



ISTRO-INFO EXTRA

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TILLAGE RESEARCH CONDUCTED BY ISTRO MEMBER — *Rolf Derpsch*

Since 1968, I have been working in Latin America on different research projects related to the development of sustainable agricultural systems in tropical environments. Since 1988, I have been working in Paraguay, where we are researching and developing the no-tillage system for mechanized, medium-sized farms as well as for non-mechanized, small-scale farms where the farmers only work with their hands or use animal traction. The main goal of our work is to reduce erosion and organic matter depletion, thus preventing degradation of the fragile sandy and red clay soils in this area. Adoption of no-tillage on mechanized farms has increased from 20,000 ha in 1992 to almost 500,000 ha in 1998. Most of this is permanent no-tillage. On small farms, no-tillage has been adopted by 1500 farmers, covering roughly 4,500 ha. Some of these farmers use no-tillage only for selected crops.

We are trying to bring back into production extremely degraded soils in eastern Paraguay that have been used for 300 to 400 years. On these soils, organic matter is less than 1%, in some places it is as low as 0.2%. Average maize yield is 600 kg/ha. Fertilizing maize and using hybrids, which are interseeded with green manure cover crops (*Cajanus cajan* L) have produced between 4 to 5 tons of grain yield with more than 10 tons of plant residues (dry matter) per hectare. It is

believed that returning this amount of dry matter to the soil during 2-3 years, can improve the productivity of these soils with medium input technology in 3 years.

Experience has shown, that in order to achieve a truly sustainable agriculture, a complete shift of paradigms for agricultural production has to take place from soil degrading to soil building production systems. Below is a short article entitled “New Paradigms in Agricultural Production,” printed here in order to make this experience available to an international audience.

“New Paradigms in Agricultural Production” by *Rolf Derpsch*

Traditional soil cultivation systems in the tropics and subtropics, with intensive soil tillage, will end in soil degradation and loss of crop productivity. This will result in poverty, exodus of farmers from rural areas, resulting in an increase of city slums and marginal populations, and finally in social conflicts. If we are to offer the farm family a chance to survive on the farm and if sustainable agriculture is to be achieved, then the paradigms of soil use and management must be changed and new farming practices must be implemented. In this article, the old and new paradigms are presented and the consequences of these two forms of soil management are analyzed.

✧ Old Paradigms ✧

Soil tillage is necessary to produce a crop:

- Bury of plant residues with tillage implements
- Bare soil for weeks & months
- Soil heating because of direct solar radiation
- Burning crop residues allowed
- Strong emphasis placed on soil chemical processes
- Chemical pest control, first option
- Green manure cover crops & crop rotations are options
- Soil erosion is accepted as an unavoidable process associated to farming on sloping land

Consequences of soil preparation and bare soil:

- Wind and water erosion are unavoidable
- Reduced water infiltration into the soil
- Less available soil moisture
- Unavoidable reduction in the soil organic matter content; thus reduction of soil quality
- Soil carbon is lost as carbon dioxide into the atmosphere contributing to global warming
- Soil degradation (chemical, physical & biological)
- Reduction of crop productivity
- Higher use of fertilisers and higher costs of production
- Survival of the farm family on the farm threatened (lower yields, production without profitability, insufficient monetary income)
- Poverty, rural exodus, increase of slums and marginal populations as well as social conflicts in cities

Off-farm effects of soil erosion:

- Sedimentation of rivers, reservoirs, & micro-catchments
- Reduction in water quality

- Reduce capacity of hydroelectric power plants
- Sedimentation of roads
- General higher cost for the government & for society due to off farm effects of soil erosion

Result:

- Sustainable land use is not possible (ecologically, socially, & economically)
- Soil resource exploitation

✧ New Paradigms ✧

Tillage is not necessary for crop production:

- Crop residues remain on the soil surface as mulch
- Permanent soil cover
- Reduced soil temperatures
- Burning mulch prohibited
- Emphasis on soil biological processes
- Biological pest control, first option
- Green manure cover crops & crop rotations compulsory
- Soil erosion is reduced

Consequences of no-tillage & permanent soil cover:

- Wind and water erosion near zero
- Increased water infiltration into the soil
- More available soil moisture
- Maintenance or increase in the soil organic matter content
- Enhancement of soil quality
- Carbon is sequestered in the soil enhancing its quality, reducing the threat of global warming
- Soil improvement (chemical, physical & biological)
- Crop productivity increased
- Reduced use of fertilisers and lower production costs
- Survival of the farm family on the farm insured through a good profitability & a

- high and sustainable crop production
- Basic needs are satisfied, living & quality of life of farm family are increased

Off farm effects of new production system:

- Reduction of sedimentation of rivers, reservoirs, lakes & micro catchments
- Enhanced water quality
- Less problems for hydroelectric power plants
- Less sedimentation of roads
- Reduction of costs for the government & for society due to off-farm effects of soil erosion

Result:

- Sustainable land use ensured (ecologically, socially, & economically)
- Rational, site-oriented use of the soil

Check out the ISTRO
Web page at
<http://soils.wisc.edu/istro/>

**15TH ISTRO
CONFERENCE
UNITED STATES 2000
"Tillage at the Threshold
of the 21st Century:
Looking Ahead"
Fort Worth, Texas
2 to 7 July 2000**

The conference will focus on tillage science

and technologies for the 21st century. Delegates are encouraged to participate with Working Groups, Technical Sessions, and Poster Presentations to look ahead at tillage research needs for the more mature, and yet more hungry, world of tomorrow. Attend to teach and to learn from one another.

The organizing committee has planned two exciting tours. These pre- and post-conference tours are described below; contact person for each is also given.

❖ ISTRO 2000 Pre-Conference Tour —

Prior to attending the next ISTRO Conference in Ft. Worth, TX, consider learning more about U.S. agriculture by traveling with your colleagues across the Corn and Soybean Belt as well as the Central and Southern Great Plains. The tour will depart from the O'Hare International Airport (in Chicago, Illinois) on Sunday, 25 June 2000. We will travel across northern Illinois, stopping at the John Deere Pavilion for lunch and a brief history tour of the John Deere Co. Travel will continue on to the Des Moines, Iowa area, where you will stay for two nights. Monday will begin with a tour of John Deere Ironworks, where the famous Model 721 no-till grain drill, cotton pickers, and light tillage equipment are manufactured. We will tour and have lunch at the USDA-ARS National Soil Tilth Laboratory, visit with some mid-Iowa farmers, examine soil profiles on the Des Moines glacier lobe, and tour some research sites at the Iowa State University Agronomy and Agricultural Engineering Research Farm near Ames. On Tuesday, our travel will continue, stopping to meet with farmers, examine the deep loess soils of western Iowa, and on to Bonner Springs, Kansas for the evening. Wednesday, we will travel a short distance to Manhattan, Kansas, where we will meet with scientists from the ARS Wind Erosion Research Laboratory, tour the Kanza Prairie, and enjoy the hospitality of Kansas State University. On Thursday, we

will continue moving through the golden wheat country, stopping to see the soils and irrigation systems within the Central Plains.

Recreation on Thursday evening will include staying in the "Old West" at Dodge City, Kansas. Friday's activities will include seeing the soils of the High Plains, grazing areas, feedlots, and the cropping systems in the Panhandle of Texas. On Friday evening, you will have a choice of having dinner while attending the play "TEXAS" in an outdoor amphitheater, or having a steak dinner at a local restaurant. Finally, on Saturday, travelers will travel across Texas to Ft. Worth for the beginning of our next ISTRO Conference. Preliminary estimates of cost for planning purposes will be approximately \$100 per day for double occupancy, bus travel, and most meals (~\$700 for the week). There may be one or two nights when you will be "on your own" for rest and relaxation with your friends and family members.

For more information on the Pre-Conference Tour, please contact:

Dr. Douglas L. Karlen, Tour Chair
USDA-ARS National Soil Tilth Lab.
2150 Pammel Drive
Ames, IA 50011 USA
Telephone: 515-294-3336
Fax: 515-294-8125
Email: dkarlen@nssl.gov.



❖ ISTRO 2000 Post-Conference Tour—

The tour will depart the Conference Hotel early on Saturday, 8 July 2000, and travel through portions of the agriculturally important states of Texas, Louisiana, Mississippi, Alabama, and Georgia before arriving at Atlanta, Georgia on the evening of 13 July 2000. The planned route will take us through Shreveport, Louisiana; Vicksburg, Mississippi; New Orleans, Louisiana; and

Mobile and Auburn, Alabama. Delegates will learn about soils of the Mississippi Delta and the Southeastern United States, about tillage and crop production practices on these soils, and about research being conducted to improve soil management and productivity. This excursion winds through rice, cotton, soybean, maize, forage, forest, and peanut production areas. The tour will provide a taste of life in rural areas as well as in small towns and larger cities. Stops along the tour will provide a sampling of life in the "Southern Tradition" and visits for delegates and accompanying persons to local historic and cultural attractions. Initial costs estimates of the Post-Conference tour will be the same as that of the Pre-Conference Tour (~\$100 per day).

For more information on the Post-Conference Tour, please contact:

Dr. Donald C. Erbach, Tour Chair
USDA-ARS, National Soil Dynamics Lab.
P.O. Box 3439
Auburn, AL 36831-3439
Telephone: 334-844-4517 {Ext. 148}
Fax: 334-887-8597
Email: derbach@eng.auburn.edu

BRANCH MEETINGS

CZECH REPUBLIC —

The Department of Soil Management of the Research Institute for Fodder Plants Ltd., Troubsko u Brna and the Czech Branch of ISTRO with the Research Institute for Crop Production, Praha and Mendel University of Agriculture and Forestry, Brno are delighted to invite you to participate at the International Conference on Soil Tillage to be held in August-September 1999 in Brno. The conference will cover the latest topics in soil condition and crop production in scientific sessions, posters, videos and special interest group meetings in soil compaction.

Conference Language:

The language of conference will be English.

Participation Fees and Accommodations:

The organizers will try to keep costs low. Accommodations will be available in hotels and student hostels.

Call for Papers:

The Call for Papers was sent on 30 January 1999 to all representative members or presidents of National Branches of the East West Committee of ISTRO who have sent the preliminary registration form. Abstracts in English, no more than one page.

Scientific Committee:

■ **Research Institute for Fodder Plants, Ltd.**
Troubsko u Brna

Dr. Jaromír Procházka (chair)
Dr. Barbora Badalíková (secretary)
Dr. Jan Hrubý (co-chair)
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■ **Research Institute for Crop Production,**
Praha

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Dr. Josef Šimon
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■ **Mendel University of Agriculture and Forestry, Brno**

Dr. Jan K_en (co-chair)
Dr. Jan Málek
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FORM FOR PRELIMINARY REGISTRATION
(PLEASE USE BLOCK LETTERS OR TYPEWRITER)

Family name: _____
First name: _____
Title/position: _____
Address: _____

City: _____ **Postal code:** _____
Country: _____
Telephone: _____
Email: _____

Yes, I want to submit a contribution (please indicate type):

Paper Poster Video

Title of contribution:

Contact Address:

Dr.Barbora Badalíková
Research Institute for Fodder Plants, Ltd.
Zahradní 1
664 41 Troubsko u Brna
Czech Republic

RUSSIA —

The 1st International Symposium of St. Petersburg Branch of the International Soil Tillage Research Organization (SPBISTRO) on “Applications of Geographical Information Systems in Agrophysics and Agroecology” 6-9 September 1999, Agrophysical Research Institute St. Petersburg, Russia.

Symposium Format:

The symposium will begin with registration and an evening reception on Monday, 6 September. Scientific sessions (oral and poster presentations) and exhibitions of research

devices, computer models and other software will be held during three days from 7 to 9 September. During these days excursions are planned to St. Petersburg's famous museums. On Friday, 9 September, the scientific session will be held in the Pushkin Department of the Agrophysical Research Institute, and there will be excursions to the famous palace and park of Catherine the Great, and finally the Symposium Banquet.

Program:

The program will include various aspects of agrophysics and agroecology including soil physics, soil tillage, soil & water management, environmental quality, plant nutrition & crop production and other related topics in the agricultural sciences. Also considerable attention will be given:

- Socioeconomic aspects of the use of GIS. Modern approaches to the spatial description of processes and phenomena in the "soil-plant-atmosphere" system.
- Interactions between GIS and computer models. Problems of analysis and interpretation of spatially distributed information.

Language:

The language of conference will be Russian and English.

Call for Contributions:

Forms of Presentations

The symposium will provide an opportunity for individuals to present original ideas and information on various aspects of the application of GIS to the agricultural sciences. Voluntary contributions will be in one of three forms: oral presentations, poster presentations and exhibits/demonstrations. Oral presentations will be allocated 15 minutes, plus 5 minutes for questions. Poster presentations will be displayed in the conference hall throughout the symposium and discussed in a special scientific session. Exhibits/demonstrations of scientific equipment, computer models and other

software will be organized in a special program depending on the special features of the exhibited objects and will be agreed with the author. The Program Committee will review all abstracts offered and will determine which form of presentation will best meet the symposium objectives.

Abstract:

Abstracts for all forms of voluntary contributions should not exceed 400 words in length. They should include the author's name, affiliation, mailing address, telephone, fax, and, if available, email address. The main results should be included in a summary written in the other language. For example, if the abstract is written in English then the summary should be written in Russian. Abstracts for all forms of voluntary contributions should be submitted in computer format as ASCII text and may be sent on a computer diskette with accompanying hard copy by mail or by e-mail. All abstracts accepted for presentation during the 1st International Symposium of SPBISTRO will be published in a book of abstracts that will be made available to all participants at the beginning of the symposium.

Symposium Proceedings:

The symposium proceedings will be published. All contributors are required to submit full papers for the Proceedings at the time of the symposium. Papers should be limited to 8 pages of single-spaced text, including figures, tables and references. Also papers should be prepared according to the instructions and presented in computer format as Microsoft Word 97 (for Windows).

Accommodations:

Sleeping accommodation has been reserved in two hotels:

- ◆ Hotel "Hipronikel"; cost per night:
 - Standard single room = \$40.00
 - Standard double room = \$60.00

◆Hotel “Hydrotechnik”; cost per night:

Standard single room = \$20.00

Standard double room = \$30.00

Hotels are located approximately 5 minutes walk from the Agrophysical Research Inst.

The deadline for reservation of accommodations is 1 June 1999. After that date, participants must make his/her own lodging arrangements.

Timetable and Deadlines:

Although the deadline for submission of Registration Forms and Abstracts is past (31 January 1999), contact symposium program committee to determine whether late submissions will be accepted.

The deadline for accommodation reservations is 1 June 1999

Program Committee:

Dr. Vladimir Badenko

[Email: badenko@venture.spb.ru]

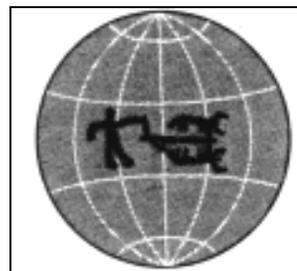
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