

## Overview and Discussion: Natural Resource Management

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"Integrating Social and Technical Perspectives in Natural Resource Management", the theme of our workshop, involves the concept that integration of social and technical perspectives can occur only by respecting diversity among various cultures and traditions as human resources; if this weren't so, the issue would be disintegration rather than integration. At first, this approach might appear to be nothing new, but as we will see shortly, this is not the case. As a matter of fact, there is a long way to go in both research and above all in public policy, so that this becomes a way of conceiving man's life as much at a private level as at a public level: in other words, so that he is part of the culture. In theories and in international political programs (I mean the wide conception of politics including economics, research and social matters), there is still the persisting tendency, which I think has been growing stronger recently, to consider underdevelopment of numerous areas throughout the world in terms of the socio-economic systems' inability to align themselves to the western model.

If we quickly run through (and thus with the necessary simplifications for which I apologise in advance) the evolving of economic development theories, which is often uncertain and not without second thoughts, controversy, and contradictions, we often find attempts to integrate social and/or institutional aspects as components of development. In the formulation of Harrod's and Domar's model of growth, the determining variables for the explanation of the increase of GNP are both the rate of capital accumulation, and thus the tendency to save as well as investment productivity. In this model a level of extreme aggregation (as if it were only a single sector) was considered and all the variables were exogenous to the model itself. In the subsequent models, (the so-called modernist models from which they took their orientation), most notably that of Rostow, the economic characteristics of different countries are referred to at different positions along a single path. At the more advanced stages they see mature capitalistic economies of the west, the "modern" ones as opposed to the "traditional or "backward" ones along the same growth process which is considered to be "linear". According to this approach, not only are economic variables (singled out by Harrod and Domar) considered as characteristic elements, but also non-economic elements such as culture and institutions endogenous to the system. However, these models are still seen euro-centrally or in any case in relation to the western world, in terms of how far or close an economy is to western models in which a merging on a common path is expected.

Subsequently the so-called dualist models (e. g. Lewis, Fei and Ranis) introduce the structural change of the economy in the growth process, trying to go beyond the excessively simplified level of the previous theories. Even if these models characterise an articulation of the economic and social structure, (which in the growth process goes from an almost exclusively agricultural economy to an industrial one), they fail to go beyond setting the concepts of

backwardness against modernity. The first concept referred to society and forms of agricultural production, the second to society and forms of industrial capitalistic production. A modern capitalistic society with an "industrialised " agriculture is still the final goal. Tied to this vision of development is the conception that the causes of underdevelopment are to be found in the amount of natural resources a population is endowed with, and in the population's ethno-cultural characteristics that are (in the case of underdevelopment) incapable of activating endogenous processes of growth.

It's mostly due to this approach that the era of the green revolution in agriculture came about; that is, the technological era, the first one indicated in the workshop overview. The western world, capable of producing technological progress, began a sort of "new civilisation", transferring capital and technological progress to induce the development process. Of course, the Figureht against hunger and misery serves as a cover (with varying degrees of sincerity), but actually it occurs due to the prospect of opening new markets and particularly the market of innovations. In fact, in these models, technological progress has always been considered an exogenous variable. According to them the developing countries should have simultaneously activated a process of structural, social and institutional change.

Ideologically "radical" and opposite to this school of thought is the model that interprets the differences in development in terms of power relationships both within the countries themselves and at an international level. This idea is near the interpretation that sees imperialism (backed by military power) as key to explaining underdevelopment, but it more thoroughly develops power relationships in terms of economics, while recognising the close connection between the two. (Barcellona 1995, Myrdal 1971) In other words, development and underdevelopment are connected through a cause-effect relationship that has made some countries become dominant over others thanks to initial endogenous factors and later an increasing divergence due to a cumulative process. The agreed upon interests between dominant social groups in the less developed countries and the strong political-economic interests of the developed countries constitutes a crucial factor in interpreting underdevelopment according to these academics. (Frans 1970. 1973, Amin 1976, Cardoso e Faletto 1979)

However, the problem of the origins' endogenous factors to the systems is yet to be solved and one can say that there has been a growing effort to introduce variables of endogenous nature to growth models. In this way a current of neo-classic thought has developed as a reaction to the "theories of dependency". This theorises on the necessity that the only role of the state be to remove (as much as possible) the obstacles to free competition, and to allow the competitive market forces to act fully with the widest freedom of both trade and the international transfer of capital. This orientation together with the ones we defined "modernist" make for a sort of homogenisation of concepts which have been elaborated in the last thirty years by the social sciences of "diversity" and "originality of development models" with reference to rural and industrial society within industrialised countries. (G. Dupré, 1991 p. 17-23)

Countering the dependency concept is that of the "global village" and of "globalisation of the economy" which makes for a capitalistic globalisation. This concept has inspired the major international financial institutions in recent years (World Bank, FMI, WTO) who with plans of "structural adjustment " make fit the institutional structures to a single western model in various countries that have radically different histories and cultures. Among these authors,

however there is no lack of those (Romer 1990) who try to explain, even in a competitive market, the causes of the increasing differentials of development. The social and production systems can constitute barriers to the free expression of market forces not only in the transfer of products and capital, but also and above all in the information systems, in the transmission of knowledge, and finally in the production of human capital. This incapacity to accumulate in infrastructures and services and especially in research, training and production of technical progress, but also and above all the lack of entrepreneurship (management and marketing), would constitute internal factors of underdevelopment, to the extent of annulling the growth rates. This contradicts the neo-classical model according to which the growth rates should have been higher in countries with a lower level of capital accumulation due to the decreasing marginal productivity of capital.

Developing countries at the international level, as well as agriculture and marginal rural areas within industrialised countries, could find endogenous elements of growth just by investing in entrepreneurship and technical progress. This is the second era of dominance of farm management and marketing, as mentioned in the workshop overview. Even though these authors share the same roots as the preceding original neo-classical orientation, they sustain the need for heavy government intervention to trigger the mechanism of growth through investments in infrastructure to support the private ones. Despite the considerable progress of this position compared to the preceding ones and its ability to give explanations for the wide diversity of situations, it maintains its tie to both the linear idea of underdevelopment and to its interpretation using only economic variables. The rather revealing novelty is the fact that technological progress continues to be considered an endogenous variable to the model of growth.

It's not by chance that I have thus far tried to utilise the concept of growth rather than development. Here "growth" is meant to be a phenomenon of expansion, prevalently quantitative, of the available wealth in a certain economic system. On the contrary "development" means a "change in the objective and subjective conditions of production and of the relationships among the different levels of the social activities. This change modifies the form of the production and of the social structures without eliminating the essential characters" (Volpi 1994). In this sense the importance lies in an analysis that integrates social and economic sciences in a way that grasps the process of development in all its complexity.

The development that characterised the industrialised economic systems and the underdevelopment of third world countries for contrast, followed and were governed by the paradigm of modernisation with a convergence of various systems to a basically unitary model. In other words, external intervention (which tended to substitute technologies, forms of production, and even institutional and social systems, tied to the so-called modernisation) tended in reality to annul the differences, and thus the possibilities of autonomous paths of development, thereby converging into a single model. A wide consensus on the limits of this evolution has been reached among academics, even though the consensus is still far from translating into real changes in political policies. As Lester Brown in the "State of the World 1993" clearly denounced, world-wide between 1950 and 1990 the annual per capita growth decreased more than 6% to become negative between '90 and '92 (-1.1% per capita). Due to the destruction of natural and environmental resources, and economic and demographic expansion the biological productivity of the land is limited. The technological progress that should produce, (as happened in many cases), an enlargement of the land's carrying capacity (in order to counter the above mentioned tendencies) failed to occur from a certain moment

on. The institutional organisation, the social structure, the cultural and traditional structures have become fundamental elements in the determination of possibilities for development.

Many studies both at the international and narrower territorial level have developed in recent years with the objective of characterising the potential for a policentric vision of development based on local diversities. The subsequent step in order to introduce the third "era" (indicated in the workshop overview) is tied to the integration of the social, anthropological, and economic sciences. The concept of endogenous development has been very clearly defined by J. Van der Ploeg and A. Long. This orientation starts off with the widespread conviction of the failure of the market in the face of the urgent problem of the growing gap between different countries, within single countries, among regions, among productive sectors, and among types of firms and families.

This integration of social and economic sciences in individual case analyses is proposed particularly in the paper presented by Valentina Mazzucato which calls for an ethno-economic approach. This distinguishes itself from the other F. S. R. studies, developed as a follow up to Schultz's work (1964), which are conducted with an economic viewpoint on "indigenous agriculture". In these studies the objective wasn't so much to identify these types of agriculture, as it was to study the needs and ways to make agriculture more economically efficient according to parameters of the western model. More recent studies on indigenous systems of economic organisation as a way to interpret sustainable development, (inspired by Hayami and Ruttan's orientation, 1985), have introduced the institutional and cultural variables into the analysis. In any case, more often than not, the variables are predefined and correspond to the experiences of market-oriented societies.

The proposed ethnoeconomic approach utilizes the tools of anthropology to understand how a certain society perceives economic phenomena and what its value system is with regard to cost-benefit, risk, interest, insurance, etc. The proposal to base economic analyses on variables that are identified with ethnological techniques, is not without difficulty as Mazzucato makes evident., both for their quantification, (dealing often with non-marketed variables), and for the comparability in space and time. However, I agree with the author that it's worth economists' energy to determine suitable models according to the cultures as well as the criteria of the different realities.

An interesting effort in this sense is that presented by N. Roling and J. Jiggins which calls for a change in viewpoint in considering the knowledge system. A knowledge system which is based on the epistemological principal that reality is socially constructed and thus dependent on the observer can be analysed according to multiple perspectives. A knowledge system and ecological information regard overall sustainability and thus consider the rural population to be part of the ecosystem. Therefore, the farmers' flow of information along with their real capacity to give right answers to environmental problems needs to be integrated with the institutions' knowledge, creating a sort of synergistic relationship of reciprocal improvement. In this case the institutions' role isn't to produce and transfer innovations, but rather to facilitate and motivate farmers' observations and experimentation (self discovery), both individually and collectively, in a training and learning process based on experience.

This concept seems to correspond to the one of technical progress of the endogenous development model, which doesn't mean a rejection of the external technological input, but on the contrary, an integration between the production of both institutional and local traditional

knowledge. An external technological input in the endogenous development process can be internalised if the knowledge system is such to permit the farmers' decoding of information and its reorganisation according to their own system of experience (Van der Ploeg 1992). In other words, the internalisation of information of external origin is the integration in the local culture system after the farmers themselves have translated it to their own language, have experienced it, and finally put it into practice locally in accordance with their own perspectives and interests. Thus endogenous development turns out to be a more dynamic and complex process compared to the endogenous growth models based on the "learning by doing" and the "learning by using" process.

The knowledge system in this type of development implies an interactive role of both the institutions and the social system along with its actors (in our case, the farmers); the objective function is no longer defined with only one quantitative parameter of economic growth, but becomes "development" as a multidimensional evolutionary process in techniques, production organisation, institutions, system quality, and its sustainability.

The concept of sustainability seems to be central to our entire talk. Numerous definitions which correspond to different disciplinary approaches can be attached to it. However, if it is examined with reference to the development process, I think it should be viewed as: environmental sustainability (natural resource conservation and intergenerational equity), economic sustainability (sufficient level of workers' income to guarantee the sustainability of production), and finally social sustainability (conservation of cultural values and local history). Sustainability and the various local systems' plurality of objectives allow for the possibility of different paths of development. Regarding these aspects Jeus Peter Hansen and Vagu Ostergaard have contributed to the identification of indicators of sustainability, and C. Kobrich and T. Rehman to applied multi-criteria analysis of sustainability (MCDM).

The sustainability indicators can be characterised starting from goals that "are resolved into a number of objectives, for which causing factors of the individual objective are chosen and divided until the last ones can be described as indicators"; they must: be quantifiable, have a scientific base, be representative of the system, and offer implications for political choices. The authors' example refers to ecological sustainability, but the method is also proposed for the evaluation of socio-economic sustainability whose identification of indicators with the above mentioned characteristics seems less obvious. A method for dealing with the complexity of sustainability objectives is proposed in Kobrick's and Rehman's paper in a case study of Compromise Programming ("supplemented by the use of some other commonly used MCDM methods such as Goal Programming and Multi-Objective Programming") in which the "micro-region" is taken on as the unit of analysis. The methodology is composed of three phases: the identification of representative farms for every relevant farming system, their aggregation into a micro-regional model, and finally its optimisation utilising the MCDM method (Multi-criteria Decision Making). In the illustrated case study, after having selected seven factors through the Factor Analysis and the Principal Components Analysis, these factors were clustered by using Ward's minimum variance as criterion. The methodology they utilised seems to have supplied satisfying results; but it would be interesting to have more information on the kinds of objectives and on the importance given to them by the farmers, for instance in the ideal solution identified in the Compromise Programming.

As a matter of fact, one of the crucial points is really the actors' role in the identification of objectives and in the elaboration and adoption of the techniques. How can the level of

participation be evaluated in the full sense, if there's only information from the outside which superimposes itself over the previous knowledge system and then proceeds to get lost as soon as the outside stimulus disappears? This problem is brought to light by both Barbera Adolph and M. Gafsi and J. Brossier with concrete experiences in water resource management in very differing environments. Adolph deals with a semi-arid region in India, whereas M. Gafsi and J. Brossier chose an area in France where agricultural and livestock farming are oriented to the goal of conservation of the quality of water which is used by a private mineral water company. These two situations and their objectives are very different. However, something they have in common is the agricultural community's problem of outside intervention. Actually this intervention, even though it aims to conserve environmental quality, shows fragility because it lacks real participation on the part of the farmers.

In many watershed management projects in India, when outside aid ceased, the farmers abandoned the water conservation structures created by the projects themselves. This happened because of a lack of involvement in not only the transmission of knowledge, but also and above all in the participation of decision-making. The results were better in situations where decision-making participation was achieved. From the methodological viewpoint the following are proposed as indicators of participation: the level of involvement in decision making (joint decision making), the evaluation of indigenous technologies, the involvement of all groups of the community, beneficiaries' contribution in currency, work, or kinds (goods), joint management of Common Property Resources, and adjusted time frame to the farmers, needs, and transference in the project objectives and strategies. The same analysis has been applied to numerous field projects. These are currently in progress in order to identify the impact of a project by taking on the farmers' perceptions of change and their observations as proxies. These are identified through participatory methods like RRA and PRA.

Also Gafsi's and Brossier's research poses (in a very different context) the problem of farmer-fueled projects using efficient techniques but of which are introduced and controlled externally. In this case the farmers accepted a contract with a mineral water company allowing for the company's control over the management of the resources (land, work, and investments), over production techniques (hay-making), and finally over objectives and activities. The farmers experienced an improvement economically speaking, but they lost their autonomy and thus risk creating a dependency which could make the system very fragile when the aid is cut off. In my opinion this situation is analogous to the one described by B. Benvenuti and J. D. van der Ploeg. They report on the danger of external conditioning experienced by Dutch farms. The conditioning was due to the system of development services and of co-operatives. Benvenuti and Van der Ploeg refer to this as T. A. T. E. (Technological Administrative Task Environment). A telling example of the need for integration among traditional knowledge, tools of interdisciplinary scientific research, and analysis of the socio-economic context is presented also by B. Hubert, Ch. Deverre and M. Meuret. According to them there have been numerous failures in the transferring of technology, the so-called "green revolutions". These have occurred in environments completely different from the ones (normally western countries) in which and for which these technologies were produced.

Currently a unique opportunity to adopt an interdisciplinary approach has presented itself in the sciences. The adoption of this approach for those countries and areas previously marginalised by "modernism" would bring about the possibility of new roles. As a matter of fact, the often quite unproductive "marginal" areas with extensive agriculture and pasture-

grazing livestock, now take on a new value as areas with high environmental and recreational value, rather than simply productive value. The research aims at directly involving the "social actors" (farmers, owners and decision makers) by taking into account: 1) the representations agents have of their environment and the reasons underlying their activities, 2) modelling of real-life processes, 3) the findings of experimental analytical studies.

Closely tied to this orientation is P. L. Osty's, S. Lardon's and P. Triboulet's paper on a biotechnical viewpoint in the dynamics of sheep farming in South Massif Central (France). "Is it realistic to rely on the long-lasting trends of agro-pastoral economics and culture" that enables "well-fitted management of pastoral resources" to ensure an adequate farmers' income and interesting landscapes? The study of the "life path" of every farm through time helps to "understand how farmers adjust their practices and their tools" to the continuously changing conditions. From an exclusively commodity-oriented viewpoint, hill sheep-farming has become more and more marginal. However, the environmental problems and a different social context enabled the elements of marginality to be transformed into the strong points of these systems: the biodiversity, the landscape, the possibility of producing products of high environmental content (high quality and absence of pollution). Thus the farmers have tried to modify the sheep-farming techniques (feeding, production, mating, kinds of enclosures... ) The diversification of the farmers' activities in order to deal with the new needs of land use (walking, gathering, sight-seeing.. ) can further contribute to characterising a modern role for agriculture.

In this case as well, the analysis of creativity, or in other words, of the culture of the "actors" can indicate a path of endogenous development that is specific to the area. An interdisciplinary and participatory research project is needed to be able to thoroughly understand the changes in progress. M. Lemon and R. Seaton are insistent in regard to this aspect. The natural and agricultural sciences have shown their inability to understand and manage the changes in farming systems by merely studying physical phenomena. Besides, the social sciences have until now avoided interacting with those of agronomy, thereby maintaining a merely theoretical level. It's only the interaction between the different disciplines that could "significantly contribute to the policy relevant diagnosis of agri-environmental issues through the representation of those issues as they are perceived at the local level". Analytical and conceptual devices and tools specific to social science can contribute to agricultural science in its ability to explain phenomena, understand problems, and identify solutions.

In particular the elicitation of those attributes and processes that help to define an issue or system of interest and the investigation of how these are configured to determine the range of options that are perceived by decision makers and the establishment of a typology of decision makers which can inform on the range of responses to those options and the thresholds at which decisions are made. These are the forms of the social sciences' contribution on which the authors based their field research in the region of Argolide. The environment's physical changes can't be studied while ignoring the fact that man is part of the ecosystem. C. Almeida, C. Gerforth, and A. Cristoreao have presented a study on the changing roles of forests and of agriculture in a region in Portugal. The evolution of the income potential for both agricultural and forestry activities together with the farmers' and small owners' perceptions of the activities' positive and negative aspects are decisive for the modification of forest care techniques and thus the conservation of the environment and landscape.

We can agree with W. Vos and A. Stortelder that the object of landscape ecology is "the study of those functional, structural and temporal properties of a landscape that make it a characteristic arrangement of ecosystems. Two aspects of landscape ecology are of special interest: the interdisciplinary approach in analysing the landscape and the emphasis on how ecosystems relate to each other". Currently, for example, also in Tuscany we have similar problems; there is a big preoccupation about the change of the rural environment and landscape which has been responsible for its fame throughout the world.

Change is inevitable because ecosystems are dynamic. They are formed on the basis of relationships among natural resources, social systems, institutional structures, and production techniques which are by now outdated. The important thing would be to succeed in understanding also what the other values of the landscape are, not only its aesthetic aspects. Only with an interdisciplinary approach can such values be understood and managed, and can constitute the base for sustainable development of local systems environmentally, socially and economically speaking.

But one of the problems I think should be central in our debate is how to ensure a real pluridisciplinarity in our research work. Has each of us to abandon his or her specialisation toward a holistic approach so that every one will integrate different disciplines in his or her training? Or as different specialists should we find a way to work together with many researchers by integrating our approaches? In other words pluridisciplinarity is a sum of specialists or a change of mentality to be realised by every researcher while keeping his or her specialisation? Maybe the answer is that if researchers work with an effective participatory method, they are forced to bring about this change of mentality, without sacrificing their respective specialisation.

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