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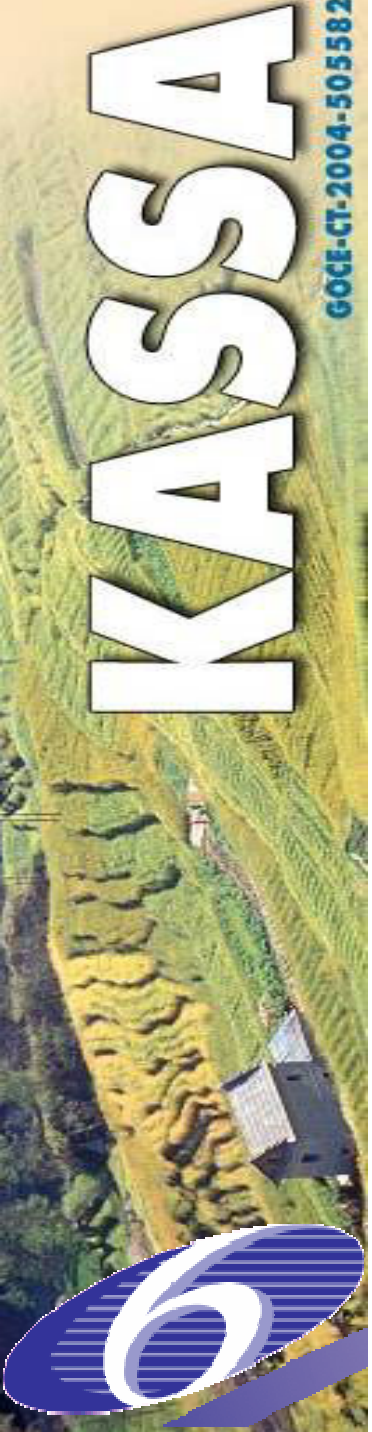

KASSA

FINAL CONFERENCE

PROSPECTS FOR CONSERVATION AGRICULTURE

LATIN AMERICA

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KASSA
GOCE-CT-2004-505582

Constraints for Dissemination of Conservation Agriculture

Socio economic aspects

- **Competitive use of residues due to the use of fodder to livestock** (Argentina, Bolivia and Brazil)
- **Use as shelter and selling of crop residues** (Bolivia)

Technical solutions:

a) increase of biomass production (multipurpose cover crops with higher biomass production)

b) rotational grazing

c) alternative sources such as fodder banks (e.g. Napier grasses), silage and others.

- **Offsite threshing** (Bolivia). Solution: Communal use of harvesting equipment, where possible.

Constraints for Dissemination of Conservation Agriculture

Socio economic aspects

- **Lack of capital** (Argentina, Bolivia and Brazil)
  Solution: Brazilian example (programs of provision of credit at low interest rates and oriented to farmer groups)
- **Lack of conviction**
  – need of short-term income
  – tradition and cultural aspects
  – false (?) perception of soil compaction
  Solution: strengthening the farmer-to-farmer communication (where benefits of no-till are clear) and the extension system (Bolivia).
- **Policies** – there are no specific policies for no-till

Constraints for Dissemination of Conservation Agriculture

Agroecological aspects

- **Hilly areas and stony soils**

  Solution: Despite the availability of human and animal-drawn machinery, it is still necessary do develop equipment/systems adapted to these conditions.

- **Rainfall pattern**
  production of biomass is frequently limited or restricted and rate of decomposition is high.

  Solution: modelling of cropping systems, species adapted to dry conditions

Constrains for Dissemination of Conservation Agriculture

Farmers' perceptions and cultural aspects

- **Farmers not convinced of the benefits of adopting no-till –** tradition, culture, religion (e.g. Mennonite), short-term priorities.

  Solution: ???

- **Soil compaction -** *The farmer perception is more evident under soil moisture stress associated to high clay and low organic matter content or in soils with high silt content.*

  Solution*:* It is necessary to evaluate to what extent farmers perceptions correspond to real problems of soil compaction (genesis, damage, measurement and remediation)

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Constraints for Dissemination of Conservation Agriculture

Agronomical aspects

- **Some crops are not cultivated under no-till**
  - cotton (A. *grandis*)
  - tobacco: a) susceptibility of the crop to high soil moisture; b) incidence of slugs; and c) lack of broadleaf herbicides.
  - potato, peanuts, cassava – Although availability of technologies, great amounts of soil are disturbed at harvest time.

  Solution: Development of no-till systems for these crops

- **Insufficient residues and high decomposition rate under tropical and some subtropical conditions**
  Factors causing the problem: a) monocropping and/or inappropriate rotation; b) lack of adapted cover crops and low biomass production.

  Solution*:* Cover crop breeding programs are required.

Constraints for Dissemination of Conservation Agriculture

Institutional aspects

- **Conflicting messages –** *neither universities nor the official research and extension structures were supportive of the farming system transformation towards no-till*

  Solution: Promotion of interdisciplinary research approaches.

- **Knowledge gaps on interdisciplinary research with systems approach –** *development of production systems compatible with no-till practices, mainly for small-scale farmers at the tropical region.*

- ***Rural extension is very weak, technicians are not convinced of the benefits of no-till and technical messages for farmers are not clear*** *(Bolivia). Lack of scientific information mainly for small farmers. Local languages hinders the farmer's access to external information.*

Constraints for Improvement of Conservation Agriculture

- **Lack of crop rotations**
  – *the practice of crop rotations is constrained because the alternatives are not economically viable under an economic context where prices are market-driven and there is virtually no policy that favours them.*

  – *the lack of profitable alternatives seriously restricts the implementation of an appropriate crop rotation.*

  Solution: Policies providing incentives (e.g. premium prices) to no-till in order to promote crop diversification.

- **Insufficient amount of straw –** *low biomass production and high decomposition rates.*

  Solution: Obtaining plants adapted to dry conditions through breeding programs (e.g. GM technology).

Constraints for Improvement of Conservation Agriculture

- **Soil compaction** – *high clay or silt content (both regions) and low OM content (tropical soils).*

  Solution: Introduction of plant species with high plant biomass production. Soil compaction may be rather a result of a farmers' perception, which still remains an issue to be further studied.

- **Pest management** – *if crop rotation is not used the reliance on chemicals is higher, resulting in higher costs and negative environmental consequences.*

  Solution: More research aiming to identify cash and forage crop species adapted to several rotational systems and to develop alternatives to chemical control for no-till, starting by basic studies aiming at the understanding of the dynamics of pests, diseases and weeds that occur under no-till.

Knowledge gaps to be filled, research topics and approaches for achievement

- **Impact assessment of the use of external inputs in no-till on soil and water quality and biodiversity**
  Partial adoption of no-till has resulted in an increase in the use of external inputs such as pesticides.
  - Further research is necessary to better quantify these aspects.
  - Define a minimum data set of soil and water parameters that best indicate their improvement or degradation.
- **Definition of soil quality indicators for different agro-ecosystems**
  - Identification of early warning indicators of ecosystem stress (to develop a simple, cheap and relatively rapid assessment of local management systems).

Knowledge gaps to be filled, research topics and approaches for achievement

- **Dynamics of soil organic matter (SOM) in agro-ecosystems**

  - Losses and gains of SOM are not well defined for principal soils in LAM.
  - The changes in SOM and their implications on microbial activity, nutrient cycling, soil structure, aggregate stability and water storage in LAM also need to be determined.

- **Quantification of the potential carbon sequestration under no-till**

- **Development of cash and cover crops more tolerant to abiotic stresses and compatible with different cropping systems**
  - Select drought tolerant cover crop species.

Knowledge gaps to be filled, research topics and approaches for achievement

- **Soil nutrients dynamics in agro-ecosystems and technology development for increasing the efficiency of fertilization and liming**

  Nutrients dynamics are altered by the adoption of no-till
  - Adjustment of fertilizer and limestone recommendations (rate, placement and timing).

- **Studies of genesis, damage, measurement, and remediation of soil compaction in no-till areas**

  In various agroecological conditions the no-till farmer has the perception, and different soil studies have shown, the development of a compacted layer.

Knowledge gaps to be filled, research topics and approaches for achievement

- **Technology development for runoff management in no-till**

  There is a perception that residue coverage is sufficient to control soil erosion inducing farmers to plant without paying attention to landscape and removing all terraces from the field.

  - Development of strategies for runoff control in specific sites of fields under no-till.

- **Technology development for Precision Agriculture**
- **Adaptation and breeding of plants aiming at cropping systems diversification for different agroecological conditions**

  Crop rotation is the key factor for the success of no-till.

Knowledge gaps to be filled, research topics and approaches for achievement

- **Analysis of the sustainability of farmer's no-till practices in relation to the "ideal model"**.
  Farmers normally do not adopt the "ideal no-till model"
  – Economic, technical and environmental studies of the different levels of no-till adoption.
- **Development of no-till systems less dependant on external inputs**
  No-till changes the dynamics of pests, diseases and weeds.
- **Technology development for some crops (cotton, potato, tobacco, peanut, cassava) under no-till**
- **Impact assessment of the adoption of GM crops and no-till**
  - Analysis of economical, social and environmental impacts of this technology in short, medium and long term.

Final Comment

The “No-tillage System”
is a conservation agriculture tool
that needs to be understood as a
complex technology
to promote the continuous
seeding operation without tilling.

LA Platform

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GOCE-CT-2004-505582

Muito Obrigado

Muchas Gracias

Thank you