

GLOBAL FORUM ON AGRICULTURAL RESEARCH

Summary Form for the presentation of research partnership case studies

A - SINTESIS

1. Title - Soil conservationist management systems on small farms of Santa Catarina State, Brazil

2. Duration - From June 1991 on to 1998, laterly, extended till June 1999.

3. Objectives

- ?? Minimize the erosion, the superficial runoff and the soil degradation, through the growth of soil cover crops and adoption of soil conservationist management systems with minimum or any soil plowing.
- ?? To adapt and/or to develop, with technicians and farmers participation, soil conservationist management systems adapted to the soil climate and social-economic conditions of the state.

4. Activities

- 4.1. Agricultural Research generation and difusion of technology; technicians and farmers training, cover crops seed production.

4.2. Rural extension and technical assistance: technical assistance and individual or groupal visits to small farmers; technical and motivational trips; training and courses; machine and equipment purchasing projects; seminars about zero tillage; growing of zero tillage demonstrative areas; soil cover crops and seeds production on demonstrative areas; and professional courses of soil conservation/zero tillage to small farmers.

4.3. PROSOLO - projects and economic motivation for machines and equipments purchasing.

5. Information about the authors

5.1. Agricultural Engineer Leandro do Prado Wildner, M.Sc. Agronomy, Epagri/CPMP, P.O. Box 791, Servidão Ferdinando Tusset, 89801-970, Chapecó, Santa Catarina State, Brazil, phone (49) 323 4877, fax (49) 323 0600, e-mail: lpwild@epagri.rct-sc.br.

5.2. Agricultural Engineer Waldemar H. de Freitas, M.Sc. Soil Science, Epagri/Sede Administrativa, Rodovia Admar Gonzaga, 1347, Itacorubi, 88034-901, Florianópolis, Santa Catarina State, Brazil, phone (48) 239 5500, fax (48) 239 5597, e-mail: algado@epagri.rct-sc.br.

5.3. Agricultural Engineer Milton da Veiga, M.Sc. Soil Science, Epagri/EECN, BR 282, km 342, P.O. Box 116, 89620-000, Campos Novos, Santa Catarina State, Brazil, phone (49) 541 0472, fax (49) 541 0777, e-mail: milveiga@epagri.rct-sc.br.

6. Brief description of case study

The generation and diffusion of technology and technical assistance for the adoption of soil conservationist management systems on small farms of Santa Catarina, Brazil, realized during seven years, was successful because the correct identification of the technical strategy, the institutional integration involving governmental and private organizations, and for the participative work between farmers and technicians.

7. Thematic area

Natural resources management and agroecology

8. Region

Latin America and Caribbean

B - STAKE HOLDERS

1. Beneficiaries of the results

Farmers - 81,000 families of farmers living in 534 microcatchments, distributed in 206 municipalities from the State (70% from the total of Santa Catarina municipalities) corresponding to an area of 1,8 million of hectares (which 600 thousands grown with annual crops), equivalent to 25% from the tillable lands of Santa Catarina State.

Technicians - took part directly of this project as researchers and rural extensionists, 250 professionals at Santa Catarina State Secretary of Agriculture and Rural Development and more 1220 professionals from the Municipal Mayorities.

Catarinense Society - from indirect form, all the society (4,975,082 of inhabitants) was beneficial to bigger grain and vegetable production and better food quality, less pollution of water manantials, staying of agricultor on the field production and smaller public expenses to resolve the problems that came from the effects of the soil erosion and environmental degradation

2. Partners of the project/programm

Santa Catarina State Government; State Secretary of Agriculture and Rural Development; Agricultural Research and Rural Extension Company of Santa Catarina State; Trade Union of Tobacco Industries of Santa Catarina State; SINDIFUMO; Cooperative Organization of Santa Catarina State - OCESC; Municipalities Mayorities.

3. Financial Support and Project Budget

The development of soil conservationist management was only possible thanks to the **Recuperation, conservation and management of natural resources in hidrografic microcatchments project**, well known as Project MICROCATCHMENTS/BIRD, executated with the Santa Catarina Government resources (US\$ 38,6 million) and the World Bank (US\$ 33,0 million).

The Microcatchments Project was divided in components, witch budgets are discriminated bellow:

1. Agricultural research..... US\$ 5,20 million
2. Rural Extension and Technical Assistance..... US\$ 17,41 million

3. PROSOLO - Motivation program to the soil and

water management and pollution control..... US\$ 8,91 million

4. Training..... US\$ 3,34 million

Other components of the MICROCATCHMENTS/BIRD Project do not mean to this project theme.

C - RESULTS AND PROJECT IMPACTS

Rural Extension and Technical Assistance: In the period of 8 years of the project duration 103,212 small farmers were attended; 8,138 motivational meetings, were realized with 151,930 participants; 1,809 technical and motivational trips with 31,772 participants were taken; 4,609 training courses for small farmers with 63,311 participants were given and also 120 training courses for 1,594 technicians participants. Individual projects were realized to purchase 1,213 soil cover crops seeds tons; 1,393 no tillage animal-drawn planters; 44 no tillage planter tractor power; 266 solid waste distributors and 561 chisel plowing (Colective projects for purchasing which are discriminated on item farmers organization); 60,649 ha grown with green manures and cover crops (GMCC); 197,676 ha with minimum tillage; 302,644 ha with zero tillage; 421,000 ha with organic fertilizer (swine and poultry waste); and distributed 18,538 t of GMCC.

Agricultural research: Realized 60 experimental trials with soil conservationist management systems, green manuring/soil cover crops; organic fertilizer (animal

wastes) and development of agricultural machines and equipments. Built a Seeds Improvement Unit for the production and improvement of GMCC seeds.

Implanted and re-equip a Soil Analysis Laboratory. Production of 203 t of basic seeds of green manure/cover crops.

Adoption by the farmers: In 1994, starting the Project, Santa Catarina grown 124,000 ha with soil conservationist management systems (minimum tillage and zero tillage) representing 6.6% from the area with annual crops on the State. In 1997, the area arrived to 685,000 ha representing 36.6% from the area with annual crops (5.5 times more, in only 3 years). In 1999, were registered 880,000 ha in all the State, considering the worked areas and not worked by the microcatchment project.

While the crop areas in zero tillage in Brazil grew the rate to almost 20% per year on the three last agricultural years, in Santa Catarina on the period 93/94 to 98/99 happened a growing in almost 48% per year. The total area of zero tillage in Santa Catarina represent around 60% from the total area of crops in the State while in Brazil this index is about 1/3.

Farmers organization: Formation of 7,761 groups of farmers mainly for purchasing and using of machine and equipments, with the application of US\$ 7,0 million, improving more than 30 thousand farmers.

Around all the project area in state, were bought, by farmers groups, 420 lime distributors, 863 chisel plow, 731 animal liquid waste distributors, 325 knife-rollers, 1,126 no tillage planter mechanical traction, 1,234 no tillage animal-drawn planter, 459 kit of minimum/zero tillage and 894 sprayers of mechanical traction.

The groups organization, besides causing a big impact for the acquisition of the machines, it had also strong influence in cooperative actions of pollution control.

The group formation and the cooperative actions in the communities, has motivated, each time more, the spirit of colectivity, searching solutions for the common problems and alternatives of families.

Results and economic impacts

The adoption of conservationists systems contributes for the growing of agricultural productivity of mainly culture in the project area: maize, of 2,549 kg/ha, in 1991, passed to 3,750 kg/ha in 1999 (increase of 47%), soybean, of 1,489 kg/ha in 1991, to 2,726 kg/ha, in 1999 (increasing of 83%) wheat, of 1,166 kg/ha in 1991, to 2,125 kg/ha in 1999 (increasing of 82%); the onion of 5,719 kg/ha in 1991, to 10,548 kg/ha in 1999 (increasing of 84%); common bean of 979 kg/ha in 1991, to 893 kg/ha in 1999 (increasing of -9%); and the tobacco, of 2004, in 1991, to 1,366 kg/ha, in 1999 (-32%).

The maintenance of the farm income, even the negative influence of extern facts (macroeconomic agriculture politics and globalization of economy) that promoted failures in relation to agricultural activities changes. The income rough average of the farmer passed from US\$ 25,029 (1991), to US\$ 24,399 (1995) and US\$ 25,613 (1998) while the production cost medium was around US\$ 11,406 (1991) to US\$ 10,664 (1995) and US\$ 13,319 (1998).

A comparative study between the zero tillage (ZT) and the conventional tillage (CT) determined bigger economic return net operational side to the ZT of maize (mechanic and animal traction), soybean (mechanic traction), common beans (animal traction) and onion (microtractor), being around 58% for the onion ZT microtractor till 164% for maize ZT animal traction. The mechanical services (tractor-hour or animal

day) were reduced between 19% (maize mechanic traction) and 66% (maize animal traction) with zero tillage. The level of economy of human labor in relation on CT was between 16% (for onion) and 59% (for common bean).

Machines Industries

With the evolution of soil conservationist management systems one new industrial activity developed aiming the development and adaptation of machines and equipments for these systems.

Blacksmiths and small country contractors in several regions of the state, developed an industrial park, composed, actually, by 55 enterprises that had their activities turned dynamic and with reflections on economy and on generation of new jobs.

The industry dedicated to the soil conservationist managements systems invoices, actually, around US\$ 4,0 million per year and generate more than 200 jobs directly.

Soil conservationist management systems for main crops

Santa Catarina State, through the own rural extension service was a pioneer on the viabilization and difusion of the maize minimum tillage on small farms, using green manures/winter cover crops, since the middle of the 80's.

The zero tillage of soybean maize and common bean was difused in the State from the experiences the limit states Rio Grande do Sul (to the south) and Paraná (to the north).

The onion and vegetables zero tillage and was also a pioneer work of catarinenses technicians and farmers who are being divulged to another Brazilian states and countries.

Farmers evaluation

By the farmers opinion, the zero tillage possibiled the ampliation of the tilled area because the liberation of human labor and disposal of machines and equipments (54%); other farmers kept the tilled area stable (33%) but they took advantage from the leisureliness of the machines and human labor in another activities; others yet, reduced the tilled area (13%) because the growth of the productivity possibiled the abandonment of no recommended areas for annual crops and the restitution of areas leased by third persons.

By the farmers evaluation the zero tillage in comparison with the conventional tillage has bigger facility of weed control; crops management facility; machines and equipments operating facility; and time in order the soil may stand in adequated conditions for planting after starting a water stress period.

The ADVANTAGES of the zero tillage may be said: bigger erosion control; reduction of the production cost; to smaller human labor use; improvement of the soil quality; the productivity increase; and a bigger time flexibility.

And the DISADVANTAGES: increase of pests incidence; smaller agricultural machines and equipments adaptation; bigger use of pesticides; and smaller seed germination on humid periods.

Environmental monitoring

The microcatchment of Lajeado São José water monitoring, water captation area for the city of Chapecó, indicated the decrease of 28g/m³ of Al₂(SO₄)₃, in 1991/92 to 15g/m³, in 1996, in average, for the water treatment, reducing around R\$ 1,800.00 on the treatment of about 675,000m³ water a month. In this exact period there was a reducing of 21% on the sediments total losses and a decrease of 68% on the coliforms total concentration (NMP/100ml) in the water.

The water turbidity in this place, in 10 years, passed from 130 units (1988) to 50 units (1997), representing a decrease of 61%; the total sediments losses passed from 6.0 t/ha/year in 1988/89 to 5.0 t/ha/year, in 1997, representing a reduction of 16.6%. Considering the average of nutrients (N, P, K, Ca and Mg) on the collected sediments in 1988, there was a fertilizer losses of equivalent to US\$ 40.00/ha/year and with the decrease of sediment losses from 6.0 to 5.0/t/year the nutrient losses decreased to US\$ 31.6/ha/year.

Besides the Lajeado São José microcatchment in Chapecó, other 14 microcatchments are being monitoring in several regions in the State.

D - PARTNERSHIP

WORLD BANK - during the project, there was always the worry of observing, of being together, of guiding and directing the works and activities developed, the recommendations and advertisements were also very clear and objective as well the forward proceedings and solutions for the detected problems. The World Bank had a detached performance in the periods of: a) Project preparation: definition of objectives of the components to reach the general project objective; and on the establishment of

technical strategies of the project components and the own project. b) The project supervision: effective performance in order to resolve administrative and technical problems; guiding to look for a better participation from the farmers on the project actions.

SANTA CATARINA STATE AGRICULTURE AND RURAL DEVELOPMENT SECRETARY - defined as one of its priority projects on the agriculture area and gave the necessary support in order Epagri could develop the work all around the State. A group was exclusively amounted (Executive Secretary) for administrating, monitoring and evaluation of the project.

In each of the components were defined the principal executor and the other participants/cooperatives, the basic activities to be developed and the respective resources.

Epagri - amounted, at first, a special structure to technical coordination and financial management as a necessary basis for the good proceeding of the works on the field. For each component was indicated on state coordinator (Sectorial manager). Around the several regions of Epagri administration, on the country part of the state, were indicated the Regional Managers for the coordination and guiding of the works on the several small cities which take part of each region. And, in the selected cities, the extensionists passed to be an exclusive dedication on the project. Epagri defined the project as one of its work priorities, putting all its structure to the disposal for the realization of all programmed activities. About the agricultural research, the majority of the specialists researchers in use, management and soil conservation, seeds production and vegetal production passed to be part of this project.

MUNICIPAL MAYORS - They gave total support to realize all the initial activities of planning and, subsequently the implantation and conduction of the works on the

selected microcatchments. As there were not Epagri technicians in some of the cities belonged to the project, the municipal mayors signed an agreement with the Executive Secretary for contracting exclusive technicians in order to work on the project. Many Mayors gave priority to the project all around the city and not only on the selected microcatchment area.

SINDIFUMO - They gave total support to the project, putting the soil conservationist management works as one of the priorities of their actions together the tobacco producers. They took a decisive part on the marketing of the project through all the communication means and publishing printed and audio-visual materials about soil conservation management.

OCESC - The agricultural cooperatives gave the initial cooperation, in special, on the motivation periods for the producers and the diagnostics of the microcatchments. According to the technical structure and institutional objectives, cooperatives had different performances and compromises as the project. Some cooperatives gave priority to the soil conservation management in special to the zero tillage, and created their own projects for the zero tillage diffusion mainly to their cooperators who were not inside this action area of the project already working on.

The project used a participative work methodology where the placed actors (farmers) took part on the planning, execution and evaluation of the process of adaptation and improvement of the soil conservationist management systems.

This process of planning happened to the level of microcatchments, considering the global actions of the environment (topography, land use, roads and ways), and of the farms with plan based on the improvements of the production system.

The way of involving and assessor was groupal to motivate the farmers organization.

The work included the followed periods: 1 - promotion of the project for municipal liderance; 2 - farmers sensibilization; 3 - physique conservationist and social-economics diagnostic; 4 - the priorization of the problems; 5 - the participative plan elaboration of natural resources with the elaboration of the projects; 6 - the execution of projects; 7 - the evaluation of the projects; and, 8 - the supporting of the plan by the farmers.

E - CONCLUSIONS

The correct definition and technical strategy application was fundamental to reach the project objectives.

The institutional integration and effective participation of farmers were imprescindible factors to the project success.

The technical knowledgment taken to the technicians and farmers through the seminars, trainings, meetings, technical trips and field demonstrations were fundamentals to the adoption of soil conservationist management systems.

The insertion of the soil conservationist management systems inside a bigger project (Microcatchment Project) was a well succeeded strategy to amplify the farmers vision in relation to the recuperation and conservation of the natural resources.

The financial incentives were essential to promote the adoption of the soil conservationist management systems.

The soil conservationist management systems are not the end but a way to reach a sustainble management, be possible to give the possibility for the implantation of organic production systems.

The institutional cooperation and integration, even with the end of the project, will not only go on but also will increase because the obtained results which showed so very positive points and negative points that must be reevaluated and worked again; there is a possibility to look for new ways and new projects. A special effort will be offered to the farmers who have not adopted any kind of soil conservationist management system or maybe are on the way of adopting it.

A new project with World Bank is being dealing with the Government of Santa Catarina State that will turn possible the work together poor farmers (with lower income).

The analysis about the expansion of area with the soil conservationist management systems offers us the evidence of the demonstrative effect that the project reached to take to the beneficiaries and the support of these systems along the years.

Micro-watershed management and zero-tillage in Santa Catarina, Brazil, is more than just a technology and a technical approach. It is a social movement that impacts positively on the relationships between man and the natural resources he depends on his livelihood (BASSI, 1999).

The technical productive, social, economic and environmental adequation of zero tillage may check sustainability on the context of the future agroecosystems and being this the embryo of the really true green revolution to be operated on the field (Toresan, 1999).