers were chosen to be privileged relays with the children as they are up-to-date on local education practices and the cultural, social and food environment. In addition, they have time, pedagogical training, and an influence over the children.

With an aim to sustainability, the Nutrimad SFP messages, information posters, and films are currently included in the classes given in the fifteen PPSs.

First results

Subsidized sales
The price of the snack is a key element in the strategy's appropriation by the beneficiaries. Preliminary surveys showed that the families' participation in the purchase of a serving could not exceed 40 ariarys (0.021 USD). However, despite work optimizing production, the production cost of one portion of gruel is 0.096 USD. The sale of gruel is therefore currently subsidized at 75% of cost.

A 86% penetration rate
Last year, during the four months that the project was active, the average daily consumption rate (= number of children eating a serving of gruel divided by the total number of children enrolled in the PPSs concerned) for the five schools was 53% of the children enrolled. The FSP sold 105,236 meals.

The current phase (2004–2005 school year) is benefiting from the lessons learnt in the previous phase. Thus, the nutrition education component was strengthened with the production of an educational film and posters targeting the students and their families. The first results show an average consumption rate of 85.7% in the PPSs, with 405,893 meals sold in three months (from November 2004 to February 2005).

The frequency of consumption by students in the fifteen schools (September to February 2005) is illustrated in Figure 1. More than 75% of the children buy at least three servings of gruel per week and more than 99% have bought gruel at least once.

Prospects

Assessment to validate and extend the strategy
The assessment set up to confirm the pertinence of the Nutrimad SFP strategy will calculate the children's SFP participation rate, identify the determining factors in participation, and measure the effects of the SFP on the school performance and nutritional status of the children in the fifteen schools. In addition, the influence of gruel consumption on children's cognitive performances, the daily structure of their meals, and their levels of energy and nutrient intake will be studied on representative sub-samples of children.

These results will notably help define improvements that could be made when expanding the program.

A "toolkit" at the service of the National Nutrition Plan
The goal of the Malagasy government's National Nutrition Plan (NNP) is to set up strategies aiming to improve the nutritional status of school children, in synergy with the heavy investments that will be made in the education sector.

With the support it provides for the local production of fortified snacks accessible to all and its elaboration of nutrition education tools for children, the Nutrimad project fits into the NNP. This "toolkit" is currently being validated.

If the Nutrimad SFP strategy is proven effective to counter immediate hunger and micronutrient deficiencies among schoolchildren, it will be validated and tested on larger scale. The institutional aspects of the program remain to be organized: 'What subsidy?', 'Attributed to which

households?', 'How?' and 'What community management mode should be adopted?' These questions – which go well beyond the scientific framework – are crucial for the success of the Nutrimad SFP. They set the conditions for its institutional anchorage. They will be answered during the 2005–2006 school year.

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Building a multisectoral vitamin A program in Uganda: Establishing sustainable roles for effective implementation

Louise Sserunjogi, MOST/USAID, Kampala, Uganda; Philip WJ Harvey, MOST/USAID and Johns Hopkins Bloomberg School of Public Health, Baltimore MD, USA.

Introduction

An analysis of the nutrition situation in Uganda was carried out in 1999 in order to identify priority nutrition actions for the health sector. At that time there was no nationally representative biochemical data on vitamin A deficiency (VAD), but indirect data suggested strongly that VAD was a problem of public health significance – under-five mortality rate was high, VAD was identified as a significant clinical problem in a "typical" district, and the usual diet was low in vitamin A.

The primary constraints to effective micronutrient nutrition programs identified by the analysis were:

- Little appreciation of the significance and magnitude of micronutrient malnutrition;
- Lack of integration of nutrition within district health services;
- No comprehensive national micronutrient strategy;
- Limited involvement of the private sector; and,
- Data gaps on key policy and program issues.

The timing of the assessment was opportune in that it coincided with finalization of a new Health Policy. The new policy focused attention on a set of priority health services known as the Uganda National Minimum Health Care Package. This package included nutrition improvement. The policy also specified that responsibility and budget for implementation of the services was to be decentralized to district and sub-district levels. The Government Health Sector Strategic Plan called for improving vitamin A status through increasing coverage of supplementation for preschool children, enhancing breast-feeding, and increasing consumption of vitamin A-rich foods through agriculture and fortification. This paper outlines a few of the key processes undertaken in the effort to achieve sustainable implementation of a comprehensive vitamin A program in Uganda.

Supplementation

In 1999 vitamin A was being delivered to children through routine EPI measles vaccination at 9 months of age and through National Immunisation Days (NIDS) for polio. The Ministry of Health instituted a stakeholders' taskforce. This consisted of technical officers, donor agencies such as UNICEF, World Bank, WHO, USAID, community-based organizations, and academic institutions. This partnership-building approach strengthened collaboration and coordination among stakeholders for a national program. The national protocols for vitamin A supplementation were made consistent with WHO recommendations.

The first step taken in strengthening the on-going supplementation interventions was to understand the knowledge and practices of health workers and caregivers in relation to vitamin A deficiency and supplementation. Several research and policy documents were reviewed, operational research was carried out, and exit interviews at NIDs were conducted. This process facilitated the development of a series of communication and advocacy materials and fed directly into the development of training programs. The Ministry of Health