Food Security and Environmental Sustainability: What Policies are Needed?

Bo R. Döös and Allen M. Solomon

Contents

Bo R. Döös, Prof.
Global Environmental Management
Packhusgränd 6
SE-111 30 Stockholm, Sweden
Tel: +46 8 20 35 70
E-mail: bo.doos@telia.com

Allen M. Solomon, Dr
US Environmental Protection Agency
200 S.W. 35th Street
Corvallis, OR 97333, USA
Tel: +1 541 754 4772
Solomon.Allen@epa.gov

Abstract

This paper examines the type of policies and approaches to their implementation needed to ensure food security in developing countries without unnecessary loss of natural resources. Actions aimed at reducing poverty and improving education in developing countries are examples of such policies. Some policies are unlikely to be accepted, for example, due to limited confidence in present predictions of global food production. As a result, policies aimed at other global issues that also contribute indirectly to improving food security might be better choices. (83 words)

Key words: food security, food demand, food supply, environmental sustainability, and policy

1. INTRODUCTION

In view of the rapidly increasing world population, and the declining stock of natural resources, serious concerns have been expressed about the future capacity of the world's food production system (Rosegrant et al. 2001; Leisinger et al., 2002). At present the developing world contains almost 800 million food-insecure people. Although this number has decreased during the last few decades, and can be expected to continue to decrease in the near future, it will only be at a rate of about one percent per year (FAO, 1999a and 1999b, and Wiebe et al., 2001). Hence, there will continue to be large numbers of hungry or food-insecure people and food demand will exceed supply for a considerable time to come.

The International Food Policy Research Institute (IFPRI) has analysed alternative strategies and policies for meeting food needs of the developing world. Thus, a recent report by IFPRI examines the effects of changes in policy, technology and life styles. One of the main conclusions is that even rather small changes in agricultural and development policies and investments can have wide-reaching effects on the number of poor and undernourished people around the world (Rosegrant et al., 2001).

The present study is concerned with the means for selecting an optimal combination of policy actions in developing countries that satisfy the objectives of food security while maintaining environmental sustainability. One problem we confront in this connection is that we are not in a position to state categorically that there will be a shortage of food during the next few decades, and that there will be a definite need for implementation of costly policy actions (McCarthy et al., 2001).

For this reason, we consider not just the selection of policy actions that are directly aimed at satisfying the stated objectives. We also review policy actions that are directed at other global issues, but which may also impact food security positively. This may permit the need for the identified policy actions to be presented more convincingly.

2. POLICY NEEDS

Although considerable efforts are being devoted to developing models for prediction of the global demand for and supply of food, our abilities to make reliable predictions for the next few decades are very limited. The main difficulty is modelling the "driving" forces, e.g. socio-economic and political factors (Döös, 2002a), and realistically accounting for the increasing human-induced environmental stresses, such as increasing frequencies of floods and drought, heat waves, and so on (Easterling et al., 2000; Vellinga and van Verseveld, 2000).

There are also other limits to predictability. For example, ambitions to design a truly comprehensive food supply and demand model may not necessarily lead to the desired result. The inclusion of processes for which understanding is incomplete can cause serious errors. Indeed, in

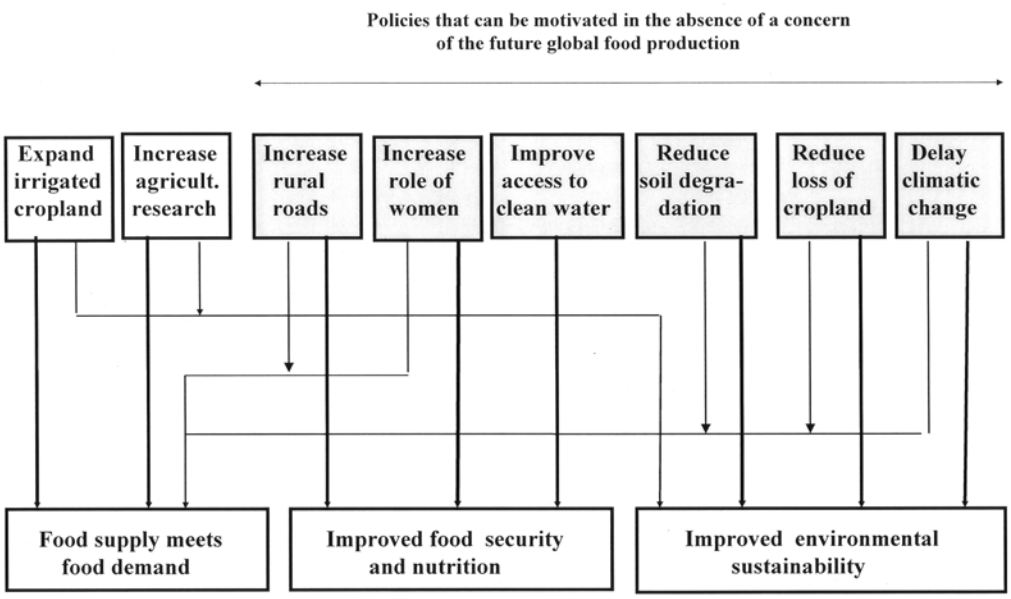

Figure 1. *Examples of policy actions that contribute to achievement of the three objectives listed in the text, either directly (thick arrows) or indirectly (thin arrows). The diagram suggests that individual policy actions can serve more than one objective. The diagram also indicates that some of the policy actions can be rationalized even if there is no concern regarding future production and availability of food.*

attempting to develop and implement policy actions aimed at improving agriculture, we must confront the following questions:

- What future capacity of the global food production system will be sufficient to meet demand?

- What future levels of food security will policy changes are required to ensure?

In light of these uncertainties, we expect governments will be reluctant to commit substantial financial resources for financing policy actions that they believe may not be needed. However, some predictions of future food production appear to be overly optimistic (e.g., Lal et al., 1998; McCarthy et al., 2001). The reason for such optimism is often that the predicted changes are evaluated on the basis of what is theoretically possible, rather than what is likely to happen.

Indeed, there will always be those who deny, or deliberately underestimate the risks, or argue that the scientific base is too weak (e.g., Singer, 1997; Lomborg, 2001). They may argue in the name of scientific prudence even when their real reasons are short-term economic concerns (Ullsten, 1991). This problem was recently illustrated in the ongoing attempts to reach an international agreement on the reduction of the emission of greenhouse gases and thereby to reduce global climatic change.

3. POLICY OBJECTIVES

In developing a strategy for implementing policy actions aimed at meeting future food needs, there are basically three objectives, namely:

1. **Sufficient increase of food production.** The supply of food should meet the likely increase in food demand.

2. **Food security for all.** The access to food must be improved and the number of undernourished and malnourished children and adults reduced in the developing world.

3. **Environmental sustainability.** Unnecessary loss of the limited world resources of soil, biota and water must be avoided.

Thus, objectives of policy actions are not limited to merely augmenting agricultural production. They also include access to the supply of food, and availability of a more healthy diet. Moreover, the rate of use of the natural resource bases should not exceed the rate at which nature can produce them.

4. POLICIES AVAILABLE

A large set of policies exist from which any individual country can choose in achieving the three basic objectives. However, we emphasize that the need for policy actions is very different in different countries. In Figure 1 some of the more important policies have been identified. These examples encompass the five sectors of investment drivers (irrigation, rural roads, education, drinking water supplies, and agricultural research) identified by IFPRI as being the most important drivers in their IMPACT model (the International Model for Policy Analysis of Agricultural Commodities and Trade) (Rosegrant et al., 2001).

In addition, three categories of policy actions directed at improving environmental sustainability have been included in Figure 1. The figure also identifies policies that can be justified even if there is no concern about the sufficiency of future global food production.

4.1 Increasing Food Supply

To reduce the gap between demand and the supply of food (the first objective), we mention the following examples of policy actions:

Irrigation. This sector ranks highest among the projected investment requirements in the baseline scenario presented by Rosegrant et al. (2001). The opportunities for expansions are mainly concentrated to South Asia, India and Latin America (Watson et al., 1998). We note, however, that low rates of return have been experienced in many recent irrigation projects Rosegrant et al. (2001).

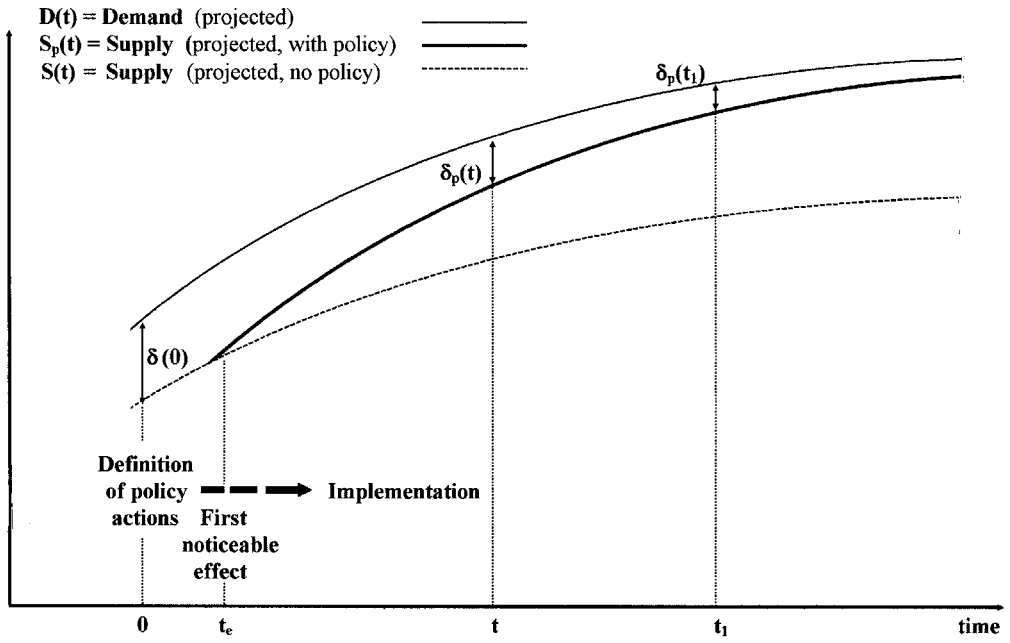

Figure 2. *A schematic illustration of the effect of policy actions aimed at reducing the gap between demand and the production of food. t = 0 is the time at which suitable policy actions have been defined, t_e is the time at which policy actions are beginning to yield results, and t_1 is the time at which the discrepancy between food supply and demand has decreased to an acceptable value. For the sake of simplicity no account is taken of the fact that the demand for food depends on policy actions.*

Fertilizers. Considerable opportunities to increase food production still exist in many developing countries by applying more fertilizers. However, account needs to be taken of the fact that gain in applying more fertilizers is much less than it was in the past. It should also be recognized that there can be demands for a more restrictive use of fertilizers in view of their potential negative effect on the environment (e.g., Vitousek,et al. 1997; NSTC, 2000).

Research Products. Recent experience indicates clearly that strong returns to investments result from agricultural research and management improvements, for example to develop locally appropriate crop varieties, or to provide farmers with better extension services (Pinstrup-Andersen and Pandya-Lorch, 2001; Brown et al., 2001).

Figure 2 illustrates these relationships schematically:

a) the increasing demand for food in the developing world: D(t).

b) the expected increase of the supply of food without policy actions: S(t)

c) the variation with time of the supply of food resulting from a combination of policy actions that contribute to increasing food production: $S_p(t)$.

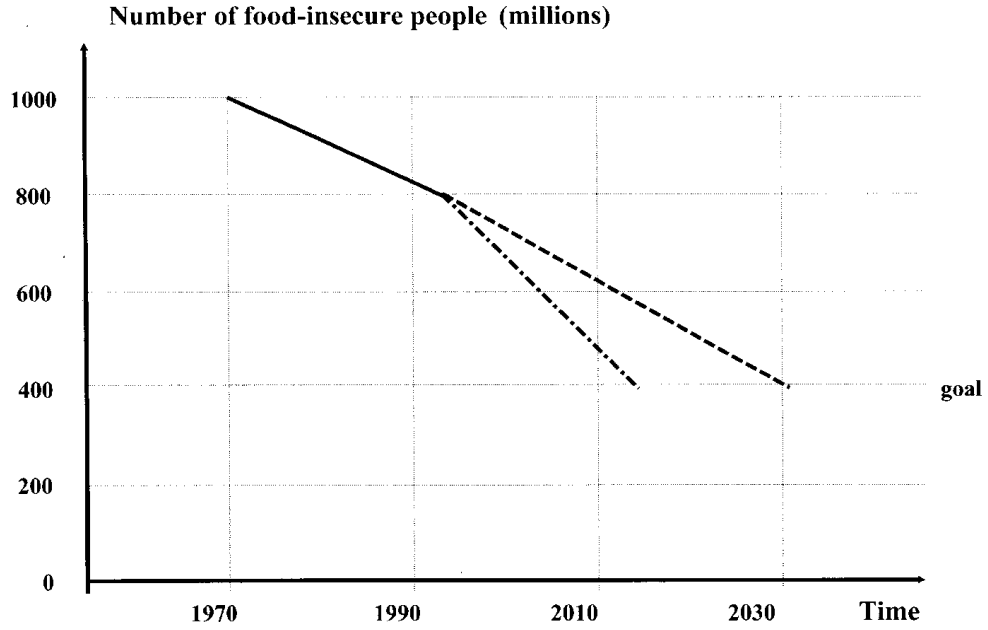

Figure 3. *Change with time of the number of food-insecure people in the developing world, in millions. The solid line is based on estimates of numbers of food-insecure people from 1969-71 and from 1995-97. The dashed-dotted line shows the World Food Summit goal and the dashed line the number recently projected by FAO (FAO, 1996, 1999a and 1999b). Recent projections by FAO (2002) indicate that the number will not be reduced to 400 million until at least 2030 (the dashed dotted line).*

Thus, we assume it is possible to successively decrease the food shortages: $\delta(t) = D(t) - S(t)$. The figure also illustrate the time that policies require before they become effective. This will be discussed later in some detail.

4.2 Improving Food Security

As illustrated in Figure 3, the number of people who live with food insecurity has been decreasing during the last few decades despite the rapid growth of the world population. Nevertheless, with about 800 million people still without enough to eat, the decline must be considered insufficient, and it is abundantly clear that sustainable food security for all is impossible by 2020 if business is conducted as usual (Pinstrup-Andersen (2001). According to recent FAO projections, the goal of reducing the number of food-insecure people to 400 million by 2015 will not be reached until 2030 (FAO, 2000). IFPRI projections suggest similarly slow progress in reducing child malnutrition. By 2020, 132 million children under the age of 6 years (i.e. one out of every four children) may be malnourished (Pinstrup-Andersson et al., 2001).

Thus, there is an urgent need to identify, prioritize and implement policy actions that can contribute to improving food security and

reducing malnutrition. As examples of suitable policy actions we mention:

- **Health care.** Pinstrup-Andersen and Pandya-Lorch (2001a) emphasize the importance of policies directed at improving health and nutrition. Good health and nutrition are the means as well as the ends to eradicating poverty and achieving broad-based development.

- **Poverty.** AS has been expressed by Vosti and Reardon (1997), poverty alleviation is essential, for poverty ruins lives and undermines development, the environment and political stability.

- **Infrastructure.** A review of investments in 14 developing countries reveals wide disparities in infrastructure availability between rural and urban areas (Komives, Whittington, and Wu, 2000). An increase of rural roads helps alleviate poverty and thereby increases food security. The need for this type of policy action is particularly important in Sub-Saharan Africa and Latin America. This policy action also contributes to increasing the crop yield and opportunities for cropland expansion (Rosegrant et al. 2001). Yet, it also contributes to the destruction of adjacent tropical ecosystems unnecessarily, reducing their sustainability (Skole et al. 1994).

- **The role of women.** Policy makers must recognize that women are major contributors to agriculture and play a prime role in ensuring food security, and that they could achieve much more (Brown et al. 2001, IFPRI, 2000). The United Nations Population Fund has presented seven policy areas involving increased understanding of women's importance, all of which require immediate attention (UNFPA, 2001).

- **Education and Clean water.** Policies aimed at improving education and providing access to clean household water are particularly important in reducing the number of diseased and malnourished children Rosegrant et al. (2001).

- **Agricultural trade.** As pointed out by the International Policy Council on Agriculture, Food and Trade (2002), the developed countries need to do more to open the agricultural markets to developing countries in order to increase their agricultural production, and thereby reduce poverty and hunger.

We emphasize that implementing these examples of policies would not only contribute to improving food security, but they would be justified in their own right.

4.3 Increasing Environmental Sustainability

Considerable loss of food production is caused by different types of environmental degradation (McCarthy et al., 2001). Here we limit ourselves to the need for policy actions in three problem areas.

Soil degradation. There is a growing concern that ongoing soil degradation represents a serious threat to food production in the developing world. Several problems of soil degradation for food security were listed by Scherr (1999). In order of global policy priority, they include:

- Improving soil quality in densely populated marginal lands.
- Improving system- and farm-level water management regimes, and investing in proper drainage systems.
- Reducing degradation of high quality rainfed land by improved integration of suitable technologies.
- Preserving agricultural land quality in urban and pre-urban agricultural lands.
- Limiting environmental degradation in marginally-productive lands caused by intensive agriculture.

Loss of cropland. Each year a considerable amount of cropland is lost by the conversion from rural to urban uses to serve the rapidly growing population. This caused the United Natios Conference on Environment and Development to launch a comprehensive programme aimed at developing an "Integrated Approach for the Planning and Management of Land Resources" (UNCED, 1991). It deserves also to be pointed out that in all likelihood the loss of cropland will be replaced by land reserves with poorer productivity (Döös, 2002b).

Climatic change. Recent regional, human-induced climatic changes, particularly temperature increases, have already affected many physical and biological systems. According to MacCarthy et al. (2001) projected adverse effects include:

- general reduction in potential crop yields in most tropical and sub-tropical regions for most projected increases in temperature,
- general reduction, with some variation, in potential crop yields in most regions in mid-latitudes for increases in annual-average temperature of more than two degrees Celsius,
- decreased water availability for populations in many water scarce regions, particularly in the sub-tropics,
- widespread increases in the risk of flooding for many human settlements as the lessened rainfall is increasingly delivered in a few large storms.

We also recognise that there is risk of an increased frequency of droughts, and that the vulnerability to extreme weather events is judged to be higher than vulnerability to changing mean conditions**.**

A large number of possible policies, measures and instruments do exist for countries to limit their emissions of greenhouse gases (Bashmakov and Jepma, 2001). However, the emissions reductions agreed on by governments so far are about one order of magnitude below what is required to have the desired effect, that is, stabilisation of the atmospheric concentration of greenhouse gases below present day levels (Nakicenovic, 2000).

5. POLICY IMPLEMENTATION

The selection of policy actions must include consideration of the generally long lead-time before they become effective. Time lags are caused by:

- The need to develop a firm scientific basis for certain policies. To achieve a consensus within the international scientific community is very time consuming. Global change science provides a recent example. Fossil fuel burning effects on climate were first suggested by Arrhenius (1896) and calculated by Callendar (1938), with large-scale research beginning in the 1970s. Consensus still was not reached until early in the 21st Century (Houghton et al., 2001; NRC, 2002).

- The complex and tedious process of negotiating national and international agreements on policy actions. Consider the Kyoto Accords in which negotiations were completed in 1997 and the agreement is still not ratified at this writing in 2003. As we suggest above, governments often hesitate to accept the scientific rationale for implementation of costly policy actions. Their reticence may also produce underestimates of the response actions required.

- The time required to accomplish a widespread implementation of the approved policy actions due to limitations of financial resources, human behaviour patterns, and other sociological processes. The Montreal Protocol banning use of CFCs to protect the stratospheric ozone layer was ratified with great unanimity in 1987, but the offending pollutants were not to be eliminated until the year 2000. More contentious agreements will require considerably longer to implement.

Figure 4 illustrates schematically how these three kinds of time lags can contribute to the delay in achieving the maximum effect of policy actions. The curves in this figure represent the variation with time of a quantity representing one of the objectives, with and without policy actions. In this particular case we demonstrate how an environmental stress is reduced by a policy action.

In some cases the entire lead-time may be less than a decade. In other cases the time delay appears to be as long as 2-3 decades as for example, in efforts aimed at delaying a greenhouse gas-induced climate change.

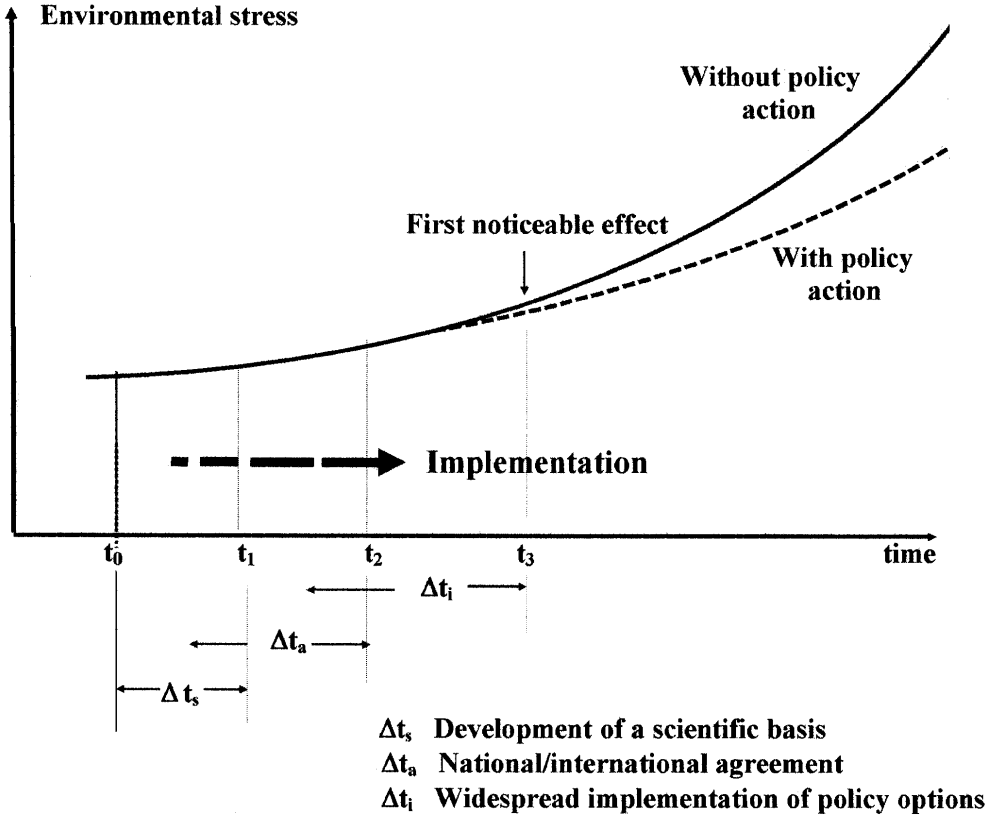

Figure 4. *Illustration of the causes of the long lead-time required for a policy action to become fully effective. Source: Döös (1991).*

In the following review, we consider two different approaches in selecting policies aimed at the given objectives. Each demands a timely implementation if it is to minimize lags and be of value during the coming decades. The basic difference between these approaches is the differing probabilities of financing the implementation of the policies.

5.1 Two Policy Portfolios

In order to illustrate the basic philosophy behind these two approaches we divided the available policies that contribute to the stated objectives into two different categories:

Portfolio A. This includes policy options that have a direct positive impact on one or more of the three objectives. Thus, it includes policies that are specifically designed to augment food production (for example, by an expansion of irrigated land, or making use of new crop varieties) or to increase reliability of its distribution (i.e., increased transportation infrastructure). However, as we pointed out, governments probably will be reluctant to implement such policies due to the present limits in predicting the future capacity of global food production.

Portfolio B. This includes policies that on one hand are related to other global issues but on the other, can also contribute to achieving food

security and environmental sustainability. Examples include policies aimed at reducing poverty and improving education in the developing world.

This portfolio includes policies aimed at a substantial reduction of the emission of greenhouse gases. An acceptance of GHG limitation policies by enough governments to ratify them is likely at this time.

5.2 The Two Approaches

A straightforward approach is to choose policies that serve the three objectives stated above in the most efficient way, and to assume that their implementation can be financed. Thick lines in Figure 1 connect such policies to the objectives listed there**.** Many of these policies also contribute to other objectives such as increasing the role of women. These achievements in turn contribute, for example, to increasing food production as indicated by the thin lines in Figure 1.

An alternative approach is to choose policy options that a) are aimed at other global issues, but at the same time also contribute to the stated three objectives, and b) are "politically feasible", i.e. they will have a high probability of being accepted and financed. In support of such an approach we note the following views:

- In addition to policies that directly aim at improving yield and expanding cropping area, agricultural and rural growth can be facilitated in numerous other ways, for example through policies aimed at improving rural infrastructure, education and health care (Roegrant et al. 2001).

- Agricultural growth is a major contributor to economic growth in many developing countries, and thereby to reducing poverty (Pinstrup-Andersen and Pandya-Lorch, 2001b).

- Empirical evidence shows that the most efficient way to reduce under-nutrition and malnutrition is through economic growth focused on the poorest people (McCalla et. al., 2001).

- One of the major causes of environmental stress in the developing world is poverty, and one of the major causes of poverty is environmental stress (Wilson, 2001).

Given this information, a simplified flow-chart (Figure 5) can identify some of the major causes and effects resulting from the implementation of either one of the two different categories of policy actions. In particular the figure demonstrates that a) policies aimed at improving food production contribute also to improving food security and environmental sustainability; and b) policies aimed at improving human resources also contribute to augmenting food production. As we discuss later, this alternative approach has definite advantages related to obtaining the necessary financial resources for policy implementation.

Certainly, the cause and effect diagram shown in Figure 5 is an oversimplification of the real world. For example, it is an oversimplification to blame the poor for the ongoing degradation of the environment. As pointed out by the US Committee for United Nations Population Fund (2002) only the wealthier families in many less developed countries engage in large-scale clearing of vegetation, over-use of agricultural chemicals, over-use of groundwater resources for irrigation, over-use of pastoral land for grazing and over-exploitation of soils for export production.

5.3 Potential Conflicts Between Objectives

In assigning priorities, we recognize that a policy response which contributes in a positive way to one of the objectives can at the same time be detrimental for another objective. For example, increasing food production through agricultural intensification can lead to environmental degradation and loss of natural resources (WRI, 2000). Similarly, agroecosystem productivity can be damaged by poorly managed irrigation or an excessive use of fertilizers.

6 AN OPTIMUM POLICY COMBINATION

Now we consider assembling a combination of policies that satisfy the stated objectives in an optimum way.

To accomplish this we consider two different approaches that require certain assumptions regarding basic uncertainties.

6.1 Basic uncertainties

For each individual country/region, assumptions need to be made with regard to:

- **The likelihood of attaining the objectives without policy action.** For example, this includes a judgement of how reliably we can predict the future food production in less developed countries. Present projections exhibit very different results about the extent to which the food supply will meet the needs. The magnitude of the impacts of the greenhouse gas-induced climatic change also will need to be realistically estimated.

- **The effectiveness of policy actions.** In general, the present predictability of policy impacts is very limited. Consequently, it is difficult to judge how effective the various policies will be in achieving the objectives. This implies that at present, we understand too little to design an ideal combination of policies. We mention here that IFPRI (2002) emphasizes the correct anticipation of the major policy issues of the future as one of the primary ingredients in establishing priorities for policy-oriented social science research. In the meantime, we will assume for the following analysis that policies will meet their designed objectives.

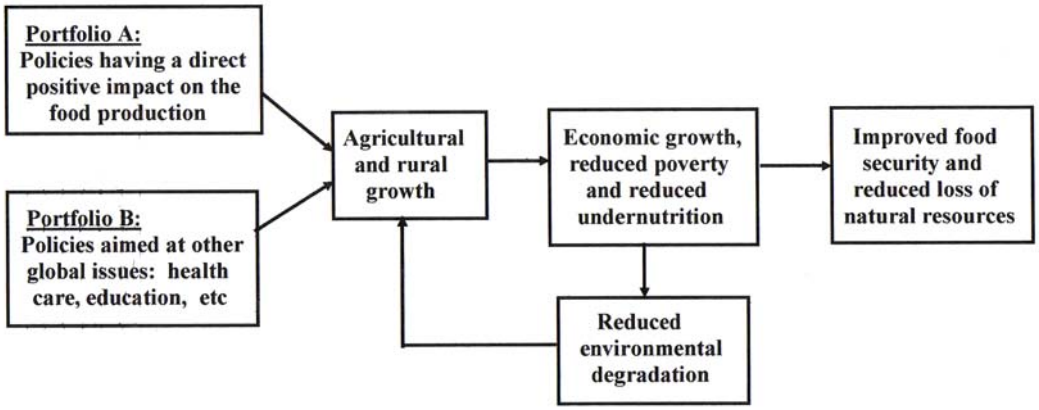

Figure 5. *A simplified illustration of how food production can be augmented by using two different kinds of policies: i) Policies that are directly aimed at augmenting food production; and ii) policies that are aimed at other global issues, but at the same time contribute to an increase of food production.*

- **The probability of funding the required policies.** The choice of a set of policies to achieve the established objectives to a large extent depends on the probability of funding the individual policies. For example, policies related to education and the role of women might be given considerably higher priority by governments than policies aimed at environmental sustainability. The probability of funding we assume to be 100% for the following analysis.

6.2 Application of Utility Theory

In attempting to make an optimum selection of the relevant policies we could use several different approaches. The most relevant analytical approach is based on the theory of utility, a branch of the theory of decisions developed within economics (von Neumann and Morgenstern, 1947). Utility theory is concerned with measurements and representations of preferences, and it can be used in decision making under both risk and uncertainty (Keeney and Raiffa, 1976).

Different types of approaches exist in using utility theory (Markandya and Halnaes, 2001). However, in our case, only the so-called multi-attribute utility analysis can be used since it is the only version that provides a framework for integrating different decision parameters and values in a quantitative analysis without assigning monetary values to all parameters.

In the most abstract form, multi-attribute utility theory is concerned with the outcomes of an agent's decisions (policy measures). The theory involves the construction of a function which is used to determine the preference between any two candidate plans by simply computing and comparing their expected utilities (degree of attractiveness) (Ha and Haddaway, 1997).

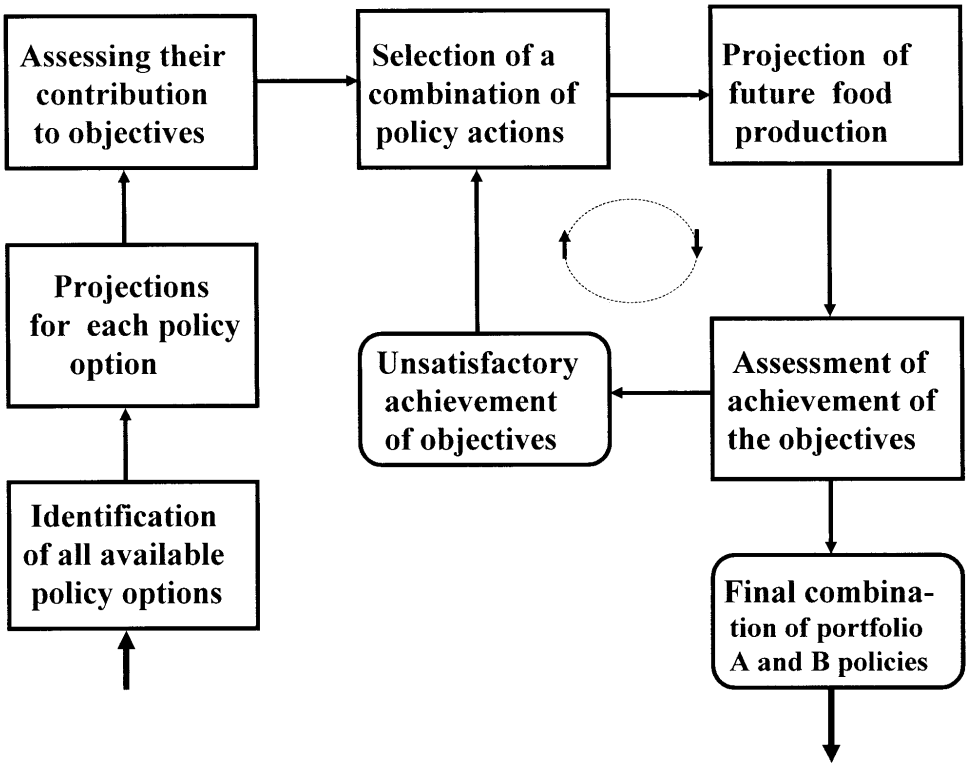

Figure 6. *A schematic of the iterative procedure for selection of a combination of policy actions directed at satisfying the stated objectives.*

Undoubtedly, multi-attribute utility theory is a powerful and well regarded tool for decision making, and it has been applied to many decisions in both governmental and private sectors. However, it is a comparatively complex method, and if not correctly applied, its' results can be misleading. For this reason, w propose to use a different method.

6.3 Application of a Successive Approximation Method

We propose a considerably less complicated, iterative method than the multi-attribute utility method for selecting a nearly optimum combination of policies that satisfy the given objectives. The procedure for the selection of the desired combination of policies is shown schematically in Figure 6.

Basically it consists of the following steps:

1. Identify all policies (portfolios A and B) that can contribute significantly to the achievement of the stated objectives, either directly or indirectly.

2. Determine the following quantities for each of the major regions of the developing world:

- food demand: D(t).
- food supply without policy actions: S(t).
- food supply obtained for each one of the identified policy actions: $S_p(t)$

3. Make as realistic estimates as possible for each individual policy regarding:

- the extent to which it contributes to achieving the stated objectives. As discussed above, at present, such estimates are bound to be very approximate.
- the investments required for implementing the policy for a given level of impact.
- the probability that the policy can be funded and implemented.

Table 1 lists some of the more important policies aimed at the three given objectives. It also contains subjective estimates of the magnitude of impacts of each policy and indications of availability of funds required for their implementation.

4. Based on the outcome of Step 3, chose a preliminary subset of policies that can provide a significant contribution to achieving the three objectives.

5. Based on the selected policy options, project the specific values that represent the three objectives. We recognize that these projections will be somewhat inaccurate, particularly regarding changes of the state of the environment.

6. Assess to what extent the selected combination of policy actions satisfy the three objectives. If the outcome of this assessment is not satisfactory, a new set of policy options must be chosen, and new projections undertaken. This implies a repetition of steps 4, 5 and 6.

7. Repeat this procedure until an acceptable combination of policy actions has been obtained.

6.4 Nature of the Expected Results

We used hypothetical values of D(t), S(t) and Sp(t) to illustrate a plausible outcome of the selection of policies, summarized in Figure 7. From this example we could conclude that:

- During the next few decades food production could meet the demand. However, that outcome would require implementation of both kinds of policies (A and B). A substantial reduction of the numbers of food-insecure people in the near future can probably only be achieved by making extensive use of Portfolio B policies, for example policies directed at improving health care and education systems.

- The prospects of satisfactory accomplishment of environmental sustainability are not good. At the least, a long-term plan for certain policies will be required, such as those relating to improved education, for example.

Table 1. *The table indicates the two different possibilities to contribute to achieving the three basic objectives : i) by using Portfolio A policies aimed directly at the three objectives, or ii) by using Portfolio B policies that are directed at other issues but also have a positive impact on the basic objectives.*

Policies relating to:	Increase **food production**	Improve **food security**	Reduce **environmental degradation**
Portfolio A.			
Ririgation New crops Management . . .	+ Major + Major + Major		— Medium
Clean water Health care Rural finance . . .		+ Major + Medium + Minor	
Soil degradation Loss of cropland GHG emission . . .	+ Major + Major + Medium	+ Minor + Minor	+ Major + Medium + Minor
Portfolio B.			
Education Role of women Infrastructure Poverty . . .	+ Major + Major + Minor + Medium	+ Major + Major + Major + Major	+ Major + Major + Minor + Minor

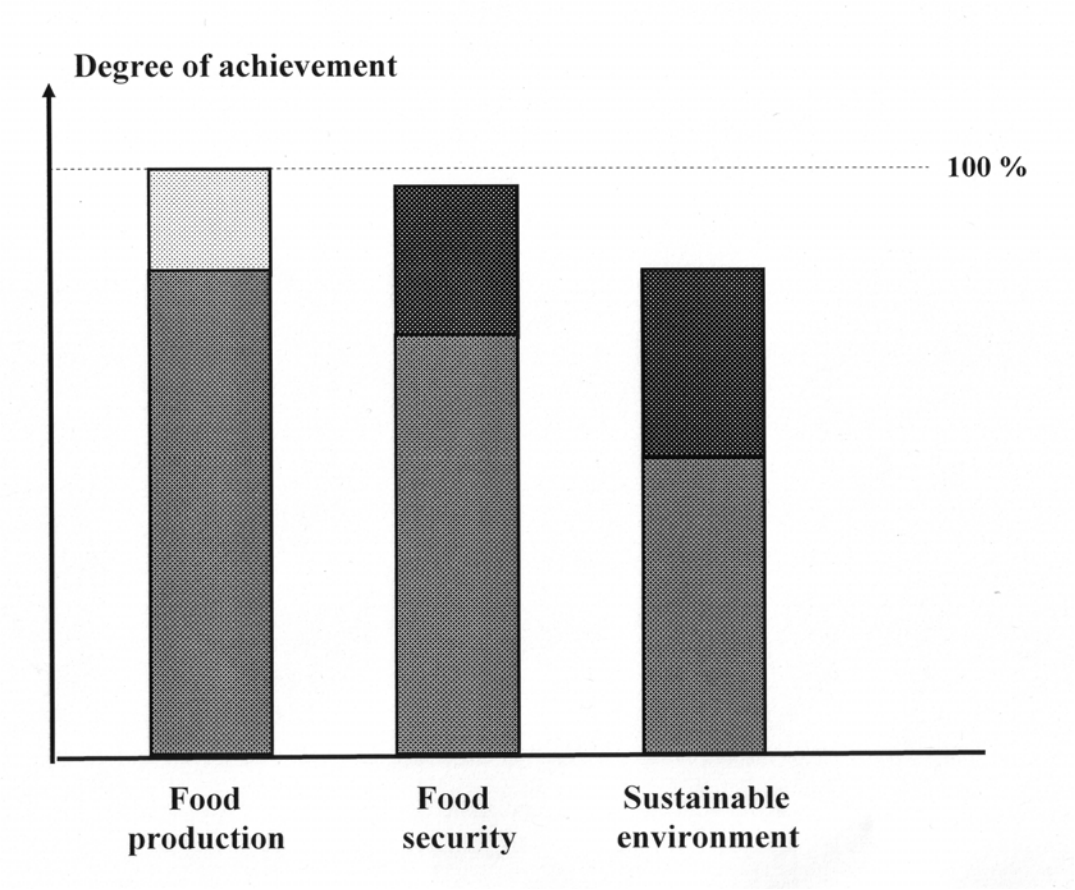

Figure 7. *An illustration of the possible outcome of the selection of a near ideal combination of Portfolio A (direct effects; light shading) and Portfolio B (indirect effects; dark shading) policies. In particular it indicates that a considerable portion of the achievement of the objectives are obtained by making an extensive use of Portfolio B policies.*

- The possibility cannot be excluded that in some regions the ideal combination of policies will consist almost entirely of Portfolio B policies.

7. CONCLUSIONS

We attempted to provide a means to identify the types of policies required to ensure that during the next few decades: i) the food supply meets the food demand; ii) food security is available for all; and iii) no unnecessary losses of natural resources take place. Although the study cannot be considered as comprehensive, we can draw certain conclusions:

- There exists a wide spectrum of policies that contribute either directly or indirectly to the achievement of the objectives. Some of these policies contribute to more than one of the stated objectives.

- The selection of an ideal combination of policies is possible but is handicapped by our limited ability to predict reliably future food

production and the state of the environment. These uncertainties in turn make it difficult to provide convincing arguments concerning the need for policy actions and investments aimed at increasing food production.

- The choice of an ideal combination of policies to achieve the basic objectives is also hampered by the present limited knowledge about the impacts of the various policy actions.

- For this reason we suggest an approach to improve food security and environmental sustainability indirectly through policy actions that are directed to other global issues. As examples we mention policies aimed at reducing poverty, improving health care and increasing the role of women.

- One advantage of such (no regrets) policies is that they can be more easily accepted and financed by governments.

- Policies aimed at serving one objective can negatively impact another. For example, increasing food production through agricultural intensification can lead to environmental degradation and loss of natural resources.

- Early identification of the required policies is needed considering the long periods they often require to be clearly defined, agreed upon, financed and implemented.

Overall, we believe that considerable opportunities exist to identify a set of policies that largely satisfy the given objectives, and that also have a high probability of being financed.

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