Fortification of food with micronutrients

GOVERNMENTS, OFTEN ASSISTED by international agencies and non-governmental organizations and industry, have for many decades taken steps to eliminate or reduce micronutrient deficiencies. Building on the impressive results of the reduction in iodine deficiency disorders (IDD) through the fortification of table salt with iodine, vigorous efforts are currently being made to address other micronutrient deficiencies through the fortification of appropriate foods.

The term "food fortification" means the addition of nutrients at levels higher than those found in the original food. Fortification is synonymous with enrichment. Restoration means that nutrients are added to a food to compensate for the loss of nutrients during processing. Generally, food fortification is undertaken at the industrial level, although food fortification can also take place at the household or community levels.

Mass fortification refers to the addition of micronutrients to foods commonly consumed by the general public (such as cereals and condiments), which is instigated, mandated and regulated by the government sector. Universal fortification refers to the fortification of foods consumed by animals as well as humans, with iodization of salt as the main example. Targeted fortification programmes also exist, for example the distribution of biscuits fortified with a certain number of vitamins and minerals in school food programmes. Furthermore, fortification of some foods (e.g. wheat flour) with specific nutrients at specific levels may be either mandatory (legislated through governments) or voluntary.

The technological problems relating to fortification are being overcome even in developing countries. Different foods may be fortified with a single micronutrient, for example sugar with Vitamin A, or with more than one nutrient, such as salt with iodine and iron or wheat flour products fortified with multi-micronutrient mixes. The international nutrition community is now looking at ways to apply fortification more prominently in order to reduce or eliminate other existing micronutrient deficiencies.

This paper outlines the role and position of FAO regarding the fortification of foods with micronutrients and presents the ways in which the Organization can provide technical assistance to governments in concert with international agencies, non-governmental organizations, public and private institutions and the food industry, to support planned and ongoing fortification programmes. However, in providing such assistance, it must be acknowledged that fortification programmes have certain limitations, and to ensure their success and sustainability such programmes should be implemented in concert with poverty reduction programmes and agricultural, health, education and social intervention programmes that promote the consumption and utilization of adequate quantities of good-quality, nutritious foods, especially among the nutritionally vulnerable.

FAO's overall policy to improve nutrition

FAO's efforts to improve nutrition worldwide are guided by the recommendations made during international meetings and conferences, including the FAO/WHO International

Conference on Nutrition (Rome, 1992) and the World Food Summit (Rome, 1996). In following these recommendations, emphasis is given to addressing the underlying causes of malnutrition and the micronutrient deficiencies that often accompany it, which rest, *inter alia*, in poverty, the underdevelopment of agriculture and poor livelihoods that lead to food insecurity at the national and household levels. Actions to promote an increase in the supply, access to and consumption of an adequate quantity, quality and variety of foods for all population groups is central to FAO's work. These actions are also the logical outcome of the right to food, which is an internationally agreed right for all human beings. In accordance with these rights, FAO promotes and supports sustainable food-based programmes and strategies to improve nutrition with the aim that all people, through a variety of different foods, can obtain a diet providing all the energy and macro- and micronutrients they need in order to achieve a healthy and productive life.

Fortification of food with micronutrients was identified by the two above-mentioned conferences as a valid technology to adopt as part of a food-based approach if existing food supplies and limited access fail to provide adequate levels of the respective nutrients. In such cases, fortification of food is seen as a valuable addition to reinforce ongoing nutrition improvement programmes. In FAO's view, fortification is not an alternative to the overall goal of improving nutrition through policy and programming responses that encourage the consumption of a nutritionally adequate diet composed of a variety of available foods.

In developing food fortification programmes, attention must be paid to the following:

- The population groups most in need of improved nutrition are the poor. They often do not have access to fortified foods because of their low purchasing power and because distribution channels remain undeveloped. The combination of low economic demand and lack of physical access to markets means that the poor often eat food directly from the field without the added value of commercial food processing.
- The poor are known to suffer from multiple micronutrient deficiencies, all of which cannot realistically be addressed by fortified foods. As most traditional diets are normally able to provide the micronutrients required for normal function and growth, micronutrient deficiencies generally result from inadequate intakes of the overall diet.
- The standards for the technology of fortification of different foods have not yet been fully resolved with regard to nutrient levels, stability and physical property characteristics as well as consumer acceptance in terms of cooking properties and taste, among other factors.
- Insufficient scientific knowledge about nutrient interaction complicates decisions concerning the amount of nutrient to add to a food.

Nevertheless, fortified foods as part of food aid are of unquestionable value in protecting the nutritional status of vulnerable groups and people affected by emergencies. In this context, FAO is pursuing the goals set by governments for overall nutrition improvement through food-based approaches as a priority, and is assisting countries in ensuring that food fortification programmes find their appropriate place as one element of national nutrition improvement policies, plans and programmes.

FAO contributions to food fortification

Governments can request specific technical assistance from FAO for food fortification. This may include assisting governments with the planning and operational management skills necessary for starting or expanding a food fortification programme to address micronutrient malnutrition. In addition, a number of elements in different sectors require technical assistance, and FAO supports and strengthens fortification programmes in the following areas.

Planning and operational management

FAO assists governments in setting criteria and identifying desirable prerequisites from different technical fields to help decide whether or not to set up or expand a food fortification programme. The setting of such criteria is considered essential to the success and continuation of programmes, because they reflect past programme results and experiences. Criteria include:

Programme coverage. The actual and expected beneficiaries of the fortification programme need to be identified and their nutritional needs as well as dietary practices analysed. Such analysis may identify population groups in need that may be excluded from a programme (e.g. the universal fortification of a staple such as wheat) if they are not purchasing the item being fortified. The outreach of a programme and accessibility of beneficiaries will determine which measures other than food fortification are required to assist the target population groups. Estimates of population sizes will also assist in the assessment of costs. This will call for comprehensive data, including socio-economic data, on the prevalence of deficiencies, food consumption (including the intake of micronutrients), and the food habits and attitudes of vulnerable groups.

Cost issues (start-up costs, purchasing power, product price, follow-up costs). Although the technical problems concerning the fortification of a food with a specific micronutrient can be

overcome, it may take years of trials to adjust for micronutrient levels or physical qualities and taste, all of which have a considerable cost. Even when the technical difficulties have been overcome, fortification programmes are not cost-free. The costs associated with the food fortification process can limit their implementation and effectiveness. Careful analysis of these issues prior to taking any decision to launch or expand a programme is needed. Although the funds for start-up costs are often available to governments from external sources, for example donors, foundations and industry, such funding can seriously distort the realistic analysis of the purchasing power of the expected beneficiaries and the recurrent costs involved in creating and maintaining the demand for these products. While various schemes (government subsidy, shifting costs to social groups with more financial resources, etc.) have been tried in fortification programmes, they tend to be unsustainable when not demand driven. Realistic government decisions on these issues must be based on the analysis of recurrent follow-up programme costs.

Requirements for food legislation, food control and quality assurance. The food industry and manufacturers of foods operate within legal restrictions and regulations set by governments as guided by national and international technical bodies. Their interest and effective participation in fortification requires the establishment of widespread legislation that includes standards for fortification in food product development, manufacturing and distribution, and consumer protection. Only such legally binding standards allow for effective food control and quality assurance later on. The standards must include regulations for claims and labelling, which are often considered advantageous for creating a consumer demand for fortified products.

Collaboration and coordination among governments, public scientific and civic institutions, manufacturers and consumer groups. The planning and implementation of a food fortification programme is a complex matter. It requires participation and inputs throughout the process from various technical, industrial and civic groups and ultimately the consumers, all to be harmonized and coordinated by government and programme staff. External assistance agencies are part of this process, but a balance needs to be struck between their drive and use of external resources for fortification programmes, and the reality and conditions existing in different programme countries. To ensure the sustainability of food fortification programmes, a "country-driven" rather than "agency-driven" focus must be given priority.

Support programmes. Food fortification programmes are ultimately directed towards consumers. The existence of a variety of population groups with different social, economic, and sometimes religious and cultural attitudes and practices requires that programmes be tailored to understand and accept these differences so that the programmes may be implemented accordingly. Social marketing and information campaigns are commonly part of food fortification programmes, but are not sufficient by themselves. The programme needs to be closely linked with a nutrition education programme for the public. Past experiences have clearly shown that the failures or inefficiencies of fortification programmes were caused by the failure to address public concerns and gain the widest public involvement possible.

Specific technical assistance elements

Cognizant of these limitations and concerns, FAO assists governments in their efforts to eliminate or reduce micronutrient malnutrition through food fortification programmes adopted as part of a comprehensive food-based strategy by:

- providing technical assistance to set up new, or review existing, food laws and strengthen the legal aspects of fortification and related food control;
- strengthening existing food control structures through support to human resources, inspection services and laboratories for product quality assurance and by collecting and analysing reliable data for monitoring and evaluation purposes;
- making technical manuals and guidelines available, including relevant publications of the Codex Alimentarius, so that effective training can be undertaken, and facilitating technical discussions on food claims, labelling and packaging taking into account international food standards;
- facilitating the collaboration of relevant industry groups, national or regional laboratories, international networks of specialists in the different technical fields required for food fortification with government and programme staff;
- supporting groups and laboratories, and developing, updating and maintaining a food composition database as essential background for determining needs for and levels of fortification, including monitoring;
- assisting in dietary assessment in population groups, including the provision of software for the analysis of dietary intake data from comprehensive or rapid surveys and the setting-up of surveillance systems for this purpose (this information provides the basis for food-labelling requirements, including product claims made by government and manufacturers);
- providing for printed and electronic technical manuals and guidelines on national food composition and on nutrient requirements of different population groups and countries;

- furnishing technical assistance to nutrition education programmes for the public so as to strengthen the impact of micronutrient fortification programmes thereby promoting sustainability;
- strengthening participatory planning and implementation of relevant aspects of food fortification programmes by facilitating appropriate linkage with ongoing programmes on household food security and overall nutrition improvement (this includes special programmes on emergencies, those directed towards population groups affected by human immunodeficiency virus (HIV) and gender-sensitive programmes).

In addition to these actions, FAO collaborates with international and national agencies and participates in relevant meetings at the national, regional and international levels on specific topics so as to accelerate the planning and implementation of comprehensive and sustainable food fortification programmes. This includes collaboration with the World Health Organization in the preparation of guidelines on food fortification for governments and agencies currently implementing or considering implementing food fortification programmes.

FAO Food and Nutrition Division

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Fortification of food with micronutrients

THIS PAPER OUTLINES THE ROLE AND POSITION OF FAO on the fortification of foods with micronutrients, and presents how the Organization can provide technical assistance to governments, in concert with international agencies, non-governmental organizations, public and private institutions and the food industry, to support planned and ongoing fortification programmes. FAO assists governments in their efforts to eliminate or reduce micronutrient malnutrition through food fortification programmes adopted as part of a comprehensive food-based strategy. FAO can provide policy guidance and technical assistance concerning various aspects of fortification initiatives and thereby assist member countries to establish appropriate fortification programmes as one element of national nutrition improvement policies, plans and programmes.

However, fortification programmes have certain limitations, and to ensure the success and sustainability of such programmes, they need to be implemented as part of more comprehensive strategies to reduce micronutrient malnutrition. Such broad-based strategies include poverty reduction programmes along with agricultural, health, education and social intervention programmes to promote consumption of nutritious foods by all, but in particular by the nutritionally vulnerable.

In developing food fortification programmes, attention must be paid to the following issues.

- The most affected population groups in need of improved nutrition are the poor. However, they often do not have access to fortified foods because of low purchasing power and undeveloped distribution channels.
- Poor population groups are known to present multiple micronutrient deficiencies, not all of which can be addressed by fortified foods.
- The technology for fortifying various foods has not been fully established as regards nutrient levels, stability and physical property characteristics; nor has acceptability by consumers in terms of cooking properties and taste been determined. Insufficient scientific knowledge regarding nutrient interaction complicates the decision regarding levels of a nutrient to be added to a food.

Nevertheless, fortified foods as part of food aid are of unquestionable value to protect the nutritional status of vulnerable groups and victims of emergencies.

Enrichissement des aliments par les micronutriments

L'ARTICLE EXPOSE LE RÔLE ET LA POSITION DE LA FAO en matière d'enrichissement des aliments en micronutriments, et explique comment l'Organisation, en collaboration avec d'autres organisations internationales, les organisations non gouvernementales, les organismes publics et privés et l'industrie alimentaire, peut fournir une assistance technique aux gouvernements à l'appui des programmes d'enrichissement prévus ou en cours. La FAO vient en aide aux pays soucieux d'éliminer ou de réduire la prévalence de la malnutrition due à des carences en micronutriments par le biais de programmes d'enrichissement des aliments s'inscrivant dans le cadre de stratégies globales fondées sur l'alimentation. Elle peut notamment leur fournir des conseils de politique générale et une assistance technique en rapport avec divers aspects des activités d'enrichissement et, ainsi, les aider à se doter de programmes d'enrichissement adaptés, intégrés à des politiques, plans et programmes nationaux d'amélioration de l'alimentation.

Cela étant, les programmes d'enrichissement ont leurs limites. Ils ne peuvent être durablement et efficacement mis en œuvre que s'ils font partie intégrante de stratégies globales visant à réduire la prévalence de la malnutrition due aux carences en micronutriments. Ces stratégies de large portée comportent à la fois des programmes axés sur la réduction de la pauvreté et des interventions à caractère agricole, sanitaire, éducatif et social. Elles ont pour objectif de promouvoir la consommation d'aliments nutritifs et s'adressent tout particulièrement aux groupes les plus vulnérables au plan nutritionnel.

L'élaboration de programmes d'enrichissement des aliments doit prendre en considération les aspects suivants:

- Les personnes les plus touchées par la malnutrition sont les pauvres, qui n'ont généralement pas

accès aux aliments enrichis du fait de leur faible pouvoir d'achat et du caractère embryonnaire des circuits de distribution.

- On sait que les plus démunis présentent de multiples carences en micronutriments que les aliments enrichis ne peuvent pas toutes combler.
- Le procédé d'enrichissement des aliments n'a pas encore fait toutes ses preuves, notamment en ce qui concerne la teneur en nutriments des aliments enrichis, leur stabilité et leurs propriétés physiques. On ne sait pas non plus s'ils répondent aux attentes des consommateurs, tant en ce qui concerne leur goût que leurs applications culinaires. L'insuffisance des données scientifiques relatives aux interactions entre nutriments complique de surcroît la prise des décisions concernant les quantités de nutriments à ajouter aux aliments.

En dépit de ces difficultés, les aliments enrichis distribués dans le cadre de l'aide alimentaire contribuent sans conteste à préserver le bon état nutritionnel des groupes vulnérables et des victimes de situations de crise.

Enriquecimiento de los alimentos con micronutrientes

EN ESTE DOCUMENTO SE EXPONEN LA FUNCIÓN Y LA POSICIÓN DE LA FAO en relación con el enriquecimiento de los alimentos con micronutrientes y se explica en qué forma puede proporcionar asistencia técnica a los gobiernos la Organización, en colaboración con organismos internacionales, organizaciones no gubernamentales, instituciones públicas y privadas y la industria alimentaria para apoyar los programas de enriquecimiento de los alimentos planificados y en curso. La FAO ayuda a los gobiernos en su esfuerzo de eliminar o reducir la malnutrición por carencia de micronutrientes mediante programas de enriquecimiento adoptados en el marco de una estrategia global basada en los alimentos. La FAO puede brindar orientación normativa y asistencia técnica sobre varios aspectos relativos a las iniciativas de enriquecimiento de los alimentos, ayudando así a los Países Miembros a establecer programas apropiados en esta esfera como un elemento más de las políticas, planes y programas nacionales de mejora de la nutrición. Sin embargo, los programas de enriquecimiento de los alimentos tienen algunas limitaciones y para garantizar su éxito y sostenibilidad se han de llevar a cabo en el marco de otras estrategias más generales de reducción de la malnutrición por carencia de micronutrientes. Estas estrategias nacionales comprenden programas de reducción de la pobreza, así como programas agrícolas, sanitarios, educativos y de intervención social, encaminados a promover el consumo de alimentos nutritivos por todas las personas, pero en especial entre las personas vulnerables desde el punto de vista nutricional. En la formulación de programas de enriquecimiento de los alimentos es necesario tener en cuenta los siguientes factores:

- Los grupos de población más necesitados de una mejora de la nutrición son los pobres, que, sin embargo, con frecuencia no pueden acceder a alimentos enriquecidos por falta de poder adquisitivo y de canales de distribución suficientemente desarrollados.
- Es sabido que la población pobre presenta múltiples carencias de micronutrientes, no todas las cuales se pueden superar con alimentos enriquecidos.
- No se ha establecido plenamente la tecnología para enriquecer distintos alimentos respecto de los niveles de nutrientes, la estabilidad y las propiedades físicas, ni se ha determinado la aceptabilidad por los consumidores en lo que respecta a las propiedades de preparación de los alimentos y al sabor. La falta de conocimientos científicos sobre la interacción de los nutrientes dificulta la decisión de la cantidad de un nutriente determinado que debe añadirse a un alimento.

No obstante, los alimentos enriquecidos como parte de la ayuda alimentaria tienen un valor indudable para proteger el estado nutricional de los grupos vulnerables y de las víctimas de situaciones de emergencia.