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**ALTERNATIVE SCENARIOS
FOR STRATEGIC PLANNING
IN EMBRAPA**

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STRATEGIC PLANNING IN EMBRAPA**

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1. INTRODUCTION

EMBRAPA, a research institution founded in 1972 and implanted beginning in 1973, has as its mission the promotion and execution of scientific and technological development necessary for resolving the problems of agriculture, forestry and agroindustry for the benefit of Brazilian society, observing the principles governing the rational use of resources and of the environment.

The fulfillment of this mission requires the execution of activities of an eminently continuous nature of long maturation. On the average, it takes 7 years between the initiation of a research project and the adoption of its results by farmers. Thus, the technology adopted today is a reflection of decisions made in the past. In the same way, foreseeing future situations, and consequent technological requirements, are indispensable ingredients for the Directorate of the Enterprise and its researchers to make efficient and effective decisions.

The importance is thus evident that EMBRAPA dispose of a planning system which allows it to carry out its mission and which imparts a social sense to its existence, through the efficient allocation of the scarce resources available. Thus, planning has been among the concerns of the Enterprise since its founding and, for the same reasons, has been constantly improved.

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In a historical perspective, the institutional and organizational transformations through which EMBRAPA has passed during recent years are a reflection of its efforts to adapt to the modifications which have place in the social, political taken and economic life of the country.

EMBRAPA's first planning system was created immediately after its founding in 1974. Based on a dynamic business-oriented structure, the main idea of the system was to define an administrative model for public research capable of providing quick answers to government objectives by seeking to adopt the agricultural sector to scientific knowledge and technology compatible with the necessities of modernization of the Brazilian rural area.

In 1979, this existing system was substituted by a new set of norms, procedures and orientations for the planning of agricultural research. This planning system attempted to adjust the previous system to the new situation to provide a greater decentralization of decisions concerning research planning. It was concluded that research units already had qualified personnel with sufficient experience and maturity to exercise greater power of decision in technical-scientific and administrative matters.

It was agreed upon to attribute to this system a circular model of research programming in which the multidisciplinary teams in the Decentralized Units would be free to make decisions on the spot, in accordance with the basic principle that "research should begin and end with the rural producer".

Beginning in 1987, an attempt was made to incorporate into the planning process the observation and analysis of the rapid transformations which occurred in society in recent years. The First Planning Directorate of EMBRAPA (PDE), organized in that year, made possible the establishment of research policies, defining their priorities for a 5-year period (1988/92).

This initial attempt to implant strategic planning in EMBRAPA arose because of the necessity of improving its prospective vision, adjusting in to the intense rhytm of change in modern society. In view of the failure of traditional previsions, based only on the extrapolation of historical data, it was necessary to rethink the supposition that considered long-term planning as the exclusive result of the projection of past events. EMBRAPA became aware that external factors and random facts, which have a decisive influence in changing the course of events, cannot always be predicted and translated in quantitative terms.

In this way, the definition of objective, directive and strategic actions of an enterprise require of planning an explicit treatment of uncertainty and the recognition of the unpredictability of the direction of the socioeconomic, political and technological changes in the future. In this sense, strategic planning depends on a clear identification of future states based on potential tendencies and events. This allows characterizing a set of business policies compatible with these different alternative states and elaborating strategies for current action, adjusted to future restrictions and opportunities.

Starting from this perspective, the improvement of the process of planning in EMBRAPA began to incorporate into the strategic approach the use of the technique of scenarios for the construction of future alternatives, enlarging the task of analyzing the external environment in which it is inserted. In addition, the task of constructing scenarios becomes an instrument for organizational communication and of modeling of the future still to be built.

In this document which consists of a synthesis of the original study, EMBRAPA (1990), the principal conceptual and methodological aspects which involve the elaboration of alternative scenarios, as a strategic planning instrument, and application exercise in the case of EMBRAPA. Such exercise resulted from the effort expended by a multidisciplinary and interdepartmental group of researchers of EMBRAPA under the coordination of the Secretariat for Strategic Administration (SEA) and with the aid of a consultant, the FIA-USP, during the first semester of 1990.

2. CONCEPTUAL AND METHODOLOGICAL ASPECTS

2.1. Antecedents

The technique of scenarios in planning was formalized by the Rand Corporation in strategic studies on international geopolitics, in the 1950's and 1960's. Herman Kahn defines scenarios as "sequences of hypothetical events constructed for the purpose of directing attention to random processes and points of decisions". (Kahn & Weiner, 1969).

The technique involves constructing future hypothetical alternatives which portray the mutual influences of economic, social, political, cultural and technological factors in the external environment relevant to the performance of an organization. In a manner similar to scenic art in the theater, the scenario portrays secondary events, profile conditions and even background figures who characterize and condition events and principal actors. When adapted to organizations, business or strategic planning, the scenario is equal to the external environment, or to that set of factors over which the organization exercises no control but which affect it. The external environment or scenario is confronted with the internal environment, consisting of controllable factors. The purpose of this exercise is the systematic identification of potential events and factors in the external environment which affect the organization, for which it must prepare itself, even though the chance of their occurring is slight.

There is no intention of making predictions of the future which have high probability expectations. The simulation of a series of evolutions beginning at the present time and going up to the appropriate future, represents the possibilities of occurrence of events and critical tendencies for which the organization should prepare itself through changes in its objectives, directives and strategies. Along this line of thought, Norse considers that "scenarios" are not and should not be considered as predictions. They merely represent a manner of

increasing the understanding of long-term potential and political events on the regional and national levels.

The time horizon of the scenarios is determined by the planning period. In the case of EMBRAPA, it has been determined that the innovation period, from the initiation of research projects until the adoption of the technologies is normally 7 years. The planning period, however, was calculated to be 10 years, which was the time horizon of the scenarios.

A distinction must be made between the planning period for the definition of objectives, and the planning period of the strategies. There are four critical factors in planning: the context (or external environment), objectives and directives, strategies or actions of the organization and the resources needed for the strategies (figure 1). Planning contemplates the definition of objectives and strategies in function of the context, by the process of definition of normative policies so as to cause the organization to be equal to the opportunities, challenges and problems of its external environment, considering the values and priorities. The future time span for anticipation of this context is determined by the response time of the actions in realizing the objectives.

These actions, however, are dependent on human, financial, and technical resources, in addition to others, which the organization obtains from its context. In EMBRAPA's case, the budgetary process is the critical factor in obtaining resources. In this process, the time horizon for planning is less than 4 years, due to the characteristics of federal public administration in which perennial investment programming in the best of circumstances, is merely indicative. In fact, the time horizon is annual or even shorter, depending on budgets and disbursements of the federal government.

As a consequence of these conditions, there are two distinct planning processes. Long-term planning involves the prospective analysis of EMBRAPA's external environment, with a time span of a decade, resulting in the definition of long-term objectives and directives. Operational planning involves obtaining financial resources from the government annually and their utilization in research programs and projects which constitute the operational actions of EMBRAPA in the short-term.

The challenge confronting the strategic planning process is to reconcile long-term objectives with short-term operational actions and resources by identifying action strategies with medium-term strategies with a normal duration of 4 to 5 years. Successfully meeting this challenge of reconciling long-term objectives with resources that vary in the short-term largely determines the viability, the efficiency and the effectiveness of organizations.

The utilization of scenarios is fundamental in strategic planning. Compared with traditional planning, strategic planning considers the long-term, emphasizing structures rather than variables; makes complexity more explicit; has a multidisciplinary, speculative and analytical approach and recognizes the existence of alternative scenarios (Table 1).

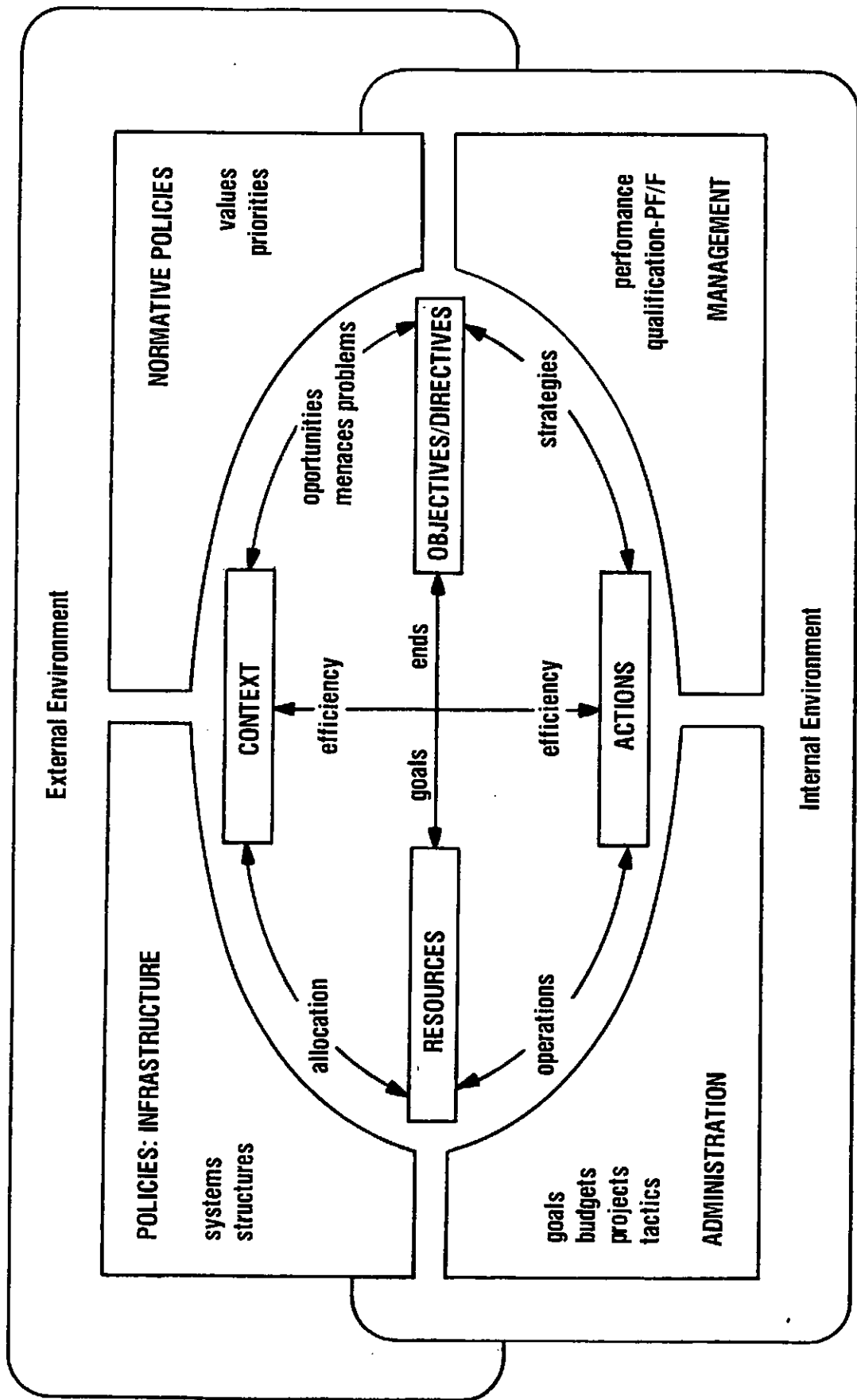


Figure 1. Planning factors

Table 1. Comparison between traditional and strategic planning

Characteristics	Planning	
	Traditional	Strategic
Time span	Short	Long
Intuition	Simplification	Explore the complexity
Focus	Use of variables	Use of structures
Approach	Discipline	Interdisciplinary
Premises	Stability	Turbulence & discontinuity
Nature	Deterministic	Indicative
Type	Quantitative data	Quantitative & qualitative
Prevision	Single scenario	Alternative scenarios

Source: Adopted from Johnson (1985)

According to Schnaars (1987), the use of scenarios is different from other forecasting technique in two respects. First, scenarios offer a more qualitative and contextual description as to how the present will evolve into the future. Second, scenarios attempt to identify a series of possible futures, having a logical chance of occurring, but not with complete certainty. It is thus assumed that the future does not consist of mathematical manipulations of the past, but of the confluences of forces from the past and of the future which should be better understood and analyzed.

The use of this technique spread in the 1970's, increasing more in the 1980's. A survey by Linnerman & Klein (1983) showed that 22% of the industrial firms listed in "Fortune 1000" were using this analysis technique by 1977 and, in 1981, this percentage reached 50%. This increasing popularity resulted from the successful experience of Shell in predicting the oil embargo of 1973 by means of the scenarios technique, which provided Shell with a competitive advantage over its competitors through its opportunity to anticipate events. (Wack, 1985).

With the diffusion of the use of scenarios, the methods used have also been improved. Huss & Honton (1987) divide these methods into 3 categories: intuitive logic analysis; trend impact analysis; and cross impact analysis.

The first - intuitive logic - used by Shell, assumes that business decisions are based on a complex set of relationships between socioeconomic, economic, political and technological factors which should be analyzed intuitively. It is the analysis of the factors of the environment external to the enterprise, of a quantitative and qualitative nature, which contribute to perfecting strategies, evaluating risks and anticipating key moments for change. The scenarios thus constructed are plausible descriptions of the course the future will take, based on different possibilities. This was the method which came closest to that employed by EMBRAPA.

The second - trend impact - combines more traditional techniques, whose inclusion allows a more profound analysis. Explicitly identifying trend impact factors, an attempt is made to establish independent forecasts for each relevant variable, adjusted to the occurrence of these impact factors. This method is more appropriate for evaluating basic decisions, or predicting the evolution of a quantitative variable with an available historical series, having been initially used by the "Future Group" to predict sales of therapeutic products to fight cancer (Gordon et al. 1974).

The third - cross impact - is based on the belief in the existence of interrelationships of future events and in the results obtained by the Delphi Technique, introduced by Dalkar & Helmer (1963). According to Wright (1985), this technique consists in the application of researchers for the purpose of obtaining an interactive questionnaire among consensual forecasts on future events. The cross impact incorporates this information from specialists in the analysis of the occurrence of an event, in the case of the occurrence of others (Duval et al, 1975). This data feeds simulation and mathematical programs for the purpose of constructing scenarios hierarchized according to the probability of their occurrence. Among the subtle methods used to define this matrix of factor interrelationships, INTERAX, developed by the University of Southern California (The Center for Future Research, 1983) and BASICS, developed by the Battelle Memorial Institute (Honton et al. 1985) stand out.

2.2. Stages

In accordance with the method utilized by the group in charge of the construction of alternatives for agricultural research for EMBRAPA, the 7 stages which orient them is given below:

1^o) Identification of the external environment or ecosystem

Following the methodological stages of the scenario technique, it is necessary to initially identify the external environment or ecosystem in which the institution is situated. This environment consists of its users, the community itself, educational and research institutions, suppliers of materials and equipment, the government and other agents which influence the institution and are influenced by it.

This environment is basically dynamic and therefore causes solutions taken from past experiences to become useless in resolving current problems. This identification and analysis of the ecosystem provides a notion of what is possible, of what is subject to modification and of what is desirable for an institution.

2^o) Identification of factors critical for the future of EMBRAPA

Once the ecosystem in which the institution is situated has been defined, factors which are most directly associated with the ecosystem and influence every decision of the enterprise are identified. Factors of a context relevant to planning include

sociocultural (social values, life style, demographic profile, etc.), socioeconomic aspects (structure, cycles and economic conjuncture, etc.), sociopolitical and institutional aspects (social organization, etc).

To facilitate this identification, the "brain-writing" technique may be used. This technique consists of compiling individually the factors related to each basic question. Each work sheet circulates between the other participants who add other factors to those previously listed, so as to permit a cross-fertilization of ideas.

Subsequently, the most relevant factors in the judgement of the group involved are taken from among those listed, attempting to keep a reduced number of factors in view of the difficulty in manipulating a very large volume of information.

Later, the causal relationships between the relevant factors selected are determined, considering the intensity, duration and velocity of action of each factor on the enterprise. In a subsequent phase such casual relationships are arranged in a hierarchical ranking, using for this a specific program of Analysis of Model Structure (IMS). The result of this exercise is the construction of a "tree" of interrelationships of relevant factors, which allows the schematic visualization of these interrelationships, facilitating their understanding and interpretation on the internal and external levels.

3°) Analysis of critical factors and determination of future alternative states

This stage corresponds to the task of collecting information to identify emerging forces which act upon the variations in critical factors. The data relative to this analysis should contain the following aspects:

a) Identification and description of the factor and its antecedents; b) establishment of the motivating and restricting forces, judged relevant in the future; c) determination of alternative possibilities of evolution of the factor in the future; d) determination of the interaction and interdependence of the factor with others; e) making explicit the implications of the factor for the institution in term of opportunities, hazards, premises and conditioning factors.

4°) Structuring and consistency analysis and formation of the matrix of scenarios

By the inductive process, the states of the future evolution of the factors are analyzed in regard to their consistency in forming a double entry matrix, where relevant factors are grouped in alternative scenarios. The purpose of this matrix is to synthesize the results of the analysis of relevant factors, forming a framework upon which the scenarios will be developed. By matrix analysis, themes of each one are identified.

5°) Elaboration and revision of alternative scenarios

This is the critical stage of the process since it requires a high degree of creativity to adequately develop the

elements, by the double matrix entry, in a consistent and plausible manner. It is usually argued that the choice of the number of scenarios depends on their specific application and on the objectives of the analysis. Some consider three scenarios as the ideal number: two tend to be classified as "good" and "bad" and four would be difficult to handle. Other authors believe that three scenarios favor the tendency to consider that intermediate scenario as the most plausible, possibly restricting the definition of analysis alternatives. In the case of EMBRAPA, a choice was made for the construction of four scenarios to permit more adequately representing the anticipation of the possibilities of evolution of the factors selected in the future, enriching the information base.

The idea that scenarios are possibilities not probabilities is the most accepted since the judging of probability estimates are subject to bias. Besides this, the basic supposition in the scenarios technique consists precisely in the impossibility of predicting the future with exactness in view of the intense rhythm of change in modern society.

A revision of the style of depicting scenarios is necessary to critically analyze the scenarios developed, avoiding internal inconsistencies and verifying their relevance and credibility. This analysis makes possible the clear formulation of coherent premises, corresponding to each scenario which was implicit during the evolutive course of the scenarios elaborated.

6^o) Establishment of conditioning and determining factors

Departing from this verification, it becomes possible to amplify the vision of the external environment of the institution, allowing the establishment of premises, conditioning and determining factors common to alternative scenarios which are appropriate to the horizon of the strategic plan of the Enterprise.

7^o) General objectives

At this stage the general objectives which the Enterprise should follow are defined, arising from the consolidation of the premises common to the scenarios, so as to orient the actions of the Enterprise in the fulfillment of its institutional mission, by confrontation with the possible evolution of the external environment. Using the same methodology adopted in the ranking of relevant factors, an analysis is next made of the objectives selected, thereby constructing a network of casual relationships among these which can also be represented graphically in the form of a "tree".

3. APPLICATION TO THE CASE OF EMBRAPA

3.1. Stages

In the case of EMBRAPA, following the steps previously described, the multidisciplinary group of researchers characterized the ecosystem of action of the Enterprise, by means of the mapping of the inter-organizational relationships, of the

interface with other governmental departments and with society and of the qualification of the principle interest groups affected by the activities which it carries out. These interrelations are shown in the insertion matrix of the Enterprise in its external environment as represented in Figure 2.

Having defined the ecosystem in which EMBRAPA is located, the group in charge listed 120 possible factors, by use of the "brain-writing" technique. Of these, 31 factors judged to be most important were selected. In a second round, 9 of these factors, considered of greatest relevance, alone or in conjunction with similar ones, were finally selected. In this process, "primary factors of production" were added, in view of their fundamental role in agricultural research, in the judgment of the group. The ten factors selected were as follow:

- a) necessity of fund raising through the sale of technology;
- b) competition for public resources among economic and social areas;
- c) a greater participation of society in the establishment of research objectives and in their supervision;
- d) a new technological model in the technology/society relationship;
- e) emphasis on environmental conservation;
- f) increasing privatization of technological development in agriculture;
- h) changes in the demand for food profile;
- i) primary factors of production;
- j) greater independence of state research systems; and
- k) pressure to regulate intellectual propriety.

In the following state, the assembled group determined the causal relationships between these ten factors, considering their effects on EMBRAPA's performance. These causal relationships were ranked hierarchically and the result of the exercise allowed the construction of a "tree" representing intervals between the above-mentioned factors, shown graphically in Figure 3.

The analysis of relevant factors involved the task of collecting information needed to identify the possible variations in each one of these ten factors, as well as conditioning factors which effect their evolution. The group of technicians divided into sub-groups in order to elaborate position papers corresponding to each of the factors, including the aspects stressed in 2.2 of item 3^o. These position papers have been published in their entirety in EMBRAPA (1990).

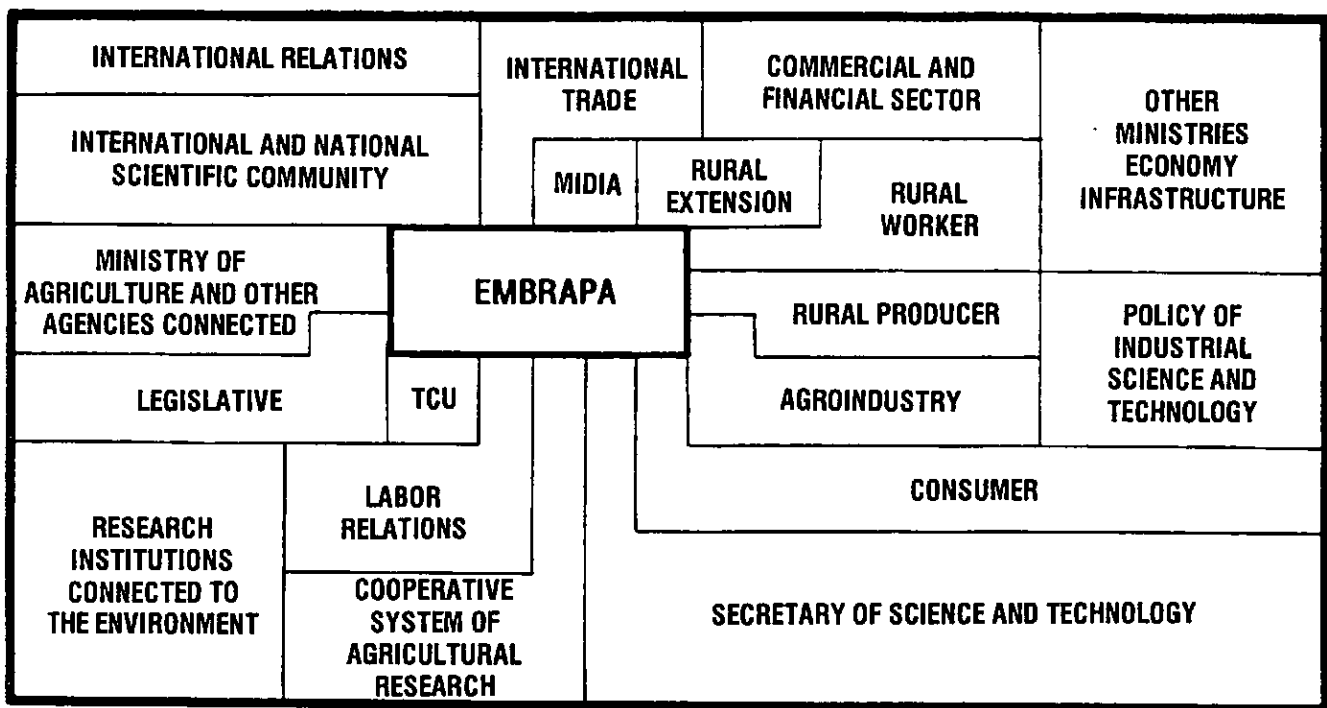


Figure 2 . Insertion matrix of EMBRAPA in its ecosystem

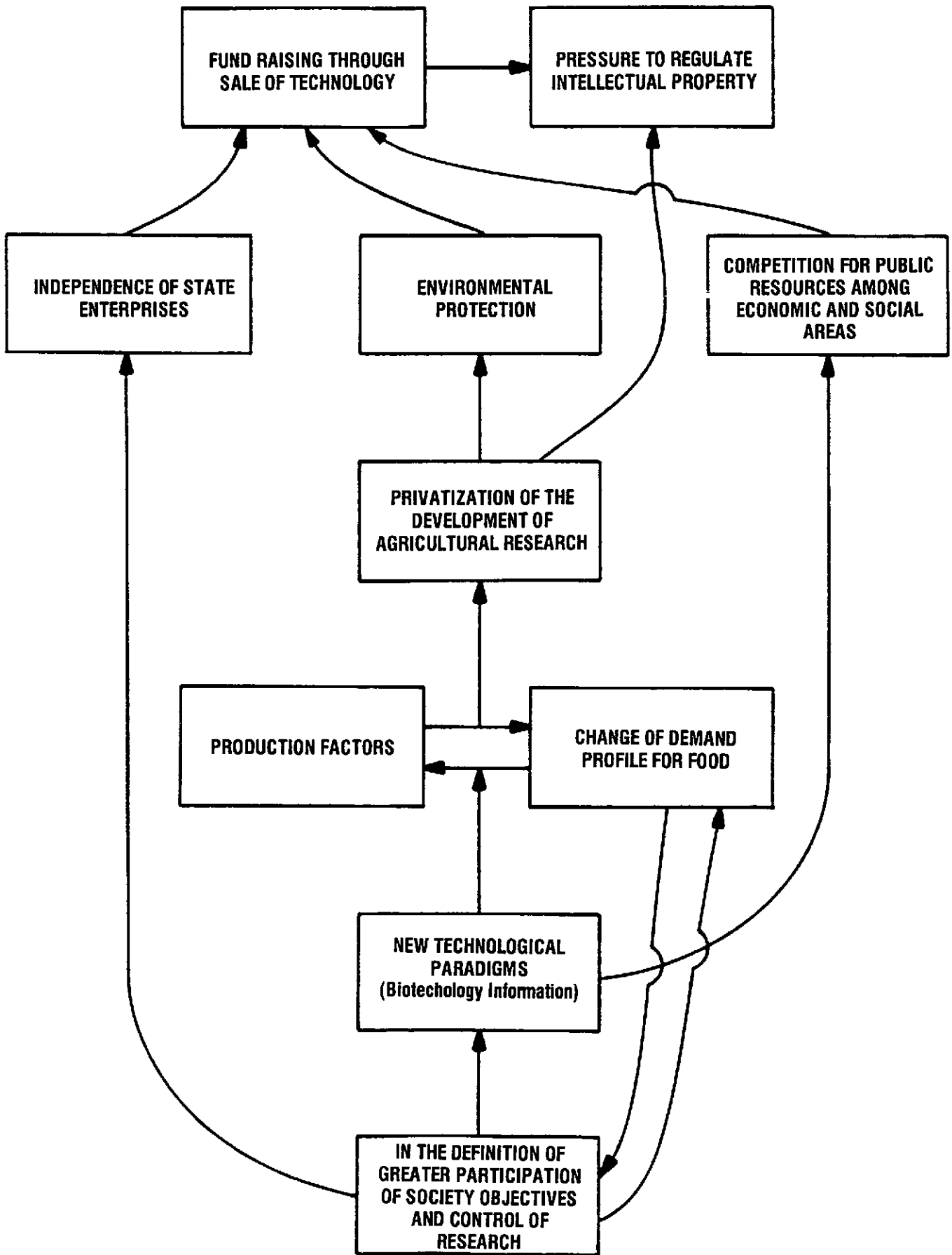


Figure 3. Trends for the decade of the 1990's

3.1. Alternative Scenarios

On the basis of the double entry matrix of themes versus factors, the following were elaborated: a common scenario and four alternative scenarios, with each scenario being analyzed and criticized by the group as a whole, especially in relation to its consistency, plausibility and importance.

Considering the difficulties involved in making previsions of the goals which will orient agricultural research activity in Brazil, alternative scenarios delineated the possibilities of the future evolution of factors and parameters of utmost importance for the action of EMBRAPA without, however, representing previsions. The theme chosen to represent these scenarios were "compensatory pseudo-liberal", "self-sustaining economic and social development", "the preservationist social democracy" and "the modernizing liberal". The description of these are to be found in detail in the document EMBRAPA (1990).

It is possible that different aspects of each scenario will predominate in any given region at different times in the future. Each scenario sought to present in a plausible and consistent manner, the principal lines of the future context which, when they occur, will certainly determine or condition the possibilities, the decisions and the institutional policies of EMBRAPA.

The purpose of the scenarios was to enrich the proposition and deliberation of general directives and the objectives of EMBRAPA in executing its social function of agricultural research. The four scenarios contemplate the results of national development, oriented either by economic rationality, by self-sustaining development or by satisfying the basic necessities of the population. The scenarios are described by an observer in the year 2010, portraying the reality of that future epoch and remembering the events, trends and values which lead to this new reality.

For the planning and repositioning of EMBRAPA in its context, the use of alternative scenarios emphasizes the uncertainty inherent in processes of social and economic change. The analysis of the uncertainties of the context made explicit the premises and the identification of external determining and conditioning factors, fundamental to the fixation of directives and objectives sufficiently robust to confront the transformation of the external environment and assure the realization of the mission and of the social functions of EMBRAPA.

In addition to contributing to the definition of the institutional directives and objectives, the scenarios sought to orient the technological planning of the various national centers and programs of EMBRAPA and of the Cooperative System of Agricultural Research (SCPA).

Conceived in a moment of political and institutional transition, the alternatives are opportune as an instrument to provoke profound reflection on the destinies of the nation, thus contributing to a superior institutional adjustment of EMBRAPA in the short and long term.

3.2 Premises and implications

Departing from the premises related in each of the four alternative scenarios, the implications and premises common to all were established, which will be the basis for the general objectives of EMBRAPA, which are:

1°) In view of the change in EMBRAPA's political support base, the importance of agricultural technology must be shown in a complex political-institutional situation. Thus, to assure the necessary financial support for the research activities of this Enterprise, a great effort must be made to convince the government and representatives of a pluralistic urban society, by showing the importance of generating technology for agriculture and the agroindustry, and its interrelations with national development.

2°) To Expedite the transfer of technologies and establish and meet priorities, EMBRAPA must forge new links with universities, state agricultural research systems, rural extension, producers of agricultural inputs and equipment, the rural producer and his formal organizations (cooperatives, unions, etc), agroindustry and the consumer.

3°) It presents a great challenge to EMBRAPA to integrate the new scientific and technological paradigms (biotechnology, information systems, new materials) to traditional techniques for the development of technologies for the producer.

4°) The evolution of ecological knowledge and the mobilization of society in defense of the environment has resulted in changed sociopolitical priorities and of science and technology for agriculture, which require of EMBRAPA an expanded capacity to resolve ecological problems and in redefining the priorities and parameters in its research program to meet these demands.

5°) The planning of EMBRAPA's activities should be reinforced by an analysis of the future necessities and opportunities of the agricultural sector, because of the instabilities and indefinitions of agricultural policy.

6°) EMBRAPA should have the ability to defend the widest interests of Brazilian society, in view of the tendency towards privatizing of technology by large multinational companies, especially in the field of advanced biotechnology, having in mind that this tendency can, on the one hand, create opportunities for development, and on the other hand, threaten to create a dependency on external technology;

7°) The political weight of the rural sector will continue to decline, with implications for the allocation of public resources devoted to agricultural modernization, rural credit rural and agricultural technology;

8°) The low cultural and educational level of the rural population (producers and workers) will regulate the rate of modernization of the agriculture sector;

9°) The awareness and organization of consumers in defending their rights is growing, in view of the sanitary problems of agricultural production and of the quality of its products;

10°) The modernization of agriculture implies the substitution of primary factors, land and labor, by capital and technology;

11°), The diversification of agricultural production to satisfy export demands, the concentration of wealth in the country, the less favored classes and agroindustries make much more complex the technological development process since each segment has factors conditioning its price/quality/market mechanisms;

12°) The persistence of the monodisciplinary model in education is reproduced in science and technology in general and in EMBRAPA in particular, making difficult the solution of technological problems of agriculture, which are eminently multidisciplinary;

13°) Political and social tendencies toward an administrative decentralization have implications for the organizational model of EMBRAPA and its administrative philosophy;

14°) The pronounced regional differences which include agricultural ecosystems ranging from temperate, humid and semi-arid climates, require different technological solutions;

15°) Technology is a necessary element but not sufficient by itself to promote an increase in agricultural production and an improvement in the quality of its products so as to satisfy the requirements of internal demand.

3.3. General Objectives

3.3.1. Definition and hierarchization of the objectives

Having described the alternative scenarios in which EMBRAPA should be inserted and having defined the premises and implications for planning, the elements essential to the establishment of the general objectives of the Enterprise take shape.

The sum of the general objectives are found in Figure 4 and represent the proposals of the top administration of EMBRAPA for the 90's, which taken as a whole define the strategic positioning of the organization in view of its past evolution and the challenge and uncertainties of the coming decade.

The purpose of these objectives is to describe the performance at the end of the century, summing up its aspirations in order to adapt them to the possible transformations in the external context. These objectives should guide the performance of all the technical and administrative employees of the Enterprise, in their priorities and efforts in the years to come.

3.3.2. Making the objectives explicit

Objectives

As clearly shown in Figure 4, at the apex of the structure, the mission of EMBRAPA, which represents its social purpose, is made explicit. This principal objectives, specific to the nature of its activities (generate and promote knowledge and technology), its applications (sustainable development of the agrobusiness complex), and the beneficiary (society). This mission brings a change of focus: in the past, the agriculture sector was the only beneficiary; now the mission has been broadened to include all of society, in such a way as to permit the economic and social development of the nation, through activities related to the agrobusiness.

These objectives support and better define this mission. Object 1, **"Increase the production and efficiency of the agrobusiness complex"** reflects exactly the economic dimension of the mission in which science and technology are destined to the expansion and increase in efficiency of the agrobusiness production system. Object 2, **"Contribute towards resolving the social and environmental problems characteristic of the agrobusiness complex"**, makes explicit the social dimension of the research mission, which seeks to contribute to solving social problems, such as the reduction of hunger and mal nutrition, the technological preparation of the small rural producer, environmental protection, etc. Complementing these two objectives, **"adequate the quality and characteristic of the products of the agrobusiness complex to the demands of intermediate and final consumers"**, adds the product quality dimension, an important aspect in the principal markets of the sector: food and agroindustry. The objectives represent the fruits of this "tree" of objectives.

Lines of Action

The mission and the set of objectives defined depend on the lines of action, i.e., the principal types of technological activities developed by EMBRAPA, representing, on the "tree" of objectives, its branches and crown. The following are related to the objectives, **4: Generate technology for agroindustrial products and processes; 5: Generate technology for basic food products; 6: Adapt technologies developed in other countries; 7: Promote and facilitate the transfer and marketing of scientific and technological information.**

In the process of technological innovation, EMBRAPA's role is to generate, adapt and divulge technology and contribute to the solution of social problems, serving producers and agroindustry simultaneously.

These objectives represent an enlargement of EMBRAPA's action. These changes indicate a recognition of the agricultural sector, in which the agroindustry has a growing importance and the interface with international commerce also shows a tendency to increase. With the extinction of EMBRATER and the transfer of part of its functions to EMBRAPA, the responsibility of research increases in order to adjust to these tendencies and conditions of the context, expanding its general lines of action.

Basic Objective

The lines of action, in turn, find their support in objective 9: "**Promote a qualitative leap forward in research**", which appears as a critical element: the point of convergence of all the objectives of the structure. This qualitative leap forward of EMBRAPA involves a renovation of the research methodology, incorporating the advances in scientific knowledge which provide new tools for research and establishing a higher level of efficiency and effectiveness for all areas and research units of EMBRAPA.

The quality leap forward occurs at a crucial moment for the Enterprise. EMBRAPA is facing a transition between a past marked by great technical successes, enjoying an almost unlimited political and financial support by the federal government, and an uncertain future in respect to this support. This transition is characterized by a lack of financial resources, by profound changes in its philosophy and in the role of the public sector. The qualitative leap forward is EMBRAPA's strategic response to these challenges which include profound international transformations.

The elements of this transformation are the advances in science and technology which must be incorporated into agricultural research. Among them are the following:

- a) modern biotechnology with its new methods of manipulation at the biological, cellular and organism levels, complements and reinforces traditional biological techniques, concentrating its efforts on processes designed to increase productivity and quality;
- b) information science and microelectronics enhance the efficiency and analytical power of research;
- c) the incorporation of knowledge of ecology, of environmental protection and of environmental impacts reduce the pressure on available natural resources;
- d) the multidisciplinary and interdisciplinary character of research allows mobilizing and coordinating all the knowledge needed for the solution of problems of the sector;
- e) the adaptation of technology necessarily takes into consideration the parameters of the ecosystem and natural resources of the diverse regions of the country;
- f) the understanding of socioeconomy contributes towards adapting the technological results of research to systems of production.

In synthesis, the qualitative leap forward is the trunk which provides form and resistance to the "tree" of objectives.

4. FINAL CONSIDERATIONS

The task of constructing scenarios had as its principal objective to analyze the possibilities of evolution of future alternatives, departing from the dynamic of the mutual influences

of the relevant variables of the external environment, in which EMBRAPA is situated.

The scenarios, as a tool for strategic planning, are of vital importance in aiding and orienting the decision-making process, especially for research institutions such as EMBRAPA, whose technology-generating processes are characteristically of long maturity. In view of the accelerated rhythm of social, economic, scientific and technological transformations which exist at the world and national levels, significantly effecting the survival of institutions, making indispensable the monitoring of these tendencies through the exploitation of the opportunities offered by the external environment.

This analysis becomes even more important in complex institutions such as EMBRAPA, since the advance of science and technology frontiers occurs at a very rapid rate.

The impacts of the use of scenarios in the context of strategic planning in EMBRAPA are occurring at distinct levels and aspects of the organizational and institutional structure of the Enterprise. The following stand out as relevant:

- 1) providing assistance to the planning system of the Enterprise as a whole and for defining the long-term mission, objectives and directives for agricultural research;
- 2) permitting an efficient orientation of the process of allocation of financial, and human resources;
- 3) permitting questioning planning premises;
- 4) favoring the enlargement of the scope of action of the Enterprise, emphasizing the study of the principal problems and identification of the technological demands of the agrobusiness industrial complex as a whole and not only of the segment made up of rural producer;
- 5) providing a greater awareness of the opportunities and challenges which effect, directly or indirectly, the performance of the Enterprise, resulting from changes in the external context;
- 6) providing elements of reference for the technological planning of the Decentralized Units of the Enterprise, in such a manner as to maintain the necessary uniformity and cohesion of the agricultural research system;
- 7) making possible the elaboration and the implementation of a strategic plan of action of the enterprise, in strict harmony with the Decentralized Units;
- 8) amplifying the awareness of the need for a greater integration of the enterprise with society to which the results of research are destined;
- 9) developing a strategic posture in view of the permanent necessity of monitoring of the external environment, relevant for the Enterprise and its Decentralized Units.

In addition, the main results from the development of the work of scenarios can be emphasized:

- 1) publication of a document containing a description of the methodology of elaboration of the scenarios and its application in the case of EMBRAPA, making possible the divulgation of the principal results both on the internal and external levels of the Enterprise;
- 2) support of a greater decentralization of decisions on all levels, leading the enterprise as a whole to rethink its institutional mission and its organizational and functional structure;
- 3) qualification of groups of researchers and administrators of the enterprise in methodologies and techniques of strategic planning;
- 4) integration of interdisciplinary teams, carrying out in greater depth the principle of participation and greater involvement in the objectives and results of the organization.

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