

## PROJECT DEVELOPMENT BY MULTIDISCIPLINARY TEAMS: AN EXAMPLE FROM A FOOD AND NUTRITION INSTITUTE<sup>1</sup>

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*Organizations seeking to improve health or nutrition around the world confront not only specific health or nutrition problems but also developmental difficulties, such as lack of public education, that enable the more specific problems to persist. The following article describes a matrix approach that the Caribbean Food and Nutrition Institute has found useful for dealing with this complex situation.*

### Introduction

#### *Traditional Science*

Scientific knowledge is traditionally compartmentalized into disciplines. Each discipline has its own linked set of laws and its own methodology. These give a coherence to the subject so that, at least until recently, a mathematician could recognize himself as being a member of the set of mathematicians and would not wonder whether in fact he should consider himself a physiologist or a chemist.

Nevertheless, as soon as a scientist moves away from contributing to the growth of knowledge in his discipline and into practical application of that knowledge, he has to move into a multidisciplinary world. Before this century's explosion of knowledge, one man could perform this feat. Now teams of scientists from different disciplines are to be found working together for a specific measurable objective—such as production of a space probe or development of a cure for bronchial cancer.

An attempt to define a discipline tends to set bounds for that discipline and thus inhibit its interaction with other disciplines. The dis-

cipline of nutritional science provides an example. Historically, nutritional science can be categorized as having two main branches—the first, closely allied to biochemistry, encompasses the study of energy and nutrients found in foods, while the second, a part of physiology, entails the elucidation of bodily needs for nutrients and responses to various intakes. This categorization was still acceptable in 1973 when WHO, FAO (1), and the International Union of Nutritional Sciences defined “nutrition” as:

1) The processes whereby living organisms utilize foods for maintenance of life, growth, the normal functioning of organs and tissues, and the production of energy.

2) The science and study of the reactions of the body to intake of food, to variations in the diet, and to other factors of pathological or systematic significance.

Such a narrow, bipolar approach is totally inadequate for applying knowledge about nutrition to human development. This is not to say that the above definition is inadequate but that, if we are to attempt to solve human nutritional problems, a much wider range of disciplines must be brought together. Here the whole food system, from food production through food digestion and assimilation (2), must become involved; and therefore the traditional discipline of nutrition can play only a small, though central, part.

<sup>1</sup>Also appearing in Spanish in the *Boletín de la Oficina Sanitaria Panamericana*.

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### *"Synaptic" Science*

Any attempts to use science to solve the problems of the world must be multidisciplinary in nature and must be as concerned with the linkages between the various traditional disciplines involved as with the content of those disciplines. In fact, a new form of science must be developed, one that builds on the linkages. Using an analogy taken from the physiology of the nervous system, we could call this new form "synaptic" science, meaning an approach to scientific investigation that concentrates on the places where disciplines intersect or come together.

That such an approach is gaining ground in public health is demonstrated by the Declaration of Alma-Ata (3), which considers primary health care "an integral part of the country's health system, of which it is the central function and main focus, and of the overall social and economic development of the community," and which states that primary health care "involves, in addition to the health sector, all related sectors and aspects of national and community development, in particular agriculture, animal husbandry, food, industry, education, housing, public works, communications, and other sectors, and demands the coordinated efforts of all those sectors." This approach raises problems of redefinition, not least for nutrition institutes and other groups working in applied nutrition.

### **A Working Objective**

The problem, then, is to create a management structure that encourages the members of a team to work toward a clear developmental objective while discouraging any tendency toward narrow specialization. At the same time, team members' specific skills must be enhanced and utilized, rather than being dissipated away on overly broad endeavors. In other words, a high degree of individual technical competence must be developed and must be directed at achieving the desired objective through teamwork.

The first priority is to escape from the confines of traditional definitions without losing a sense of identity. The member governments of the Caribbean Food and Nutrition Institute (CFNI)<sup>3</sup> have tried to do this, in part by defining an overall objective for the Institute that fits its work clearly into the development process. That overall objective is as follows:

"To collaborate with the member governments in their efforts to achieve by the year 2000 a level of nutritional well-being for all that will permit them to lead socially and economically productive lives as part of overall development" (4).

While the above objective is wholly devoted to provision of services, it should in no way be construed as inhibiting the practice of science. What it does is focus science on the development objective rather than allowing it to diffuse itself into narrow specialties. Nor does it exclude research; instead, it allows research to take its true place as a service component rather than an isolated program area. As a result, the curiosity that is such an important stimulus to good research can arise out of the questions raised by the objective.

Despite its usefulness, however, such an overall objective in no way provides adequate direction for the work to be performed. That is because the problems involved have to be identified and defined in more specific terms than are expressed in the overall objective.

### **Experience with a Matrix Approach**

In essence, there are two main categories of problems. One category includes problems relating specifically to the subject of nutrition—such as a high prevalence of protein-energy malnutrition or an unsuitable food supply. These problems can be broken down into smaller and smaller elements, or they can be combined and built up into more general cate-

<sup>3</sup>CFNI is a specialized Center of the Pan American Health Organization/World Health Organization serving seventeen Caribbean countries.

gories; but irrespective of this fact, they all pertain to subjects of traditional nutritional concern. Epidemiologic and economic studies can help to define the nature and extent of these problems and to pave the way for determining the relative priority that they should be accorded.

The second category of problems confronting achievement of the aforementioned objective are developmental problems, such as poor infrastructure development or inadequate public education, that hinder achievement of nutritional well-being.

Obviously, the overall objective cannot be attained unless the problems in both categories are analyzed, and unless solutions are developed that take account of the two categories together. The remainder of this article is devoted to suggesting an approach for solving this management problem, describing an applied example of that approach, and discussing the approach's implementation.

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After much consideration and some false starts, the Caribbean Food and Nutrition Institute (CFNI) has developed and successfully employed a two-dimensional matrix approach for nutrition program management. This approach involves defining the two aforementioned problem categories in simple terms,

listing one set of problems along the vertical axis of a matrix and the other set along the horizontal axis, and planning programs for the various cells within the matrix.

For the purpose of constructing this matrix, as indicated in Tables 1 and 2, the problems in category 1 were restated as "impact objectives" and those in category 2 as "process strategies." The initial matrix then appears as set out in Table 3 and the upper portion of Table 4. Within this context, the matrix can therefore be defined as a two-dimensional listing of actual and potential CFNI activities relating both to impact objectives (listed vertically at the left in Table 4) and to process strategies for achieving those objectives (listed horizontally above).

It is of course possible to further analyze each objective or strategy and to further subdivide each cell of the matrix. For example, impact objective 1 dealing with undernutrition could have a subdivision for low birth-weight, and that in turn could have a further subdivision for inadequate diet in pregnancy. Similarly, process strategy 4 dealing with public awareness, understanding, and knowledge could contain a subdivision for secondary school curricula. And if such curricula are found to have an important bearing on inadequate diets in pregnancy, a program seeking to improve the nutritional status of pregnant women through secondary school education

**Table 1. Restatement of nutritional (category 1) problems as "impact objectives."**

Category 1 problems	Impact objectives
1) Undernutrition	1) Eliminate undernutrition as a public health problem in all population groups.
2) Anemia	2) Reduce anemia in all population groups to functionally acceptable levels.
3) Obesity and diabetes	3) Lower the incidence of obesity and reduce the prevalence of diseases related to overeating—particularly obesity, diabetes, and hypertension.
4) Unsuitable food supply	4) Ensure the availability and accessibility to all individuals of an adequate and stable supply of nutritious, safe, and acceptable food by promoting and supporting national and regional programs.

**Table 2. Restatement of development (category 2) problems as "process strategies."**

Problems	Process strategies
1) Implementation of national and regional policies, strategies, and action plans	1) Cooperate with member governments and relevant agencies in their efforts to achieve the general objective through national and regional policies, strategies, and action plans.
2) Development of institutional machinery for executing and monitoring food and nutrition-related programs	2) Promote and support institutional development so that member governments can plan, execute, and monitor food and nutrition-related programs.
3) Personnel education and training	3) Cooperate with relevant institutions to ensure that all categories of government personnel are educated and trained appropriately and in sufficient numbers to carry out nutrition and nutrition-related activities.
4) Public food and nutrition education	4) Cooperate with relevant agencies to ensure a level of public awareness, understanding, and knowledge of food and nutrition that enables people to make nutritionally acceptable choices.
5) Establishment of food and nutrition information systems	5) Cooperate with member governments and relevant agencies in their efforts to establish appropriate information systems in food and nutrition.

**Table 3. A matrix based on impact objectives and process strategies (see Tables 1 and 2). The dashes indicate individual cells of the matrix.**

Impact objectives	Process strategies			
	1	2	3	4
1	—	—	—	—
2	—	—	—	—
3	—	—	—	—
4	—	—	—	—

could be developed, along with the necessary research.

Industry has found that this kind of two-dimensional matrix organization is useful in product development, because it provides a means of reconciling the traditional functional departments of a firm (production, finance, marketing, and so forth) with the activities of project teams (5). In our case, the "products" are the impact objectives. For example, the elimination of undernutrition as a public health problem is a product, albeit a social one. It is measurable. Similarly, though to a

lesser degree, the traditional business functions are somewhat analogous to our process strategies—inasmuch as the same process strategy (e.g., nutrition education) can be applied to each impact objective rather in the way that the same business function (e.g., marketing) can be applied to each of various products.

## Discussion

In practice, CFNI has found this matrix approach useful in defining priority areas needing study and action. On the one hand, it prevents uncritical and unscientific concentration on the process strategy or strategies involved; and, on the other, it guards against overemphasis on scientific study of traditional nutrition problems. In this manner, the approach helps to achieve the desired aim of having a balanced, scientifically based program directed toward well-defined objectives.

Study of the matrix as it applies to a specific community, region, or country can be used quite directly to define a nutrition institute's

staffing needs. Shaping the management structure as suggested by the matrix, so that it is project-oriented and nonhierarchical, emphasizes the importance of teamwork. Staff members can then be assigned responsibility for an objective or strategy on either axis of the matrix. Where programs enter any given cell of the matrix, the staff members responsible for both the impact objective and the process strategy must develop their activity as a team, bringing in other specialists as needed. (Post descriptions should be rewritten to fit this structure and procedure.)

Within a year of its development and voluntary adoption by the CFNI staff, this matrix system was working well. No major problems had been encountered, and the approach was generally accepted. Staff members were sure of their responsibilities, and this had led to increased confidence and work satisfaction. In addition, even though CFNI is primarily a service institution, a number of applied research ideas influenced by this approach had been developed and some were being implemented.

Teamwork is basic to the functioning of the system. For that reason two CFNI staff members, specializing in markedly different disciplines, are made responsible for each impact objective and process strategy. One member of each pair is given the prime responsibility for initiating action, but always in consultation with the other. Most staff members are responsible for more than one objective or strategy.

Staff members assigned responsibility for a given objective or strategy must retain an overview of that objective or strategy as a whole, must keep abreast of developments relating to the objective or strategy, must maintain a middle-range to long-range view, must revise the "objective profile" or "strategy profile" annually, and must ensure that CFNI programs designed in collaboration with member governments to achieve the objectives are carried out and that evaluation of those programs is maintained. (The specific

objectives and strategies adopted by CFNI are those that the member countries specify in their policies and programs. CFNI has thus organized itself so as to improve its cooperation in implementing government priorities.)

Some programs and activities that are listed under one process strategy do not support one impact objective specifically. For example, the development of intersectoral food and nutrition councils was originally listed in the matrix under a hypothetical impact objective encompassing "the development of infrastructures that lead to achievement of more than one of the impact objectives." In practice this has presented no problems at CFNI, where achievement of impact objectives has remained the main criterion for carrying out programs or activities. However, it has meant that many activities fell outside the matrix.

To reduce this technical difficulty, we recently added two "process objectives" below the four impact objectives listed in the matrix. Although these process objectives do not relate directly to any one impact objective, they are considered necessary preconditions for achieving the impact objectives. As indicated in Table 4, these two process objectives are (1) the development of policies, strategies, and action plans and (2) institutional development.

We found that all the program activities which could not be tied to any one of the four impact objectives could be fitted into an extension of the matrix that relates the two process objectives to the five process strategies. It is true that process objectives 1 and 2 are almost identical to process strategies 1 and 2; but this is in fact logical and is no cause for concern. (We consider that process strategies 3, 4, and 5 are more in the nature of direct support strategies than are process strategies 1 and 2 or process objectives 1 and 2, which tend to be intermediate in nature.) As this modification demonstrates, in addition to its other advantages, the matrix format is flexible and permits new ideas or new priorities to be incorporated without disruption.

**Table 4. A matrix of CFNI 1982 program activities listed according to the impact objectives and process strategies in Tables 1 and 2 and the two process objectives cited in the text.**

Impact and process objectives	Process strategies				
	P.S. 1. Promotion of policies strategies, and action programs	P.S. 2. Support for institutional development	P.S. 3. Promotion of personnel education and training	P.S. 4. Fostering public awareness, understanding, and knowledge	P.S. 5. Support for information systems
I.O. 1. Elimination of undernutrition	Support national breast-feeding workshops Support Jamaica nutrition education programs Support national breast-feeding strategies			Evaluate breast-feeding teaching package Promote weaning food guide	Promote collection of birth-weight data
I.O. 2. Reduction of anemia	Promote regional anemia strategy  Submit research proposal	Develop hemoglobin screening in primary health care Standardize hemoglobin measurement in laboratories		Produce anemia pamphlet	Monitor anemia status  Assess functional significance of anemia Analyze iron in sugars Classify anemia Produce hemoglobin screening device
I.O. 3. Reduction of obesity and diabetes	Follow up and evaluate diabetes workshops  Promote self-reliant national diabetes workshop follow-up using 'guide'		Support national workshops on dietary management of hypertension	Provide teaching package on diabetes Provide educational materials on diabetes	
I.O. 4. Provision of an adequate food supply	Support formulation of national food production programs Support implementation of national food production and marketing programs Support development of price control systems Improve disaster response	Support AMCs, food and nutrition councils, and surveillance units Follow up intensive food and nutrition program implementation courses Support Belize food and nutrition councils' self-sufficiency program development Promote dietary services manual	Support undergraduate and postgraduate training at the University of the West Indies Faculty of Agriculture Provide in-service course for extension officers Train health personnel in use of diet manual Teach in food service supervisors' course	Promote home food production Promote nutrient cost methods	Monitor food prices and availability and publish quarterly

		<p>Draft job descriptions of dietary personnel</p> <p>Support reorganization of dietary services</p> <p>Update regional diet manual</p> <p>Follow up food service supervisors</p> <p>Follow up recently trained dietetic technician</p>	<p>Develop training program for institutional food service supervisory staff</p> <p>Support dietetics training for geriatric nurses</p> <p>Evaluate dietetic technicians' course</p> <p>Evaluate dietetic diploma course</p>		
P.O. 1. Development of policies, strategies, and action programs	<p>Support implementation of national food and nutrition policies</p> <p>Support formulation and revision of national food and nutrition policies</p> <p>Collaborate with CARICOM in regional food and nutrition strategy</p>	<p>Support food and nutrition council development</p> <p>Support nutrition councils' program development and CFNI collaboration</p> <p>Support nutrition units</p> <p>Identify candidates for government posts</p>	<p>Upgrade skills in food and nutrition program planning</p> <p>Promote fellowship awards</p>	<p>Support food and nutrition week</p> <p>Publish nutrition materials for public</p> <p>Adapt and publish technical information for the public</p> <p>Adapt national materials for regional use</p> <p>Publish <i>Cajanus</i></p> <p>Provide reference library service</p> <p>Prepare nutrition resource materials</p> <p>Distribute press releases</p>	<p>Collaborate on surveys</p> <p>Develop national food and nutrition surveillance systems</p> <p>Standardize methodology of nutrition status surveillance</p> <p>Maintain national food and nutrition profiles</p>
P.O. 2. Institutional development		<p>Support regional preschool child development center</p>	<p>Promote nutrition exams at the College of Advanced Science and Technology</p> <p>Support continuing education of nutritionists and dietitians with the Caribbean Association of Nutritionists and Dietitians</p> <p>Collaborate with PAHO/WHO program in development of allied health training curricula</p> <p>Ensure adequate nutrition in health science courses curricula</p>		<p>Conduct regional workshop on food and nutrition surveillance</p> <p>Maintain CFNI computer-based activity file</p> <p>Maintain CFNI mailing list</p> <p>Maintain CFNI publication list</p> <p>Edit CFNI staff writing</p>

Table 4 (Cont.)

Impact and process objectives	Process strategies				
	P.S. 1. Promotion of policies strategies, and action programs	P.S. 2. Support for institutional development	P.S. 3 Promotion of personnel education and training	P.S. 4. Fostering public awareness, understanding, and knowledge	P.S. 5. Support for information systems
			Promote nutrition in nurses' curricula Collaborate with Trinidad and Barbados in curricu- lum for courses in nutri- tion and dietetics Serve on UWI committee on B.Sc. nutrition Serve on UWI committee on dietetic internship Foster community nutrition course Teach in family nurse practitioner course Circulate manpower study Support workshop for home economists Teach in UWI Medical School Teach in UWI Faculty of Agriculture		



The matrix format is particularly valuable for a small team that has more than one impact objective. That is because the format encourages individuals to contribute to the objectives in many ways, devoting part of their time to different cells in the matrix as appropriate.

Use of the matrix format in industry can lead to problems in allocating authority (5). Likewise, the potential for exercising authority must exist even when the team involved is pursuing a social objective, particularly with regard to administrative matters. This authority resides with the team leader, who in the case of CFNI is the director of the institute.

Nevertheless, when a multidisciplinary team of professionals is pursuing social objectives, the problem is less one of ensuring authority than of encouraging responsibility. So the need to develop a strong authority structure is less urgent than the need to establish a milieu that nurtures a sense of purpose, the growth of teamwork, and a feeling of

interdependence. The matrix approach described here serves that function well.

## Conclusion

The multidisciplinary nature of real-life developmental programs seeking to achieve such things as nutritional well-being for all by the year 2000 renders the boundaries of traditional scientific disciplines inappropriate. Teams consisting of individuals from different disciplines need to work together. Clear objectives linking subject area goals to development needs can help produce and maintain the linkages required between team members. Within this context, a two-dimensional matrix provides a useful management tool for such multidisciplinary work. It permits a clear but flexible definition of objectives and of the strategies needed to achieve them; it draws attention to areas requiring priority attention; it promotes a sense of purpose directed at developmental objectives; and it encourages teamwork.

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## SUMMARY

Those seeking to improve public nutrition in the Caribbean area and elsewhere face two general types of problems—problems relating specifically to nutrition, such as a high incidence of protein-calorie malnutrition, and problems relating to developmental difficulties, such as lack of public education. Obviously, both kinds of problems demand attention, and any general plan for improving nutrition needs to consider both kinds together.

One way of doing this is to devise a two-dimensional matrix that lists the specifically nutrition-

related matters on one axis and the development-related matters on another. The Caribbean Food and Nutrition Institute (CFNI) has done this in the following manner: The specifically nutritional problems have been restated in the form of "impact objectives" (e.g., reduction of anemia) and the development-related problems have been restated as "process strategies" (e.g., promotion of personnel education and training). All CFNI program activities have then been listed in the appropriate cells of the matrix; program activities not fitting into the

framework have been accommodated by adding two intermediate process objectives below the impact objectives.

In practice, CFNI has found that this matrix approach has helped to achieve a balanced, scientifically based program directed toward well-defined objectives. That is, it has permitted a clear but flexible definition of objectives and strategies; it has drawn attention to areas requiring priority atten-

tion; it has promoted a sense of purpose vis-a-vis developmental objectives; it has proved useful in defining staffing needs; and it has encouraged teamwork. Overall, experience to date suggests that this matrix approach could provide a useful management tool for other organizations concerned with improving health and nutrition, especially when relatively small teams of personnel are involved.

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