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SPATIAL ENVIRONMENTAL EVALUATION OF ALTERNATIVE EU AGRICULTURAL SCENARIOS FOR MEDITERRANEAN COUNTRIES

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ABSTRACT

In this article we will investigate the impact of different EU policies that aim to meet the target specified in the UNRAA (Uruguay Round Agreement on Agriculture) of 1994. In particular, we will analyze which possible additional reforms are needed to make the EU Common Agricultural Policy (CAP) compatible with the GATT-WTO agreement, seen from the perspective of a possible operation of a Free Trade Area between the EU and Mediterranean countries. It is at present expected that under this pressure the EU will set new policies through which the removal of barriers to trade in agricultural products should be achieved. The question raised in our article concerns the consequences of the reform brought about in the EU document Agenda 2000 on economic, social, and environmental conditions among different regions or countries of the Mediterranean area. It should be noted that the current interests in proper land use analysis have arisen from the general awareness of the specific geographic features of sustainable development. Particularly in land use planning, much emphasis is at present placed on designing plans that are more favorable to goals of multi-functional use, rather than for merely agricultural use as in the past. Consequently, the choice of methodological tools based on a multi-assessment approach can be critical in developing new policy initiatives that are to be implemented from a sustainability perspective. In this article on an assessment of the Free Trade impact at the spatial level of Mediterranean countries, we will deploy a methodological framework that involves the use of modern multicriteria analysis, in particular the Generalized

Regime Method. The article will explore the usefulness of this method by applying it to clusters of countries in the Mediterranean area with a view to support proper land use management on the basis of different policy scenarios. The article will end with a discussion of the changing scene of policy analysis for spatial sustainable development.

1. INSTITUTIONAL ISSUES ON LAND USE POLICY IN EUROPE

Europe has gone through a drastic change in industrial and residential location patterns. These far reaching transformations in spatial and industrial structures have had profound impacts on land use in Europe. Not only do we observe urban sprawl and the emergence of mass tourism areas, but the agricultural sector is also subjected to unprecedented changes. The latter changes are partly caused by the structural market changes in the sector, but are also partly due to institutional changes taking place at the worldwide level of international negotiations.

In this introductory section we will investigate the impact of different EU policies that aim to meet the targets specified in the UNRAA (Uruguay Round Agreement on Agriculture) of 1994. In particular, we will address the question which possible additional reforms are needed to make the Common Agricultural Policy (CAP) compatible with the GATT-WTO agreement in the light of a possible future cooperation in a Free Trade Area between the EU and Mediterranean countries. It is now expected that under this pressure the EU will set new policies through which the removal of barriers to free trade in agricultural products should be achieved.

Although the Agreement on Agriculture seems to foster liberalization, the question of how the major policy instruments should be modified is still a much-disputed issue. In particular, modifications of the price support system for a range of products and the use of non-price support instruments, such as structural measures, remain the most frequently discussed issue.

The conclusion of the agreement on agriculture of the Uruguay Round resulted in clear progress in reducing export subsidies, production- and trade-distorting domestic measures, and increased market access for agricultural goods. In addition, a whole range of other trade issues is likely to attract the attention of policy makers in the near future, including sanitary and phytosanitary measures, environmental standards, regional trading arrangements, and marketing systems in general. It should be observed that the expanding free trade of agricultural products does not in itself imply a dismantling of the EU agricultural policy. High transaction costs and various barriers will still remain. The Marrakesh agreements of 1994 which brought the Uruguay Round to an end, were *de facto* a subdivision of the world into large regions (area of free trade or economic clusters) that became

formally recognized: 1) the EU, 2) the NAFTA (North American Free Trade Area), 3) the MerCoSur (Mercado Comun do Sur) in Latin America, 4) the Far East countries dominated by the Japanese economy, and 5) the emerging Chinese economy. In this respect, the Uruguay Round has acknowledged the regionalization process that was already taking place worldwide. Consequently, these agreements have a spatial differentiation and do not lead to full international free trade. As a result, a reduction of the EU domestic price of agricultural products may to some extent mean a partial dismantling of the CAP. Under the UNRAA agreement, all direct and indirect measures which restrict agricultural trade should be reduced. For the EU, the most binding commitments are those concerning the reduction in the aggregate measure of support (AMS) and in particular those concerning the subsidized exports. The 1992 CAP reform converted a significant part of domestic support for cereals, oilseeds, and proteins (COPs) and for beef from price support into compensation payments, which by negotiation were explicitly excluded from the AMS. In this setting they were classified as *Blue Box* measures and they were not subject to reduction commitments. This makes these payments apparently secure until 2003, but their legitimacy is under increasing scrutiny by the WTO. If transfers are made in ways which do not create additional incentives to increase crop area planted or numbers of animals raised, or to increase yields by the use of additional variable inputs, and do not act as a disincentive to consumption, then they should not distort trade and are to be classified as a so-called *Green Box.* Green box policies are those considered to have minimal trade distortion effects of effects on production. These policies have been exempted from reduction commitments, and hence these measures are neither included in the AMS calculation. The green box is defined in both a general form and in terms of an illustrative list of eligible policies, which include various measures such as advisory services, domestic food aid, decoupled income support, income insurance and safety net programs, and set-aside payments.

As a result of the Blair House Accord between United States and EC, the so-called *Blue Box* exemption has been agreed upon, with the result that both the US deficient payments and the new compensation under the reformed CAP of the EU are not included in the AMS calculation schemes and in the reduction commitments. The wording chosen for this purpose exempts “direct payment under production limiting programs,” if they are made on the basis of fixed areas and yields (or number of heads for livestock), or on a maximum of 85 percent of the base level of production [1].

The precise nature and site of the consequences of modifications in the CAP are difficult to estimate. There is hardly any model which is able to encapsulate the great variety of complex, multinational policy dimensions. To map out possible future land use implications for countries in the Mediterranean, we will use in the next section a scenario analysis.

2. USING POLICY SCENARIOS FOR MEDITERRANEAN LAND USE

To examine the implications of a Free Trade Area between the EU and Mediterranean countries, we have identified two clusters of regions that encompass six countries and an evaluation model based on a multicriteria analysis. We have chosen this approach over conventional empirical models, because it captures the three critical levels (economic, social, and environmental) of sustainability implications of a further agricultural policy reform. Different policy scenarios may lead to different results. For creating and identifying various relevant alternatives, we have adopted the scenario method.

According to Heijden [2] there are a number of general rules to be respected in this process: 1) at least two scenarios are needed to reflect uncertainty, 2) each of the scenarios must be feasible or plausible, i.e., they should grow logically from the past to the present, 3) they must be internally consistent, i.e., a scenario must be related through cause/effect lines of argument which cannot be flawed, 4) they must provide useful, comprehensive, and challenging ideas against which it is possible to consider future plans, strategies, and directions. Following the Agricultural Strategy Paper [3], in the present study these four alternative choice possibilities are indicated as: *status quo, developing the 1992 approach, radical reform,* and *environmentally-oriented strategy*.

A1—Status Quo

This scenario tries largely to maintain the current policy, although it may change the basic CAP mechanisms included. It is mainly based on the principle of decoupling introduced in the 1992 Mac Sharry reform that involves the separation between market prices which would move toward the international market, and income support, through compensations aimed directly at supporting the farmers' incomes. The Mac Sharry reform was followed by the so-called "Agro-environmental package" applied mainly on the basis of regulatory measures. They provide a compensation for loss of income or for higher costs to farmers who commit themselves for a certain period of time to undertake a more environmentally-friendly and less intensive agriculture, incentives for early retirement, and promoting afforestation on the farm land.

A2—Developing the 1992 Approach

This scenario involves a deepening and an extension of the 1992 CAP reform. This implies a reduced reliance on price support; compensations may be necessary by direct payment, whatever their concrete form may be. Following the logic of the 1992 reforms, compensatory payments are meant to compensate farmers for significant price support cuts. A continuation of the 1992 reform approach, which would lead to a clearer distinction between market policy and income support, is

not only less distorting from an economic point of view but should increase the market orientation of the sectors and help to make them more competitive. This strategy decouples market prices for a number of key products thus reducing the gap between its internal price and internal market prices. From an environmental point of view, it would imply a coherent rural development policy, in which a greater emphasis on environmental protection is placed. Compensations, both to protect against environmental damage and against the depletion of rural resources and the decay of the cultural landscape of rural areas, and to encourage enhancement of these resources and the social fabric of rural areas, are offered in this setting. However, even if farmers are fully compensated for their revenue loss, this can still have an effect on their production decisions.

A3—Radical Reform

This option would lead toward more market orientation and competitiveness. Under this scenario, market price support through the Common Market Organization (CMO) is expected to shrink further, as prices are reduced to world market levels. This involves the abolition of price support or a reduction to world market levels; income compensation (partial or full through direct payments); abolition of quotas and other supply management measures; direct income support payments and payments for environmental services on a national basis with or without Community co-financing. The agri-environmental and structural policy components of the CAP should be transformed into payments (not subsidies or transfer), because they are paid to those who commit themselves to supply public environmental services. The rural development incentive should be concerned with all aspects of rural development and agricultural development, using a particular emphasis on stimulating opportunities for non-agricultural uses for farm resources and opportunities for resources release from agriculture. It tries to encourage farmers to create income by undertaking other economic activities in rural areas. Consequently, such farmers will be free from the production constraints which prevent them from producing for expanding world markets. In addition, they would adapt their farming system to supply also public environmental goods. These farmers are also able to market their products on a regionally differentiated basis as high quality products.

A4—Environmental Scenario

This scenario is specifically addressed to considering the environment as a "common goods" objective to be achieved. It is mainly based on the integration concept of agricultural policies, which involves the need of coherent multifunctional land use. The husbandry dimension of land management, related to the sustainability, exploitation, and continuity of natural resources over a long time horizon, is particularly stressed here. This involves the use of actions oriented toward the promotion of crop-rotating systems, the use of traditional extensive

farming systems, the careful use of scarce natural resources, and the rehabilitation of degraded land. This scenario takes also into consideration the interdependence dimension, such as traditional farming in which the farm and the surrounding natural areas achieve an equilibrium based on interaction and mutual system resilience. Hence, the maintenance of the quality of natural-human system interactions is the aim of this scenario. It also links various forms of direct regulation to environmentally-sensitive land management such as zoning, standard, and licenses. In particular, from an environmental point of view, it recognizes that Mediterranean countries are experiencing serious drought and/or decertification caused by excessive exploitation of the soil and by an irrational management of the natural resources. This scenario, specifically oriented toward conservation, includes regulatory instruments for the preservation of the natural resource stock (clean water, soil, air), and the biological stock (e.g., species diversity and the conservation of a genetic pool), but also the recreation and upgrading of lost land (such as reforestation of fallow land) or the rehabilitation of degraded land [4].

Thus, altogether we have four scenarios (see also Figure 1). The question is now which policy choices can be drawn out of these possible futures for land use, if applied to the Mediterranean. This will be further explored in Section 3 by using multicriteria analysis.

3. MULTICRITERIA ANALYSIS FOR THE EVALUATION OF LAND USE POLICY SCENARIOS

3.1 General Introduction

As suggested by the name, multicriteria analysis aims to offer the decision-maker proper tools in order to enable him to solve a decision problem where often several points of view with a conflicting character must be taken into account. In decision-making the notion of preference plays a fundamental role [5]. The decision-maker, when comparing two actions a and b, will have one of the following choice possibilities:

a P *b,* if *a* is preferred to *b*
b P *a,* if *b* is preferred to *a*
a I *b,* if *a* and *b* are indifferent
a ? *b,* if *a* and *b* are incomparable.

A usual approach consists in replacing a decision problem by the optimization of an objective function *g* defined on A. This approach implies that decision-maker's preferences meet the following model:

$\forall\, a,b \in A$: a P b $\Leftrightarrow$ g (a) > g (b), and **(traditional model)**
a I b $\Leftrightarrow$ g (a) = g (b)

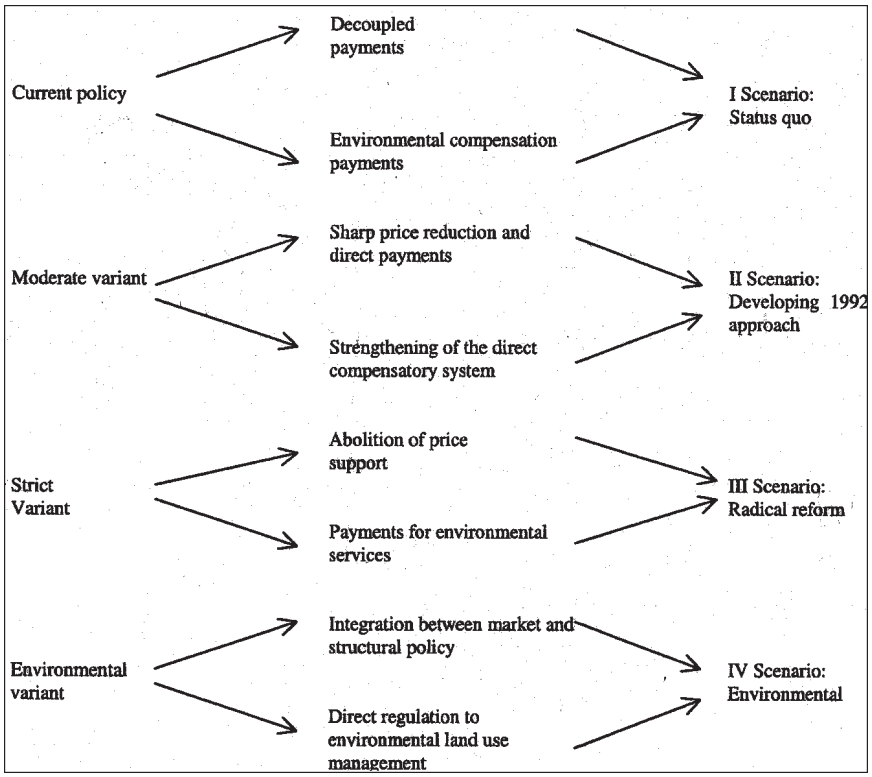

Figure 1. Scenario scenery for agricultural land use in Europe.

This model is incompatible with the existence of a minimum threshold below which the decision-maker does not feel any difference between two elements or refuses to declare a preference for any of the elements. By introducing a positive threshold q the model of comparison becomes:

$$\forall\, a,b \in A: \quad a\ P\ b \Leftrightarrow g(a) > g(b) + q \qquad \textbf{(threshold model)}$$
$$a\ I\ b \Leftrightarrow |\, g(a) - g(b)\,| \leq q$$

One drawback of the latter model is the fact that it takes into account only a fixed threshold. It is, however, often useful to introduce a variable indifference threshold such that:

$$\forall\, a,b \in A: \quad a\ P\ b \Leftrightarrow g(a) > g(a) + q\,(g(b)) \qquad \textbf{(variable threshold model)}$$
$$a\ P\ b \Leftrightarrow g(a) \leq g(a) + q\,(g(b))$$
$$g(b) \leq g(a) + q\,(g(a))$$

In a mono-criterion approach there is always a unique criterion that is supposed to capture all the relevant choice aspects of the problem. Such a comparison can be interpreted as based on "global preferences," i.e., preferences taking into account simultaneously all relevant points of view. In a multicriteria approach the comparison deduced from each of these criteria should be interpreted as "partial preferences," i.e., preferences taken into account from the specific point of view underlying the definition of the criterion. In a multicriteria approach different conflicting evaluation criteria are taken into consideration; there is a no action which is better than all the others for all criteria considered simultaneously. Thus, a multicriteria problem is an ill-defined mathematical problem, i.e., it has no unambiguous objective solution. The consequence is that a complete axiomatization of multicriteria decision theory is very difficult [6]. Multicriteria decision methods are in general important tools for helping the decision-maker to master the (often complex) data involved in his choice problem and to advance toward a solution [7].

A multicriteria problem is thus a situation in which the definition of a set of actions and of a family of criteria on A is possible with the aim:

1. to determine a subset of actions considered to be the best with respect to some given criteria (**choice problem**);
2. to divide A into subsets according to some prespecified norms (**sorting problem**);
3. to rank the actions of A from best to worst (**ranking problem**).

It must be pointed out that this is only one way to formulate a decision problem, because it frequently happens that in a real-life problem it is necessary to use a mixture of choice, sorting, and ranking.

Over the past decades, a wide range of multicriteria assessment techniques has been developed. The usual classification of the most frequently used techniques is based on the alternatives selected and on the type of information utilized. According to the first classification, the methods can be distinguished into continuous (if there exists an infinite number of alternatives), and discrete (if a finite number of alternatives can be selected). For the second classification, the class of multicriteria techniques can be subdivided into numerical quantitative techniques (if the measurement of the information is in on interval or ratio scale), qualitative techniques (if the information is measured on a nominal or ordinal scale) and mixed methods (both types of information). Various steps can be followed to arrive then at a consistent final solution (see Figure 2).

In our article we will focus on decision problems with a discrete set of alternatives. Furthermore, in an evaluation of—often qualitatively oriented—policy scenarios, we are usually dealing with a blend of qualitative and quantitative information.

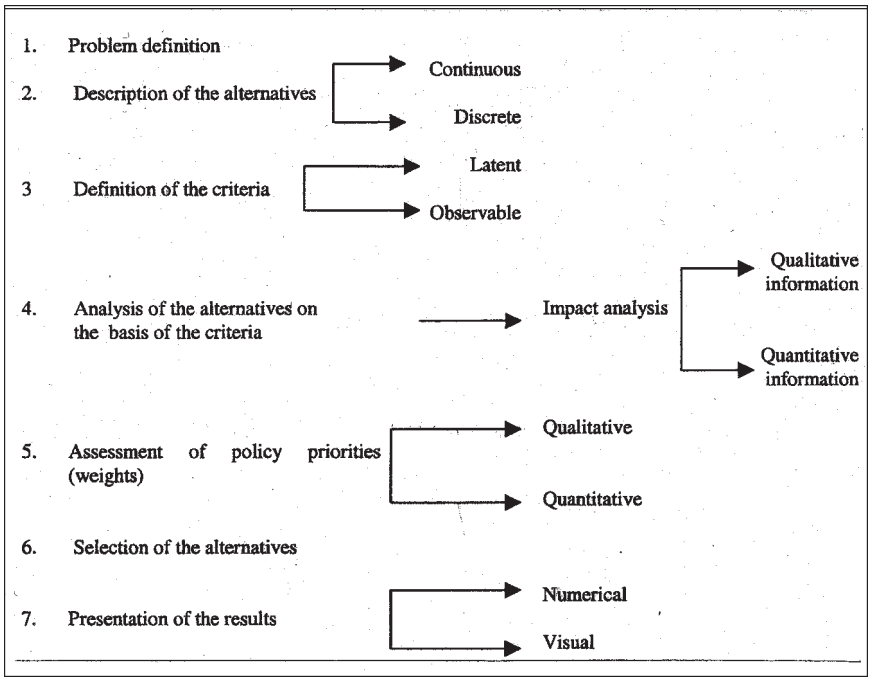

Figure 2. Structure of a multicriteria decision problem.

In case of discrete methods the set of alternatives is represented by an **evaluation matrix** in which the number of rows corresponds to the various criteria (j = 1,...J) considered and the columns to the alternatives (I = 1,...I):

$$P = \begin{bmatrix} p_{11} \ldots\ldots\ldots\ldots p_{1I} \\ \ldots\ \ldots\ \ldots\ \ldots\ \ldots \\ p_{1J} \ldots p_{Ji} \ldots\ldots p_{JI} \\ \ldots\ldots\ldots\ldots\ldots\ldots \\ p_{J1} \ldots\ldots\ldots\ldots p_{JI} \end{bmatrix}$$

where the typical element p_{ij} (measured on an ordinal or cardinal scale) represents the effect of each relevant alternative in relation to each relevant criterion. Associated with P is a J-dimensional vector of weights δ that expresses the information concerning the relative importance of the criteria under consideration. Regarding the vector δ it is possible to consider both specific numerical values and ordinal information on the relative preference of the criteria (e.g., $\delta_1 \geq \delta_2 \ldots\ldots \geq \delta_1$).

In the context of discrete multicriteria methods we will utilize in this article the so-called **regime method** that has proven to be an extremely helpful tool for dealing with binary, ordinal, categorical, and cardinal (ratio and interval) data (see also [8]). The regime method is a generalization of **concordance analysis**, an evaluation method in which the basic idea is to rank a set of alternatives on the basis of their pairwise comparison in relation to relevant decision criteria.

If we consider the alternatives *i* and *i',* it is possible to define a concordance set C_{ii}, as the class of the criteria for which alternative *i* performs better than—or equal to—alternative *i'*. Then we can define as a **concordance index** the sum of weights of the criteria that belong to $C_{ii'}$. It can be expressed as follows:

$$C_{ii} = \sum_{j \in C_{ii}} \delta_j$$

This index indicates the relative dominance of the alternatives in the concordance set. Clearly, the higher the value of the concordance index of an alternative, the more attractive this alternative is compared to the others. To facilitate the comparison between alternatives we can also define the net concordance index:

$$\mu_{ii'} = \sum_{i \neq i'} (C_{ii'} - C_{i'i})$$

Similarly, we can define the discordance set D_{ii}, as the class of the criteria in respect to which alternative *i* performs worse than alternative *i'*. Then it is possible to utilize a **discordance index**, which indicates the maximum of the difference of the scores for the alternative under consideration. It can be expressed as follows:

$$d_{ii'} = \max_{j \in D_{ii}} (q_{i'j} - q_{ij})$$

where q_{ij} is the standardized value of the element p_{ij} of the evaluation matrix. The information collected can be represented as in Table 1.

Thus, from Table 1 we can select as preferable alternatives two choice possibilities, viz., one with the highest concordance index and another one with the lowest discordance index.

The traditional concordance method has clearly several weaknesses. It may not necessarily lead to an unambiguous solution, while it is also difficult to deal with qualitative information. If we do not have information about the cardinal value of

Table 1. Concordance Analysis

Pairwise Alternatives	Concordance Index	Discordance Index
(i, *i'*)	$c_{ii'}$	$d_{ii'}$

the weights, we may have to focus our attention only on the sign of the index $\mu_{ii'}$. If the sign is positive, this indicates that alternative *i* is more attractive than alternative *i'*; if negative, it will imply the opposite. We observe here that due to the nature of the information of the indicator $\mu_{ii'}$, no numerical meaning can be attached to the order of magnitude of the difference between alternatives, because only the sign is important. We will then only be able to rank our alternatives. Against this background, the more recently developed regime method offers a useful and applicable evaluation method. It is able to deal consistently with all types of information, while it leads always to unambiguous results in terms of a quantitative performance score. Instead of an ambiguity of the sign $\mu_{ii'}$, the regime analysis introduces a certain probability p_{ij} for the dominance of the criteria i respect to criteria i' as follows:

$$p_{ij} = prob\ (\mu_{ii'} > 0)$$

It defines an aggregate probability measure which indicates the success score as follows:

$$p_i = \frac{1}{I-1} \sum_{i \neq i'} p_{ij}$$

An important problem is then how to assess $p_{ii'}$ and p_i. In the regime method we have to make the assumption that ordinal weights can be interpreted as stemming from unknown quantitative weights. In other words, the vector of weights can adopt with equal probability each value that is in agreement with the ordinal information. This argument is based on the principle of insufficient reason that also constitutes the foundation stone for the so-called Laplace criterion in case of decision-making under uncertainty. The use of stochastic analysis which is consistent with an originally qualitative data set may help to overcome the methodological problem derived from impermissible numerical operations on qualitative data. The regime method then identifies the feasible area in which the class of weights must fall in order to be compatible with the condition imposed by their probability value. By means of a random generator numerous values of weights can be calculated. This allows us to calculate the numerical performance scores p_i for each alternative *i.* Thus we can determine a unique rank order for the alternative considered (see for details also [9]).

In several evaluation studies we observe choice situations in which major decision criteria are not precisely defined; examples are: nature conservation, improvement of labor market, etc. Then we have to define more detailed indicators, so that a nested approach is adopted. In our study such a nested adjusted method for providing a compound evaluation of different land use policy scenarios is proposed. The essence of this so-called Generalized Regime Method (GRM) is based on the conventional regime method, but differs from it in one main aspect.

Many attributes and rankings of scenario elements obtained for a broad land use evaluation may be latent, so that they have to be evaluated more precisely. This involves a multi-stage procedure for the evaluation of the alternatives considered. This means that each alternative is judged on the basis of its constituent broad policy criteria (limited in number), while each of these criteria is judged in more detail by means of measurable criteria. This approach will be illustrated on the basis of the impact tables for two clusters of countries of the Mediterranean area. The first cluster comprises three Mediterranean EU countries (France, Italy, and Spain), and the second cluster three countries of the Maghreb area (Algeria, Tunisia, and Morocco) as presented in Tables 2 to 5. In our case this procedure implies first that all measurable indicators within a few main criteria are taken together and subdivided into three subgroups: economic, social, and environmental attributes that represent the three dimensions of any sustainable agricultural policy. The data set for this model is derived from MEDAGRI [10]; for some indicators no quantitative information is available, so that then we are confronted with a case of mixed information.

Table 2. Impact Table of Mediterranean EU Countries

Indicators	Unit of Measurement	A1	A2	A3	A4
A) Economic Macroeconomic Indicators					
1 Agricultural GDP	(million $)	+	+/–	–	–
2 Agricultural Imports/Export	(qualitative)	–	+/–	+	–
3 Agricultural and livestock products	(qualitative)	+	+/–	–	– –
4 Average income of agricultural activity	(qualitative)	–	+/–	–	– –
B) Social					
1 Rural population	(millions)	+/–	+	–	+
2 Agricultural labor force	(millions)	–	–	– –	–
3 Food availability per capita	(kg/year)	+/–	+/–	+	–
4 Access to the amenities	(qualitative)	–	+/–	–	+
C) Environmental					
1 Management of abandoned areas	(qualitative)	–	+/–	– –	+ +
2 Forest and woodland	(000 ha)	–	+/–	–	+
3 Fertilizers per hectare	(kg/ha)	+	+/–	+	–
4 Livestock number per hectare	(qualitative)	+	+/	+	–

qualitative measurement: + + = 5; + = 4; +/– = 3; – = 2; – – = 1
quantitative measurement: + + = +30%; + = 20%; +/– = the same value; – = –20%; – – = –30%

Table 3. Impact Table for Maghreb Countries

Indicators	Unit of Measurement	A1	A2	A3	A4
A) Economic Macroeconomic Indicators					
1 Agricultural GDP	(million $)	+/–	+	+	–
2 Agricultural Imports/Export	(qualitative)	–	+	+	+/–
3 Agricultural and livestock products	(qualitative)	+/–	+	+	–
4 Average income of agricultural activity	(qualitative)	+/–	+	+	–
B) Social					
1 Rural population	(millions)	–	+/–	–/+	++
2 Agricultural labor force	(millions)	–	–	–	–
3 Food availability per capita	(kg/year)	+/–	+	+	+
4 Access to the amenities	(qualitative)	–	+/–	–/+	++
C) Environmental					
1 Management of abandoned areas	(qualitative)	– –	+/–	–	++
2 Forest and woodland	(000 ha)	– –	+/–	–	+
3 Fertilizers per hectare	(kg/ha)	++	+/–	–	+
4 Livestock number per hectare	(qualitative)	++	+/–	–	+

qualitative measurement: ++ = 5; + = 4; +/– = 3; – = 2; – – = 1
quantitative measurement: ++ = +30%; + = 20%; +/– = the same value; – = –20%; – – = 30%

The second step is to carry out the regime analysis for each individual country of the EU Mediterranean area. Then, we will repeat the same procedure for all three countries together. Next, we will apply the same process for the Maghreb countries.

The final step then is an overall ranking of the results obtained. As mentioned before, we also need a policy weighting scheme for our multicriteria analysis. In the light of the need for economic development, we specify here only weights at the level of main criteria as follows: economic > social > environmental [11]. Of course, any other ranking can be tested out in a sensitivity analysis, so that the robustness of the choice solutions can be verified.

The results of the GRM are found in Tables 6 to 8, for both the Mediterranean countries, the Maghreb countries and all countries taken together. The scores in these three tables show that the ranking of the alternatives according to the scenario selected does not clearly discriminate in a detailed geographical sense (at least on a country basis). Due to the high aggregation of the criteria considered, a specific detailed spatial evaluation is apparently not possible. Nevertheless, it may

Table 4. Impact Table of Mediterranean EU Countries

Indicators	Unit of Measurement	France A1	France A2	France A3	France A4
A) Economic Macroeconomic Indicators					
1 Agricultural GDP	(millions $)	35067,6	29223	23378,4	23378,4
2 Agricultural Imports/Export	(qualitative)	–	+/–	+	–
3 Agricultural and livestock products	(qualitative)	+	+/–	–	– –
4 Average income of agricultural activity	(qualitative)	–	+/–	–	– –
B) Social					
1 Rural population	(millions)	15778	18933,6	12662,4	18933,6
2 Agricultural labor force	(millions)	860	860	752,5	860
3 Food availability per capita	(kg/year)	3522	3522	4226,4	2817,6
4 Access to the amenities	(qualitative)	–	+/–	–	+
C) Environmental					
1 Management of abandoned areas	(qualitative)	–	+/–	– –	++
2 Forest and woodland	(000 ha)	12004	15005	12004	18006
3 Fertilizers per hectare	(kg/ha)	290	242	290	193,6
4 Livestock number per hectare	(qualitative)	+	+/–	+	–

Table 5. Impact Table for Maghreb Countries

Indicators	Unit of Measurement	Algeria A1	Algeria A2	Algeria A3	Algeria A4
A) Economic Macroeconomic Indicators					
1 Agricultural GDP	(millions $)	5033	6039	6039	5033
2 Agricultural Imports/Export	(qualitative)	–	+	+	+/–
3 Agricultural and livestock products	(qualitative)	+/–	+	+	–
4 Average income of agricultural activity	(qualitative)	+/–	+	+	–
B) Social					
1 Rural population	(millions)	9879	12348	12348	14777
2 Agricultural labor force	(millions)	2068	2068	2068	2068
3 Food availability per capita	(kg/year)	+/–	+	+	+
4 Access to the amenities	(qualitative)	–	+/–	–/+	++
C) Environmental					
1 Management of abandoned areas	(qualitative)	– –	+/–	–	++
2 Forest and woodland	(000 ha)	2765	3950	3160	3950
3 Fertilizers per hectare	(kg/ha)	19.5	15	12	18
4 Livestock number per hectare	(qualitative)	++	+/–	–	+

Table 4. (Cont'd.)

Italy				Spain			
A1	A2	A3	A4	A1	A2	A3	A4
32977	27481	21985	21985	17445,6	14538	11630,4	11630,4
–	+/–	+	–	–	+/–	+	–
+	+/–	–	– –	+	+/–	–	– –
–	+/–	–	– –	–	+/–	–	– –
19118	22941	15295	22941	9229	11078,8	7383,2	7383,2
1388	1388	1215	1388	1152	1152	1008	1152
3426	3426	4112	4112	3654	3654	4384,8	2923,2
–	+/–	–	+	–	+/–	–	+
–	+/–	– –	+ +	–	+/–	– –	+ +
5416	6770	5416	8124	12909	16137	12909	19364,4
204	170	204	170	+	+/–	+	–
+	+/	+	–	+	+/–	+	–

Table 5. (Cont'd.)

Tunisia				Morocco			
A1	A2	A3	A4	A1	A2	A3	A4
2366	2839	2839	1893	6055	7266	7266	4844
–	+	+	+/–	–	+	+	+/–
+/–	+	+	–	+/–	+	+	–
+/–	+	+	–	+/–	+	+	–
3043	3803	3803	4944	11166	13957	13957	18144
623	623	623	623	3418	3418	3418	3418
+/–	+	+	+	+/–	+	+	+
–	+/–	–/+	+ +	–	+/–	–/+	+ +
– –	+/–	–	+ +	– –	+/–	–	+ +
473	676	541	811	6909	9870	7896	11844
23	18	14	22	40	31	25	37
+ +	+/–	–	+	+ +	+/–	–	+

be possible that at a national level the four development options may be judged more properly in a visual representation, if their patterns differ significantly, as is suggested by Table 9 and Figure 3. To evaluate the alternative scenarios from a spatial perspective the use of Geographic Information Systems (GIS) may then be helpful. In the next section we will offer an interpretative framework for our results.

Table 6. Ranking of Scenarios for the EU Countries Obtained by Applying the Regime Method (Weights: Economic>Social>Environmental)

	Probabilities		
Scenarios	France	Italy	Spain
A2 — Developing 1992 approach	0.97	0.97	0.98
A1 — Status quo	0.67	0.64	0.64
A3 — Radical reform	0.34	0.31	0.37
A4 — Environmental scenario	0.02	0.08	0.00

Table 7. Ranking of Scenarios for the Maghreb Countries Obtained by Applying the Regime Method (Weights: Economic>Social>Environmental)

	Probabilities		
Scenarios	Algeria	Tunisia	Morocco
A2 — Developing 1992 approach	0.99	0.99	0.99
A3 — Radical reform	0.66	0.65	0.65
A4 — Environmental scenario	0.26	0.29	0.27
A1 — Status quo	0.09	0.07	0.07

Table 8. Ranking of Scenarios for All Three Mediterranean and All Three Maghreb Countries Together

	A1 — Status Quo	A2 — Developing 1992 Approach	A3 — Radical Reform	A4 — Environmental Scenario
France	0.67	0.97	0.34	0.02
Italy	0.64	0.97	0.31	0.08
Spain	0.64	0.98	0.37	0.00
Algeria	0.09	0.99	0.66	0.26
Tunisia	0.07	0.99	0.65	0.29
Morocco	0.07	0.99	0.65	0.27

Weights: France = Italy = Spain = Algeria = Tunisia = Morocco

Table 9. Final Ranking of Alternative Scenarios for All Selected Countries Obtained by Applying the Regime Method

Scenarios	Probabilities
A2 — Developing 1992 approach	1.00
A1 — Status quo	0.67
A3 — Radical reform	0.33
A4 — Environmental scenario	0.00

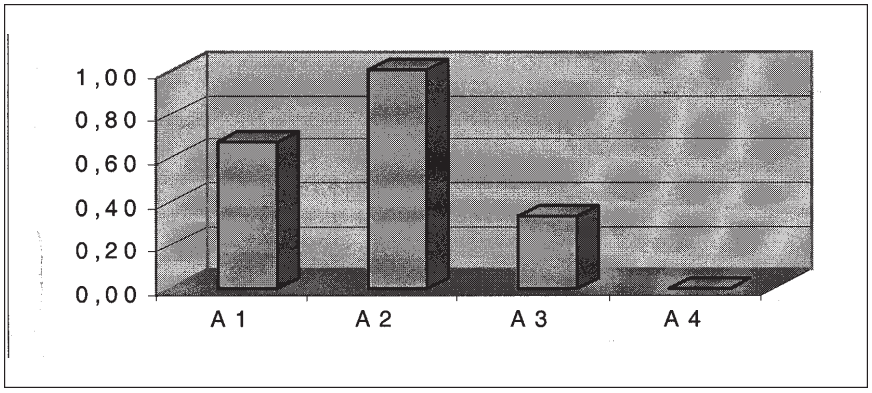

Figure 3. Visual representation of the success scores of the four alternative development scenarios.

4. INTERPRETATION OF THE RESULTS

The recent GATT agreement and the subsequent measures established are of extreme importance in establishing Free Trade Areas between EU and Mediterranean countries. The evaluation of the effects of a modification in tariff barriers and the reduction in the number of privileged agreements between countries is rather complex. This is especially due to the diversity of the socioeconomic situation of the countries in the region analyzes. Nevertheless, the GRM model performed has provided some useful insights into spatial relevance of the application of the four scenarios selected at appropriate policy levels.

The results emerging from our analysis are suggestive and clearly significant: there is a general trust, especially in the developing countries, toward more open economies and structural adjustment which would create more favorable conditions for trade. All choices point at the direction of allowing an enhanced role for market forces to determine production, consumption, and trade outcomes. But the

results indicate that the impact of the four scenarios is rather different for the two distinct clusters of countries.

Regarding the "developing the 1992 approach" scenario, Table 6 shows that it presents the highest ranking in both clusters of countries. The intermediate scores of the "status quo" scenario seem consistent with the message of the EU document "Agricultural Strategy Paper" [3], according to which a continuation is not a feasible option without any drastic adjustment measures. On balance, even though current pressure toward more liberal policies is a prevailing trend, the policy of protectionism has not fully disappeared in the past years. The "radical reform" scenario appears to be a less attractive scenario for our case study area. The principal complication is formed by the southern EU members which would not agree to a free trade zone under the application of strict trade conditions. They constitute a transition area between North-African countries and the northern EU countries. There are several commonalities between the two zones in terms of port structures that are both oriented toward the North. The agro-food exchange between EU and Mediterranean countries is rather dynamic but in favor of the North; those in favor of the South are instead rather weak because of the similarity of the exported and imported products. The most important product from the point of view of competitiveness is formed by fruits and vegetables, which constitute one of the principal elements of the agro-food balance in the whole area.

In retrospect, the Agreement on Agriculture in the Uruguay Round in combination with other possible policy reforms allows more discipline and transparency for the policies affecting trade. In general terms, the provision of the Agreement, both on border measures and domestic support, allows for the maintenance of the overall initial support and protection existing in 1986-1988, although the concrete policy instruments may have to change. The better performance of the "radical reform" scenario for the developing countries can be linked to the uncertain effects of the provision of the Agreement. In fact, for many developing countries it can represent an opportunity to apply higher levels of external protection in the form of tariffs. In addition, they could make use of the provisions on domestic support. Regarding "green box" policies, which are generally expensive and require a considerable administrative capacity, many developing countries have a serious lack. In terms of domestic support through easily implementable policies—such as direct price support to producers (i.e., policy instruments that fall under the Aggregate Measure of Support (AMS) which must be reduced, and in any case cannot be increased)—developing countries are generally in a disadvantageous situation because they have submitted a very small or almost zero level for the initial base period (1986-1988). In contrast, those countries which had a high AMS in the base period can of course retain a fair part. Finally, for the "environmental oriented" scenario this does not appear a plausible choice for both clusters of countries [12]. The low performance scores from the GRM analysis results indicate that a policy strategy based on protection of natural resources alone would be inadequate. In general terms, the developed countries are

in a better position to move in the direction of an improvement in the management of their natural resources. But much will depend on policies and institutional measures providing incentives for farmers and resource management practices, on well-defined property (or user) rights as well as on enhanced public participation. The extent to which countries adopt more environment-friendly practices depends clearly on their socio-economic and natural resource situation. The agricultural resource constraints still continue to be a major factor in the prospects for solving the food problem in many countries.

5. CONCLUSION

This article has shown the potential of multicriteria decision methods, in particular the Generalized Regime Method (GRM), as a flexible tool of dealing with mixed (qualitative and quantitative) information for agricultural policy scenario evaluation.

The first step was to design four appropriate policy scenarios describing a spectrum of feasible policies for the area concerned. The four scenarios consist of a package of EU agricultural measures aiming at alternative future developments in the economic, social, and environmental structure of the Mediterranean areas up to the year 2000.

As a tool for conflicting policy management, the GRM performed has been demonstrated to be an important evaluation method. Due to the openness of space, there are often conflicting interests between different actors (consumers, firms, institutions, etc.), a situation which can be represented as a multiobjective problem and which has a clear impact on the spatial policy of a certain area. From an operational point of view, the major strength of the above method is its ability to provide more insight into the nature of conflicting interests, not only at different policy levels, but also at different spatial level to arrive at policy compromises in case of diverging preferences in a multi-group system and in making complex choice situations more transparent to decision-makers.

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