DESUSMO
A Holistic Approach for the Management of Natural Resources under Subtropical Conditions.

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1. ABSTRACT

The international and multidisciplinary research project „Development of Sustainable Farming Systems on Mountainous, Low Fertility Grazing Land in South America“ (DESUSMO), which was started in 1994, linked several European and South American institutions. The main objective of the project was the development of farming systems which are economically viable, socially acceptable and environmentally sound. One objective of the mainly EU financed DESUSMO-project was to find means to combat the pollution of soil, air and water resources in the rural environment as well as to explore a farmer accepted soil conservation strategy. Another goal was the identification of economic and social constrains for sustainable farming. The project concentrated on the development of the Mata Atlantica region in Brazil.

Keywords: Farming systems, Sustainability, Mata Atlântica, Brazil,

2. INTRODUCTION

In order to combat the continuously progressive land degradation in the highlands of South America, the international and multidisciplinary research project "Development of Sustainable Farming Systems on Mountainous, Low Fertility Grazing Land in South America", has been carried out between 1994 and 1998. It linked institutions from Germany and Spain with various institutions from Brazil, Bolivia and Chile (Prinz et al. 1998). The project activities were concentrated on two locations in the Mata Atlântica Region of Brazil, Paty do Alferes (Rio de Janeiro State) and on Afonso Claudio (Espirito Santo State). The main study area,

Paty do Alferes, is situated around 120 km north-west of the city of Rio de Janeiro.

Before the advent of European settlers in Brazil in the 16th century, the **Mata Atlântica rainforest** stretched from about 8° southern latitude in NE Brazil to about 28° southern latitude in Uruguay. This forest extended inland from the coast about 100 kilometres in the north, widening to more than 500 km in the south. Altogether, the forest covered about 1 million km². Nowadays approx. 70 % of the Brazilian

population live in this area and the big metropolitan areas like Rio de Janeiro and São Paulo lie within the subtropical part of the Mata Atlântica. Only approx. 6 % of the “original” Mata Atlântica have not yet been eliminated by human activities.

2. PROBLEM ANALYSIS

After deforestation and their use for the production of sugarcane and coffee, the lands had lost much of its soil cover and fertility. Their present use as low input - low output pastures contrasts with the need to supply the nearby “Mega-Cities“ with food and fibre. In some mountainous locations, unregulated ley farming systems with horticultural or other commercial crops grown for 1-3 years on pasture land have developed.

Inappropriate cropping techniques result in enormous soil losses and other environmental problems. Fig. 1 shows the main problems resulting from the existing land management.

The present farming systems reflect the socio-economic situation of the farmers (large land owners – share croppers) as well as the mentality of the people of the region (fig. 2).

3. OBJECTIVES

In the context of “Sustainable Development”, as expressed in the Agenda 21 of the ‘United Nation’s Conference for Environment and Development’ in Rio de Janeiro in June 1992, the DESUSMO project, aiming at "**Development of Sustainable Farming Systems on Mountainous, Low Fertility Grazing Land in South America**” searched for ways to develop and to implement sustainable farming systems which are **economically viable, socially acceptable and environmentally sound** (Prinz et al., 1998).

One significant goal was to increase the supply of uncontaminated agricultural produce to the urban markets while at the same time environmental pollution can be halted, soil erosion be diminished and forest remnants be protected. Furthermore special attention was given to improve the socio-economic situation of the rural population in order to guarantee the long-term influence of the proposed measures.

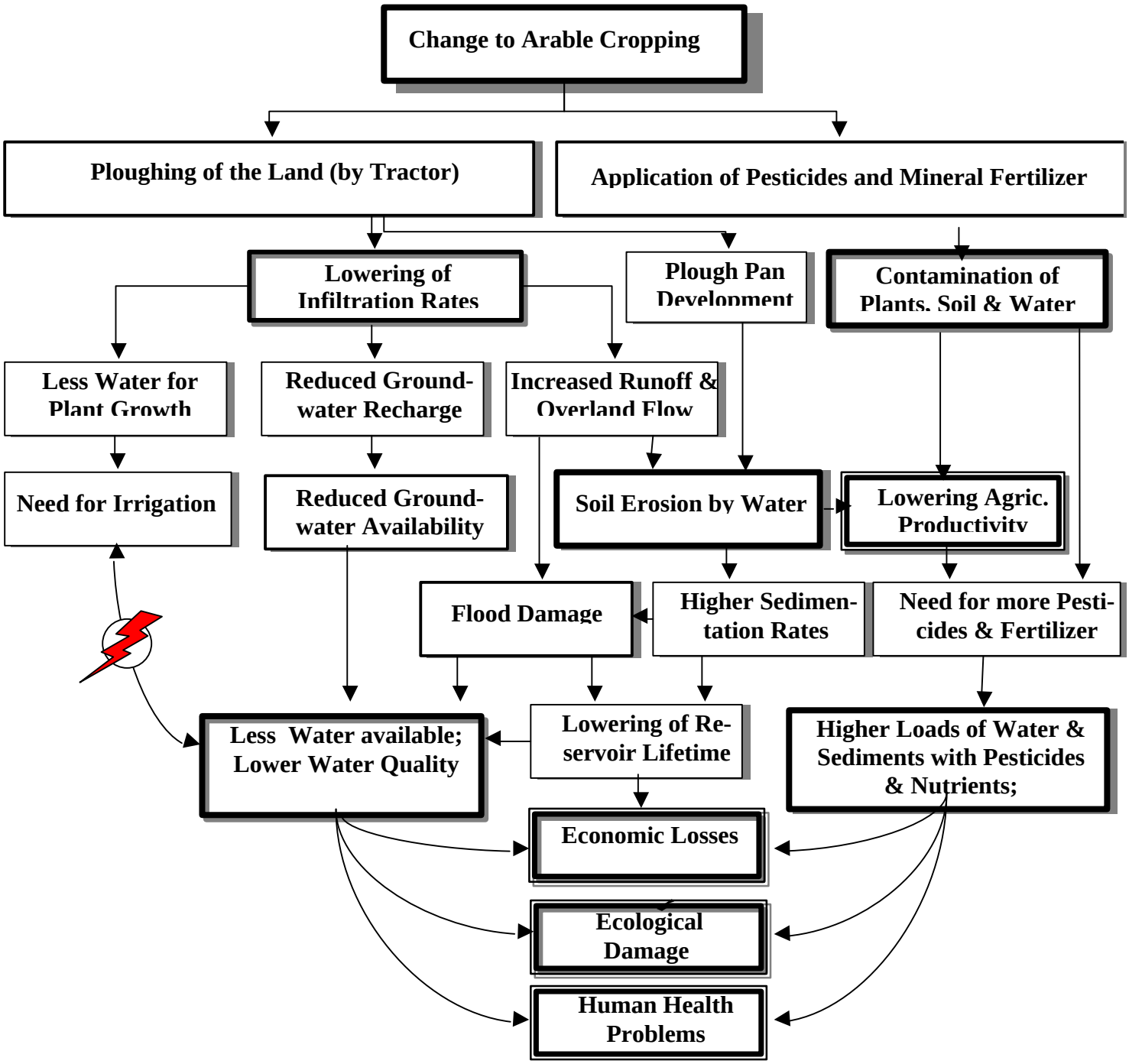


Figure 1 Problem analysis of the DESUSMO project area

In order to achieve the overall goals of the project, the following objectives had been identified:

- Identification of biophysical, socio-economic and policy variables associated with **resource degradation**/enhancement.
- Identification of economic, social and organisational **constraints** for the development of sustainable farming systems.
- Development of production methods which need considerably **less agrochemicals** without reduction in financial terms. Elaboration of proposals to control the use of agrochemicals and to combat agricultural weeds. Measurable decrease of the chemical contamination of soils and water.
- Development and installation of **soil conservation methods**, which diminish soil erosion losses, simultaneously increase the agricultural output and improve the food supply.
- Improvement of **irrigation methods** which reduce water losses and avoid soil erosion.
- Development of appropriate **agroforestry systems** in order to improve forest protection.
- Pointing out of possibilities to protect the environment by **laws and regulations** (e.g. related to the use of agrochemicals, allocation of water etc.) on community and governmental level.
- Increasing substantially the co-operation and exchange of knowledge/experience between European and Latin American scientists and as well as training of students.
- **Decrease of the use of agrochemicals** by developing alternative production methods as well as solutions for the agrochemical waste disposal and
- Production **of food which is not contaminated** by chemical residues and therefore will not harm the health of the consumers.

The research questions/hypotheses were given as follows:

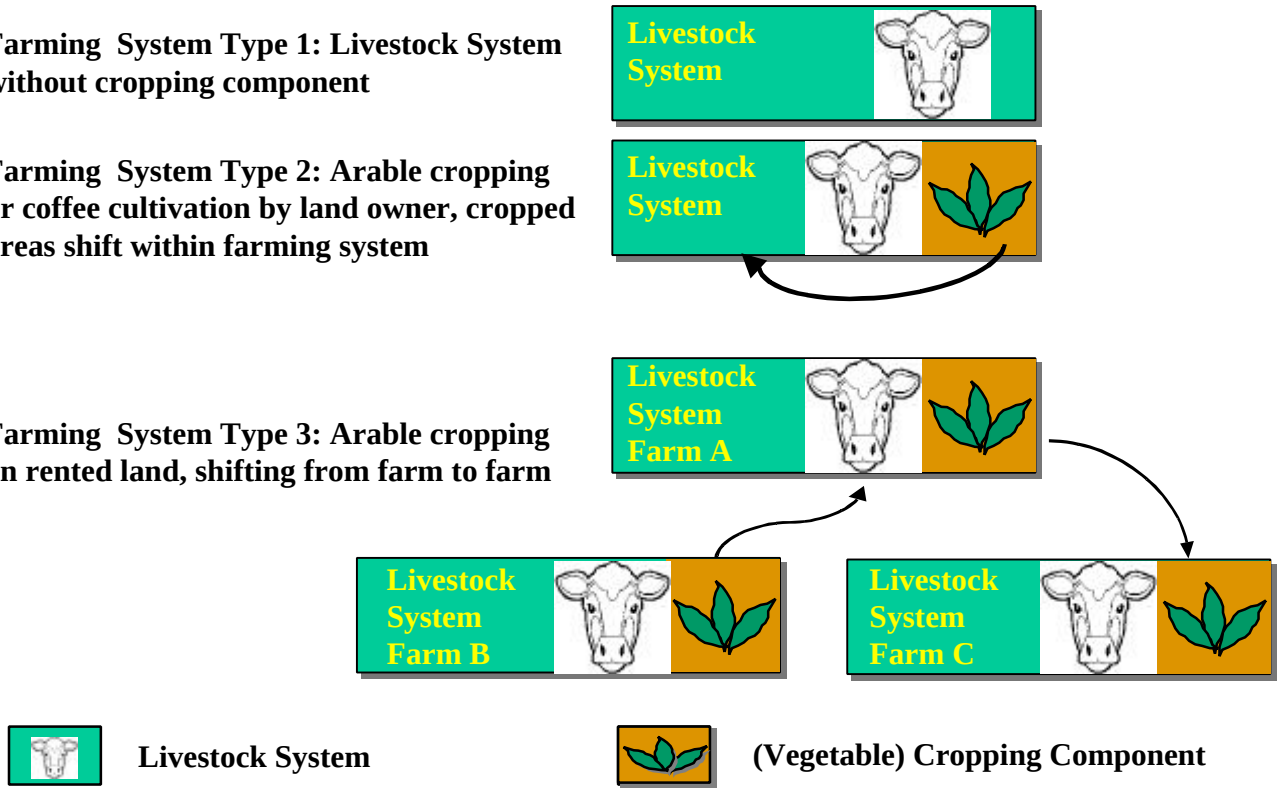
(1) Sustainable farming systems can be developed which are economically viable, socially acceptable and environmentally sound .
(2) Agricultural intensification can be achieved in harmony with forest protection..

FARMING SYSTEMS TYPES IN SOUTH AMERICAN HIGHLANDS

Farming System Type 1: Livestock System without cropping component

Farming System Type 2: Arable cropping or coffee cultivation by land owner, cropped areas shift within farming system

Farming System Type 3: Arable cropping on rented land, shifting from farm to farm



4. METHODOLOGY

When evaluating a farming system, or when introducing new techniques, a number of sustainability criteria can be applied (Reijntjes et al., 1992). Agriculture to be sustainable should be:

- Ecologically sound
- Economically viable
- Socially just
- Humane
- Adaptable.

In order to achieve the above mentioned objectives and goals a holistic and interdisciplinary approach was applied, taking into account the complexity of the

system and the diversity of influencing factors (fig. 3). Special emphasis was given to:

- Socio-economic and biophysical factors, which have been regarded to be of equal importance.
- The farming systems have been seen as part of the local community, the region and the nation. The target groups` objectives, combined with the objectives of the nation and/or the society determined research and extension.
- The past and future dynamics of the farming systems.
- Farmer's participation in on-station, on-farm and in household research as well as in extension activities has been regarded as essential for the success of the project (Prinz, 1998).

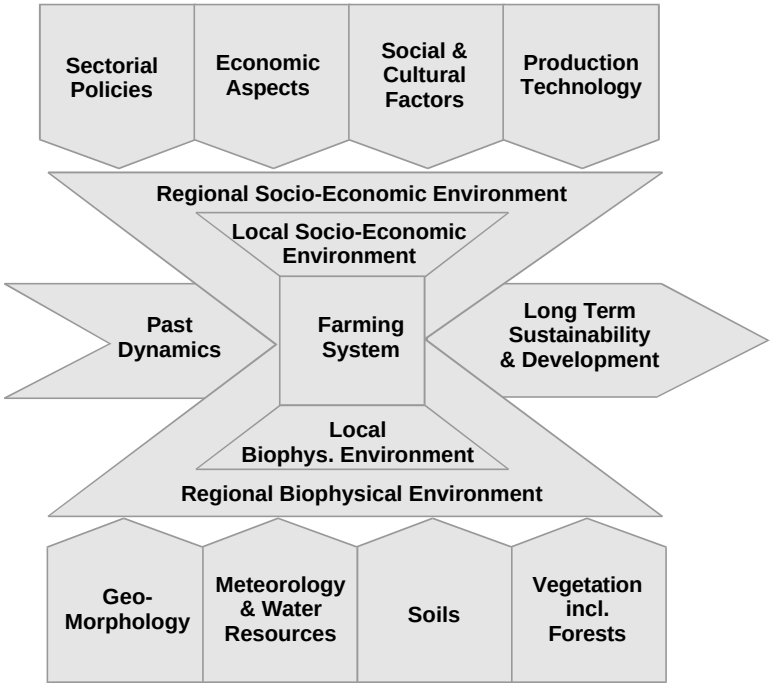


Fig. 3 The DESUSMO holistic approach (Source: Prinz, 1998)

5. RESULTS

The project achieved the testing and implementation of (hopefully) sustainable cropping and pasture systems for the Mata Atlântica Region. It could clearly be shown, that already the introduction of slight changes in the common cropping systems alleviated the pressure on the environment significantly (Prinz et al., 1998).

The main findings of the project can briefly be summarised as follows:

Environment

- Production methods have been developed, which need considerably less agrochemicals (pesticides, fertilisers) without reduction in financial terms and therefore contribute to the sustainable protection of the water resources. The chemical contamination of farmers, agricultural products, soils and water has been analysed and recommendations for the reduction of the use of agrochemicals elaborated.
- Soil conservation methods have been found, which diminish soil erosion to the tolerable soil loss limits without reducing production efficiency. Already through simple and cheap methods like contour cropping with “fanyu juu” elements, slightly graded furrows to evacuate excess water, plowing the fields with oxen and minimum tillage, soil erosion can be diminished by almost 80 % in comparison to traditional cultivation techniques.
- Recuperation of degraded pasture by using appropriate fodder plant species has been successful.
- Agroforestry trials, integrating numerous tree species into different pasture set-ups, showed a good soil stabilisation, better infiltration rates, the incorporation of organic matter through biological activities and a better availability of nutrients.

Socio-Economics

- The profits of the farmers involved in the programme could be increased by using improved production systems and by cultivation of perennial fruits and a greater variety of crops (crop diversification).
- As larger quantities of unpolluted fruits and vegetables of a greater variety were produced, the consumers could be supplied with healthier produce.
- The consciousness of farmers, farmers organisations, local politicians, etc. to adopt sustainable farming systems in order to protect the natural resources and to safe their basis of livelihood was raised.

6. DISSEMINATION

The dissemination of results consisted of

- Organisation of courses, seminars, lectures, field-days meetings and debates on alternative technologies, sustainable development and environmental problems;

- Elaboration of articles in newspapers and magazines about management and conservation of natural resources;
- Dissemination to the municipal community on the objectives, action lines, goals, ongoing activities and of the results obtained by the DESUSMO project;
- Production of scientific and technical reports for the scientific community and extension technicians.
- Organisation of the SATHLA Conference ("International Conference on Sustainable Agriculture in Tropical and Subtropical Highlands with Special Reference to Latin America"), Rio de Janeiro, RJ, Brazil at the end of the project period.

7. DISCUSSION

It was considered essential to include the local farmers into the whole process of developing sustainable farming techniques. After an initial cautiousness, some farmers were co-operative in making their land available for the set up of the experimental plots and helped with some of the data collection (sediment and Runoff quantities and readings from the hydro-meteorological station). In general, the readiness of the farmers to cooperate remained rather limited, not the least, as some of the proposed measures (e.g. the change from up-hill tractor ploughing to contour ploughing by oxen) were regarded as " a step backward" in modernisation of agriculture.

8. BIBLIOGRAPHY

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