

# Approaches to linking agriculture and nutrition programmes

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Malnutrition continues to be a problem of staggering proportions throughout the world. Many programmes and policies have been used to reduce the number of malnourished, with mixed results. The purpose of this paper is to provide a conceptual framework for identifying the factors influencing individual nutritional status and a range of possible interventions. A review of the most common interventions for mitigating malnutrition both at the household and individual level, and lessons learned, are presented. Finally, guidelines for creating linkages between nutrition and agricultural projects are suggested. Experience gained from past interventions provides three 'rules of thumb' in the design of successful policies and programmes to mitigate malnutrition:

- 1) Use existing infrastructure, programmes, and projects rather than creating a new organization.
- 2) Build on certain types of agricultural projects which are amenable to coupling with nutrition objectives.
- 3) There are several influential factors that must be addressed conjointly in order to have a positive impact on household food security and nutrition: the income and other resources available to the household, the extent to which women control these resources, and how these resources are distributed within the household.

## Introduction

Despite considerable progress in understanding the nature and causes of malnutrition, it continues to be a problem of staggering proportions throughout the world. According to The United Nations Report on the World Nutrition Situation, there were 184 million underweight pre-school children in developing countries alone in 1990 (UN/SCN 1992). The Fifth World Food Survey estimates that 700 million people in the developing world consume a daily diet that is grossly inadequate (Mellor 1990). Developing country policymakers and donors have employed a variety of approaches over the years in an attempt to reduce the number of malnourished. Strategies have ranged from broad-based economic development policies intended to increase income to food nutrition interventions specifically targeted to the most vulnerable members of society.

Particularly troublesome are the obstacles that thwart efforts to reduce malnutrition in rural areas. First there is the sheer magnitude of the problem; in many countries, the majority of the

poor and malnourished live in rural areas. Second, the problems of poor infrastructure, lack of access to services and inadequate educational opportunities are more acute in rural areas. Third, the isolation of the rural poor makes it more difficult and costly to reach them through policy interventions.

The imperative need to implement effective policies and programmes that reduce the number of people suffering from malnutrition forces a re-examination of past interventions in an effort to learn from experience. Reducing malnutrition, particularly in rural areas, requires overcoming significant hurdles. The extent of the problem and the scarce resources available requires cost-efficient strategies to be employed that address the situation-specific characteristics of the malnutrition problem.

In order to design and implement mitigative strategies, decision-makers must have a clear idea of the factors contributing to the incidence of malnutrition and appropriate policy interventions and options. The purpose of this paper is to

provide a conceptual framework for identifying the factors influencing individual nutritional status and a range of possible interventions. A review of the most common interventions for mitigating malnutrition, both at the household and individual level, and a summary of lessons learned are presented. Finally, guidelines for creating linkages between nutrition and agricultural projects are suggested.

### **Conceptual framework and typology of nutrition interventions**

While malnutrition manifests itself at the individual level, its causes typically reflect a combination of individual, household, community, national, and even international factors. The schema presented in Figure 1 illustrates the range of causes of malnutrition and potential programme and policy intervention options.

#### **Causes of malnutrition**

Food availability at the national, regional, or local level is one factor that can affect household-level food availability but it is generally not the most important. Until recently, an inordinate emphasis was placed by many developing country policymakers on food production self-sufficiency as a means of achieving food security for the population. Many believed that national food self-sufficiency would alleviate malnutrition.

There are two major flaws with this argument. First, food insecurity and malnutrition are primarily problems of distribution, not production (World Bank 1986). It is common to have 20% to 30% of a country's population consuming less than 80% of caloric requirements, even though national level food availability is at or greater than 100% (World Bank 1986). It is the household's ability to obtain food that is critical in ensuring household food security. As the purchasing power of households increases, access to food increases.

The second flaw in the food self-sufficiency argument relates to the links between hunger and malnutrition. Hunger and malnutrition are not synonymous. Food is only one of a series of inputs into the production of health and nutritional status. Factors such as the health/sanitation environment, including hygienic practices

within the household, availability of health services, food distribution within the household, cultural practices related to weaning, and child feeding practices, can have a greater influence on nutrition than simply the amount of food available at the household level.

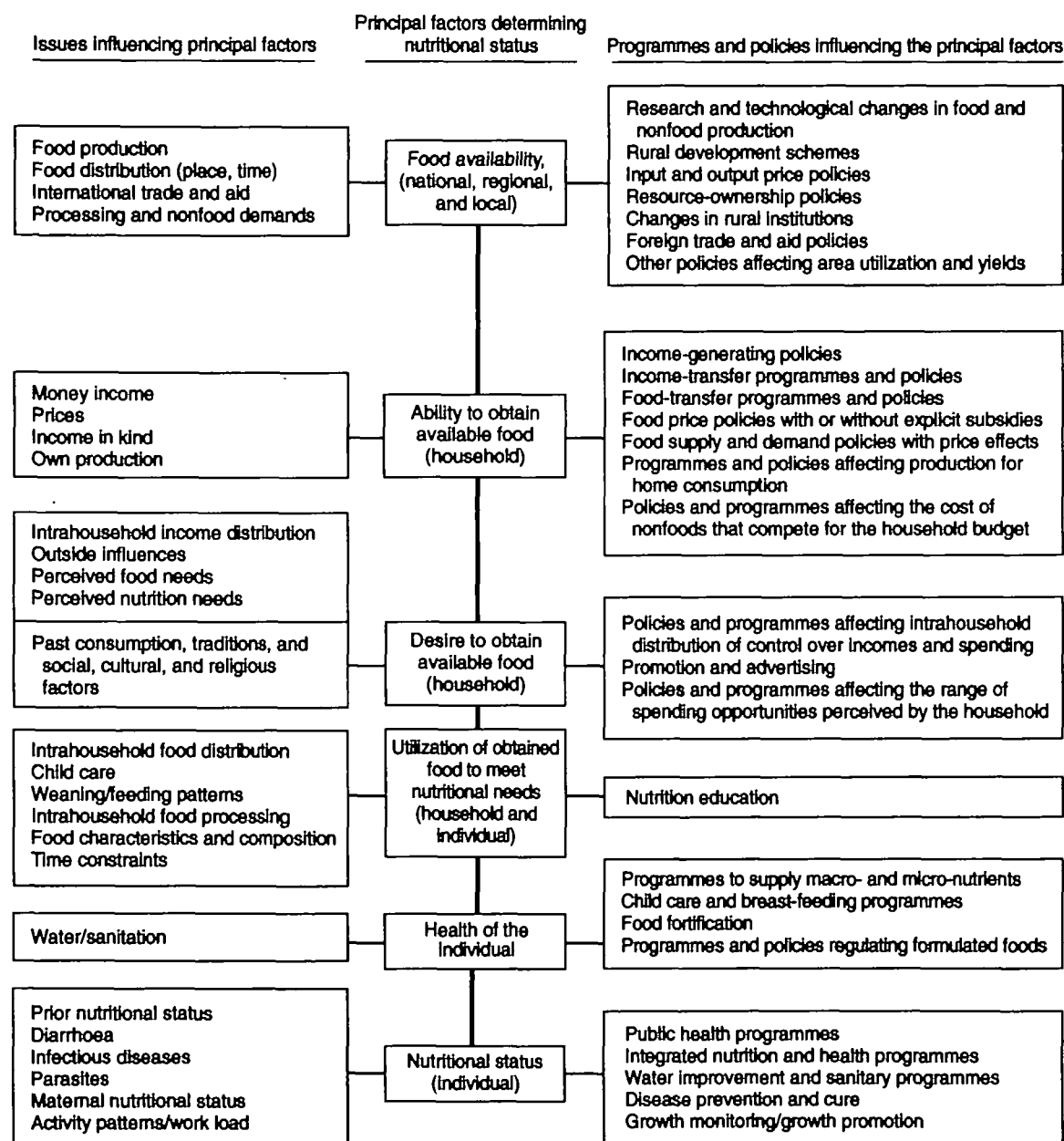
This is not to argue that macroeconomic policies (including those affecting food production) are not important. Clearly, national level development policies have a direct effect on market prices, household income, and availability of publicly provided health and social services. These community- and household-level factors, then, have an impact on the health and nutritional status of individual family members.

#### **The importance of appropriate interventions**

The implementation of appropriate interventions depends on being able to identify the relationship between principal factors and the health and nutritional status of households and individuals. The type of interventions that will be most effective depends on which factor or combination of factors are the most limiting constraint in achieving good nutrition. The lack of empirical nutrition information in a context-specific setting has resulted in the implementation of interventions that have not addressed the underlying causes of the malnutrition problem. For example, on a macro level, the assumption has been that by focusing on income alone, the problem of malnutrition would be resolved. Clearly, this is not the case (Kennedy et al. 1992). Alternatively, on a more micro or targeted level, the supplementary schemes for pre-schoolers, as they have been typically implemented, have had only limited effects (Kennedy and Alderman 1987).

The choice of the most appropriate intervention will depend on who is malnourished and why. This sounds so obvious, yet, over and over again, an effective nutrition programme or project has been transplanted to a new setting and has failed. It may be less that the interventions are ineffective per se, and more that they are inappropriate given the nature and causes of the specific malnutrition problem in this new setting.

The list of nutrition interventions outlined in Figure 1 covers the range of types of approaches that have typically been used to alleviate



**Figure 1.** A schematic overview: factors influencing nutritional status and policy options

Source: Kennedy and Pinstrup-Andersen (1983).

malnutrition. Each of the interventions are based on different assumptions about who is malnourished and what are the causes of malnutrition. Are the malnourished simply those with a lower calorie diet, or are there other micro-nutrients? Are the causes of malnutrition primarily a result of food shortages, or are they due to a combination of factors including exposure to infection and parasites, and access to adequate sanitation and potable water supplies? Is malnutrition a national problem, a household problem, or a pre-school problem? Part of the continuing controversy as to which type of nutrition intervention is most effective is due to the fact that policymakers are identifying different factors as the most limiting constraint in causing malnutrition.

### **Summary of nutrition interventions**

The following is a brief review of the most common nutrition and food security interventions used to reduce malnutrition. Some of these interventions are aimed at individuals, i.e. children, pregnant women, while others are aimed at the household.

#### **Supplementary feeding programmes**

Supplementary feeding programmes are a common type of nutrition intervention in developing countries. Typically, these schemes provide supplementary food, either on-site or for taking home. Generally, the food supplement is made available to preschool-aged children and, to a lesser extent, to pregnant women and school-aged children. Supplementation programmes are based on the premise that food given directly to nutritionally vulnerable groups, such as women and children, will do more to improve their energy and nutrient intake than interventions directed to the household.

However, a review of over 200 supplemental feeding programmes in developing countries concluded that such programmes, as they are normally operated, have not been very effective in alleviating malnutrition (Beaton and Ghassemi 1982). Often, these programmes tended to have erratic participation and large leakages of the supplement to non-target individuals, thereby significantly increasing cost. In contrast, supplementation programmes that were effective in improving nutritional status tended to have cer-

tain characteristics in common: provision of a high level of calories (often close to 100% of requirements); targeting to moderately and severely malnourished individuals; and regular participation over a 3-to-12-month period (Kennedy and Alderman 1987).

The modest impact of many supplemental feeding programmes led to a rethinking of these schemes, with an emphasis on selective use of food combined with growth monitoring/promotion activities. The Tamil Nadu Nutrition Program in India is an example of the successful application of this approach (Berg and Austin 1984). All children are weighed monthly, but only one-third of the most vulnerable (those who failed to gain weight or those children who lost weight) are given supplemental food. Food is given only for a three-month period; those children who fail to improve during this 90-day period are then referred for more intensive care.

Although most supplementation programmes are targeted to preschoolers, it is supplementation of pregnant women that is often most cost-effective. Energy supplementation of high risk pregnant women, as was done in Narangwal, India, is associated with significant decreases in neonatal and infant mortality (Kielmann et al. 1978).

#### **Weaning foods/formulated foods**

Formulated or blended foods were originally conceived of as a low-cost, commercially available processed food used during weaning. A formulated food is a nutrient-dense dietary supplement based primarily on a mixture of a local staple and vegetable proteins. Commercial weaning foods come in a variety of forms, including beverages, pastas, and biscuits. Examples include Incaparina, a beverage available in Guatemala; Superamine, an Algerian pasta; and Wheat Soy Blend Flour, which is sometimes provided as part of PL 480 Food Aid.

Commercial weaning foods have had limited success. First, cost has been the principal barrier to widespread use. On a nutrient per dollar basis, commercial weaning foods are between 8 and 40 times as expensive as homemade traditional foods (Kennedy 1983). Even with substantial government subsidies, the cost of these foods is prohibitive for many poor households. Second,

the acceptability of commercial weaning foods has been low. Third, there is an urban bias in distribution because marketing channels and commercial vendors are not as readily available in rural areas.

As a result of the limited success in formulated or blended weaning foods, most governments are now stressing the use of home-produced weaning foods. This type of weaning food can be produced at lower cost, with better acceptability, and is made up of indigenous household foods (Kennedy 1983).

The most successful weaning food interventions have been combined with nutrition education, using social marketing techniques. There are instances, however, in which nutrition education regarding the needs of the weaning-aged child is not the limiting factor in providing adequate food for the child. Financial constraints within the household may preclude sufficient calories for the preschooler. In this case, a weaning food could be provided as part of an integrated health/nutrition intervention and distributed free to vulnerable households. If possible, such a weaning food should be one that is prepared locally in villages and not manufactured on a large-scale commercial basis.

### **Fortification**

Diets of low-income households and young children in developing countries are often characterized by a lack of diversity. Staple grains, such as rice, wheat, and corn, are only occasionally supplemented with vegetables and small bits of meat or fish. These cereal-based diets are the major source of calories but also micronutrients. Countries in which a single grain supplies a disproportionate share of the total dietary intake consistently show a higher prevalence of micronutrient deficiencies (Kennedy et al. 1979).

Vitamin A, iodine, and iron-folate are the three most common micronutrient deficiencies in developing countries. As a result, fortification programmes have typically focused on one or a combination of these nutrients. The most dramatic results have been obtained by the addition of iodine to salt. Iodination of salt has almost completely eliminated goiter and

cretinism in the United States and some parts of Latin America and Asia (Austin et al. 1981).

The results of vitamin A fortification programmes are less clear-cut. Vitamin A deficiency is associated with night blindness, xerophthalmia, and, if left untreated, eventual blindness. An accumulating body of evidence now suggests that vitamin A decreases mortality and certain types of morbidity. Vitamin A fortification of sugar in Guatemala and MSG in the Philippines has had some success in increasing serum vitamin A levels. The MSG fortification programme also showed a reduction in the clinical signs of vitamin A deficiency.

The success of fortification with any nutrient depends on identifying a food carrier that is consumed regularly by the target population. Where this is not feasible, a mass dose programme is a possible alternative. A recent randomized clinical trial in India, involving 15 419 preschool-age children, was able to deliver low doses of vitamin A weekly to children, using community health volunteers (Rahmathullah et al. 1990). There was a significant decrease (54%) in mortality among children receiving the vitamin A supplement.

Mass dose distribution programmes have been less successful in other countries, particularly in Africa, where coverage of the target population is poor. Some of the principal reasons for the poor coverage include irregular or short supply of the vitamin, lack of supervision by programme personnel, and lack of preparedness of the community. A weekly distribution of vitamin A, as done in India, would be much more difficult to implement in parts of rural Africa, where infrastructure is poorly developed. The difficulty in accessing convenient distribution points is compounded by the long distances that people must travel in rural Africa.

Iron-folate supplementation programmes have proved successful in some areas in improving the hematological status of pregnant women (Sood 1975). Programmes for preschoolers have had less success, primarily because of sporadic coverage and infrequent participation by the intended beneficiary.

Success in improving preschooler growth in some programmes without the distribution of food

reinforced the fact that a lack of nutrition knowledge or awareness was a limiting constraint to improving nutritional status in at least some households (Rohde et al. 1975). Interventions under the general label of 'nutrition education' have been used to address this knowledge or attitudes gap. However, the freestanding nutrition education interventions that were common in the 1960s and 1970s have been replaced by programmes where nutrition education is provided in conjunction with other activities. Thus, a weaning foods intervention integrates nutrition education skills as part of the programme.

Given the checkered success rate of nutrition interventions targeted to specific individuals, many policymakers believe that interventions aimed at households may be a more cost-effective way of improving the nutritional status of vulnerable individuals. Berg (1981) has concluded that even if policymakers were interested in reaching only preschoolers, it would often be more cost-effective to reach them through programmes that would affect households as a whole. Many of the intervention strategies outlined in Figure 1 have a household orientation.

#### **Targeted consumer price subsidies**

Targeted food price subsidies are a popular and common type of intervention aimed at increasing food consumption of poor households. Subsidized food items are provided to consumers at below market prices. Lower food prices increase the real incomes of the poor, which generally results in higher expenditures on food. Subsidy programmes are attractive policy instruments because they are highly visible and allow governments to reach a large number of poor people easily. However, food price subsidies have been criticized as being expensive, even well targeted schemes.

Most subsidy programmes are intended to achieve broad social and political goals. Better nutrition may be a stated or unstated objective of these programmes. A recent multicountry study of the nutrition impacts of subsidy schemes (Kumar and Alderman 1989) found that such schemes can have a significant impact on household food consumption. The nutritional effectiveness of a specific subsidy programme will be increased if it is aimed at those households with the greatest caloric deficits and, in turn,

at those individuals within the household who are most nutritionally vulnerable (Pinstrip-Andersen 1989). The potential nutrition effect of any food subsidy will be enhanced if the subsidy can be applied to a food normally consumed in large amounts by the malnourished population, but that is not eaten by other income groups. This type of 'self-targeting' food was used successfully in Pakistan and Bangladesh (Rogers et al. 1981; Karim and Levinson 1980).

#### **Food stamps**

Food stamp programmes are potentially a less costly alternative to food subsidy schemes. Sri Lanka switched from a ration system to food stamps in 1979 and reduced total government expenditures from 14% to 7% (Edirisinghe 1988). Jamaica also garnered a substantial saving in government expenditures by replacing a general food subsidy system with a food stamp programme (Government of Jamaica 1987).

Empirical evidence suggests that the food consumption of low income households increases as a result of participation in both food subsidy and food stamp programmes. However, little evidence is available to document the nutrition effect as a result of the household's participation in these programmes. This failure to demonstrate an observable effect on individual nutrition status is related in part to the complex set of linkages between household food expenditures, household caloric intake, individual member caloric intake, and, ultimately, growth.

#### **Increasing household income**

The direct relationship between increasing household income, poverty alleviation, and improved food consumption has been well established (Alderman 1986; Balderston 1990; Kennedy and Bouis 1993). Strategies that increase the incomes of the poor will result in significant reductions in hunger. Since the majority of poor and food-insecure households are in rural areas of developing countries, a continued and increased emphasis on agricultural policies and programmes is the starting point for alleviating hunger. In addition, agricultural policies that are labour-intensive and, thus, generate employment for the rural landless also offer an effective strategy for reaching vulnerable non-agricultural households.

Although the household income/food security relationship has been well established, the association between income and improved nutritional status is less apparent. An accumulating body of evidence suggests that income-generating schemes, by themselves, may not alleviate malnutrition, at least in the short to medium term (von Braun and Kennedy 1992; Kumar and Alderman 1989; Alderman and Garcia 1990). Thus, policymakers need to explore ways to improve the food security and nutrition

impacts of income-generating policies being implemented in developing countries.

Table 1 summarizes some of the impacts of nutrition interventions that have traditionally been targeted to either households or individual household members. What is clear from this table and the preceding discussion is that most types of nutrition programmes can be effective. However, to date, no one approach has been universally accepted as the most effective means

**Table 1.** Summary of nutrition interventions

Programme	Effectiveness	Constraints
Consumer food price subsidies	Some evidence that subsidies improve family caloric consumption. Little evidence for the alleviation of preschooler or maternal malnutrition. Most effective as preventive strategy for improving nutrition.	Difficult to implement on a small scale and expensive to implement on a large scale. Administratively difficult to implement in rural areas. Most cost-effective when combined with some type of targeting, either to lowest income groups or by use of self-targeting food.
Food stamps	Some evidence that food stamps can increase family nutrient intake. No evidence for the improvement of maternal or preschooler nutritional status. Focus is preventive rather than therapeutic.	Feasible only where households rely on the marketplace for food purchases; in this sense, they are prone to urban bias.
Food-for-work	Information on nutritional effectiveness is limited. Given the focus of most programmes (1 to 3 months participation), it is most effective in alleviating seasonal fluctuations in consumption.	Most programmes rely heavily on food aid.
Supplementary feeding	Typically not very effective in improving preschooler malnutrition. Most effective when targeted to high-risk individuals. Programmes offering a small ration (200–300 calories) to a large number of people are unlikely to show a measurable impact on growth.	Level of supplementation provided has not taken into account leakage to nontarget group individuals. As a result, net calories consumed by a child are not enough to cover the energy gap and/or improve growth. Also, programmes are administratively intensive, requiring a moderate amount of infrastructure and logistical support.
Integrated health/nutrition	An appropriate mix of health/nutrition services are effective in improving maternal and child health. Successful projects target services to high-risk persons, use supplementary feeding selectively, and tailor programme components to individual needs.	Programme usually requires some health infrastructure and is very labour-intensive.
Formulated foods	Only limited success in improving nutritional status of preschoolers.	Cost is a primary barrier for commercially available weaning foods. Low consumer acceptability has also limited their use.
Home gardens	Some evidence suggests an impact on increasing micronutrient intake, but the effect on increasing macronutrient consumption appears limited.	Land and labour is insufficient for cultivation of home gardens by the most nutritionally needy families.

Source: Kennedy and Alderman (1987).

of dealing with malnutrition in children and women. What is less clear from the research is whether linking nutrition activities to agricultural policies and programmes would be more effective in reaching the food-insecure households and households with malnourished members than some of the more traditional interventions shown in Table 1.

### Nutrition and agriculture linkages

During the last decade much of food policy research concentrated on identifying the ways in which a range of policies and programmes affected consumption (Mellor 1978; Kramer and Ruby 1989; Balderston 1990; Frankenberger 1990). This range of policies includes changing producer prices, providing input subsidies, increasing the commercialization of agriculture, and supporting technological change (e.g. improving high-yielding crop varieties).

The links between income generation, poverty alleviation, and improved food intake are clear. Strategies that increase the incomes of the poor will result in significant reductions in hunger. However, while the income/household food security links are strong, the links between income and improvement in nutritional status are less robust.

The idea of linking food security and nutrition components into agriculture is not new. Effective approaches for incorporating nutrition goals into agriculture and rural development projects were recognized as necessary a decade ago, but effective approaches for doing so in an operationally acceptable way were not available (Pinstrup-Andersen 1981).

Many developing countries are enthusiastic about the possibility of achieving nutrition goals through the agricultural sector. The difficulty, as it has always been, is in identifying the combination of nutrition/agriculture approaches that offer the potential for success. The experience gained from past interventions has helped researchers develop a series of criteria that should be considered in the design of successful nutrition/agriculture programmes. These can be viewed as 'rules of thumb' for the implementation of interventions to mitigate malnutrition.

1. Typically, the greatest health and nutrition needs are found in areas with little in the way of existing infrastructure. Nutrition/agriculture programmes, however, are more likely to be successful if implemented through whatever existing infrastructure there is, however imperfect. This process of building upon what is already in place (programmes, institutions, pre-trained personnel etc.) can result in significant cost and efficiency savings. Of course, the more successful and established the institutions or programmes that are used (those having political clout, and those with a multi-disciplinary or multi-issue focus) the more successful a linkages programme can be (Kennedy 1991a, World Bank Working Paper).
2. An inventory of agricultural experts from developing countries identified certain types of agricultural programmes that were more successful than others in achieving food security and nutrition objectives (Kennedy 1991a). These include a) expansion of cash crop production; b) introduction of hybrid varieties; c) creation of effective and appropriate extension services; d) making available agricultural credit to male and female producers; and e) expansion of food crop production. These programmes were able to reach the lowest income households, which were often the households most at risk nutritionally.
3. Three important issues must be addressed conjointly for intervention to have a positive impact on household food security and nutrition (Kennedy 1991b). These include the income and other resources available to the household, the extent to which women control these resources, and how these resources are distributed within the household. If an intervention focuses on one of these issues and ignores the others, the nutritional effects on an individual can be less than expected, or even, in some instances, detrimental.

It is clear from available studies (Alderman 1987) that as household income is increased, there is an improvement in both the quality and quantity of the household's diet. Increasing income at the household level, however, is not sufficient to alleviate malnutrition. Whether increased income translates into improved household and in-



dividual nutrition depends on a variety of factors including how much of the increase is spent on nutritious food, how the increased quantity and quality of food is distributed among family members, and what the health and hygiene levels are of individual family members.

Before an intervention can attempt to improve the nutritional status of family members, it is important to know what kind of control the primary caretaker (usually a woman) has over the resources that will help to achieve this goal. The more control women have over income, the more expenditures there often are on food, health care, and education (Thomas 1992), with a positive impact on children. It is also important to know how much income the women are contributing to the overall household income. Studies have shown that as the income of women in particular increases, so does the quantity of food within the household, since women tend to spend a greater percentage of their income on food than men (Guyer 1980; Engle 1988). It is important, however, to note that at least some authors have highlighted the fact that the incomes of both men and women are important, for different reasons, in improving child nutrition (Engle 1993).

Another important point is that 'activities that increase the labour demands on women's time may lead to changes in cooking habits, the preparation of less nutritious and/or fewer meals, the cultivation of less labour-intensive and less nutritious food crops, and less time devoted to breastfeeding and child care' (Frankenberger 1990), and other nurturing activities.

For best results in improving the nutritional status at the household level, food needs to be distributed on a need basis. Intrahousehold allocation of resources in addition to food (including the time of the primary caretaker) is important in influencing child nutritional status (Engle 1991). Increasing the number of meals eaten by children is a significant factor in improving preschooler nutritional status, but it is also time-intensive (Kennedy 1989). It is important to understand how income generation strategies at the household level affect the time needed for activities directed towards children.

There appear to be subtle behaviours that positively influence child health and nutrition, which are not directly income-mediated. For example, empirical evidence suggests that preschoolers in Malawi and Kenya, from the lowest income, *de facto* female-headed households (households in which the male head of household was absent more than 50% of the time), had lower rates of stunting than preschoolers from higher income, male-headed households (Kennedy and Peters 1991). 'Women in *de facto* female headed households appear to be acting as 'shock absorbers' for children's nutrition . . . [and] . . . are pursuing investment strategies that appear to protect child nutritional status' (Kennedy 1993). There appear, therefore, to be low-cost/low-technology ways of investing in children that have high nutritional payoffs. A better understanding of these successful nutrition-coping strategies would permit their integration into agricultural programmes. And given the increasing problem of rural health delivery in developing countries, governments are looking for ways to improve the nutritional status of the public via the agricultural sector policies and programmes.

### **Prototype of nutrition/agriculture programmes**

Using the guidelines presented above, nutrition and agriculture programmes can be linked to give the potential for improving the food security and nutritional status of individuals living in the rural areas of developing countries. The following are some of the more successful ways that such links have been designed.

#### *Provide credit to women in rural areas where agricultural activities are developed*

Programmes that target women for credit to pursue various financial endeavours would provide the potential for women to increase their income and control of resources. This increase would, in turn, help to enable women to better provide for their children and engage in nurturing behaviours that would improve child nutrition.

#### *Target agricultural extension activities to women*

Extension in the form of training, technical support, and increased access to agricultural inputs, is typically a large part of the agricultural sector

budget in most developing countries. Yet, extension activities typically have not done well in reaching rural women. In developing countries, women are actively involved in many aspects of food crop production (and increasingly in cash crop production). Extension activities geared to women, therefore, could result in increased food production that would benefit household food security, as well as provide an increase in the income of women. This increase in income could then result in improved child nutrition since women tend to spend a greater percentage of their incomes on food.

*Combine health and social services with production schemes for both cash crops and food crops*

In a recent comparative analysis of cash cropping projects in 6 countries (Kenya, Malawi, The Gambia, Guatemala, the Philippines, and Rwanda), the only project that was associated with a decrease in the incidence of illness was in Guatemala (Kennedy et al. 1992). This decrease may be due to the fact that this was the only case where health services to the farmers and cooperative members were combined with an income-generating project. It was found that longer membership in the cooperative was associated with less weight deficiency and stunting among the children.

The health and social service activities in Guatemala that were provided to cash-cropping households were financed from profits generated from the cooperative. Thus, the issue of financing recurrent costs were addressed from the beginning.

*Identify, test, and extend cropping strategies that decrease seasonality in production, consumption, and labour requirements*

'In most areas of the world there is a seasonal dimension to agricultural production, food availability, and malnutrition. Many farm families must cope with a cyclical period of deprivation referred to as the 'hungry period' (Frankenberger 1990). This hungry period coincides with an increase in agricultural labour demands, particularly for women, and peaks in levels of illness and malnutrition. Smoothing out these seasonal cycles has a potential benefit both for household food security and nutrition.

## Summary and conclusions

Contrary to what was held as true by many policymakers until recently, national food-self sufficiency will not necessarily alleviate malnutrition at the household level. In order to design and implement successful nutrition intervention programmes, policymakers must have a clear idea of what factors are contributing to the incidence of malnutrition and what policies are available and appropriate to alleviate this problem. Some of the more common intervention programmes include supplementary feeding, weaning and formulated foods, fortification, targeted consumer price subsidies, food stamps, and increasing household income.

The concept of linking nutrition objectives with agriculture programmes is not new, but with recent experience three 'rules of thumb' have emerged that may help design intervention programmes that incorporate this linkage: 1) programmes should be built upon existing infrastructure and programmes, 2) certain types of agricultural activities (expansion of cash crop production, introduction of hybrid varieties, creation of extension services, and availability of agricultural credit) lend themselves more successfully to achieving nutrition goals, and 3) policymakers must consider three important issues relating to income and resources (household level, woman's control, and household allocation). Research has shown that there are certain nutrition/agriculture links established in programmes that have the potential to improve the food security and nutritional status of household members: 1) agricultural credit programmes for women, 2) agriculture extension services targeted to women, 3) combining health and social services with crop production schemes, and 4) devising strategies to reduce the seasonality aspects of production, consumption, and labour requirements.

Future work on intervention programmes that link nutrition and agriculture must identify and test strategies that are currently being used in developing countries. Expected versus actual outcomes are often quite different. Policymakers need to have some concrete examples where linked nutrition and agriculture programmes have resulted in 'success' stories. Until this happens, there will continue to be scepticism about the viability of the linkage approach.

Two issues need more attention in future research. The first is the impact of agricultural policies and programmes on women. Relatively little information is available regarding their impact on women's income, energy expenditures, health, and nutritional status. It is quite plausible that the major positive effect on overall household food security and nutrition may come about through an improvement in women's nutritional status.

The second issue relates to the fact that the discussion on income/food consumption/nutrition linkages has focused almost exclusively on calories. There is an implicit assumption in much of the development literature that as household energy intake improves, the consumption of other nutrients (vitamins and minerals) will also improve. This may not be true in all cases, particularly in the case of children. Some recent data from Kenya indicate that as child caloric intake increases, vitamin A consumption decreases, primarily because intake of beta-carotene-rich vegetables declines (Kennedy and Oniang'o 1991). Similar results have emerged from India where researchers report that micronutrient intakes in children declined in the postharvest, surplus season. Future work on nutrition/agriculture should focus on examining the impact of agricultural policies on both macro- and micronutrient intake.

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