Agriculture & Rural Development Working Paper

A Road Map from Conventional to No-Till Farming

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Introduction

This brief document is one chapter from the more comprehensive *No-Till Farming for Sustainable Rural Development*, published simultaneously by the World Bank. It is intended as a 'how to' guide for project managers, researchers, extension agents, farmer groups, and others who seek a starting point to begin the transition to no-till farming in their communities.

As more farmers make the transition to no-till farming in diverse ecosystems, under different climatic conditions, under various socioeconomic structures, within a range of marketing options, and under various types of government structures, the body of knowledge about how to successfully navigate the transition from conventional tillage to no-till farming will expand. Future editions of this guide will include such experience.

A Road Map from Conventional to No-Till Farming

In countries where no-till systems have not yet been developed, the first step toward NT adoption would be to sensitize stakeholders to land issues and NT opportunities so as to create awareness and willingness to change. Thereafter, activities would initiate the change process, primarily to identify pathways of change, pilot NT farming, establish support for knowledge and information systems, and build capacity of local institutions and producer organizations.

Creating awareness and willingness to change

The objectives of these initial activities are:

to sensitize key stakeholders on the root causes and adverse effects of land and soil degradation on farm productivity and the environment (from farm to watershed levels), and the relationship with increased poverty and food insecurity;

to provide evidence to stakeholders that changes are urgently required, that opportunities for productive and sustainable land management exist, and that they have been successfully implemented by comparable farming communities elsewhere;

to identify and begin to address specific inertia and resistance to change issues at national and local levels; and

to identify a dedicated NT core group to start networking among stakeholders who are committed to change.

A good way to begin the change process is to make people aware of the potential benefits of NT systems by showing them fields that employ these techniques. Study tours, field visits, and farmer-to-farmer contacts are among the best triggers for a sequence of activities designed to capture interest and create willingness to change among individual farmers, front-line agricultural service providers, as well as high-level decisionmakers. Often, external specialists may be needed to create initial motivation and raise interest through presentation of successful experience elsewhere.

At the national level, information and sensitization should be targeted at policymakers and decisionmakers at the highest levels, concerned staff from research and development organizations, universities and other education institutions, the private sector, and donors. A key objective is to identify a few 'NT champions' and get their support for Sustainable Land Management/Better Land Husbandry (SLM/BLH) approaches and NT development in the rural sector development agenda. This approach would open a dialogue with government to review the policy framework, and as appropriate, make the required adjustments. Sensitization and lobbying at the national level would also ensure that NT development efforts are not undermined by contradictory government policies or donor strategies, such as continuing support for expanding agricultural mechanization using disk plows and harrows.

At the local level where NT development would be initiated, stakeholder involvement is essential to facilitate the process and promote socially acceptable and economically sound strategies for change. The stakeholder analysis should be designed to:

enhance understanding of prevailing farming systems;

categorize different stakeholder interests (political, financial, landholding, employment, commerce, NGO, religious, tribal, etc.),

elucidate gender issues in each stakeholder group;

identify conflicts or convergence of interests with the NT development agenda;

assess the level of awareness and demand for adopting the BLH approach and developing NT farming among each group; and

characterize the non-resource-poor rural producers and landlords. Stakeholder understanding and expectations might be ascertained through discussions (Box 1).

At the end of this first round of awareness activities, a small informal group (so-called core group) of dedicated people, ideally including representatives of farmers, front-line agents (extensionists, NGOs, researchers), government institutions, donors, and the private sector would decide to network to plan further development of NT activities. Awareness and sensitization activities should not be seen as a one-time exercise, and should be adapted as needs arise during the NT adaptation and adoption process.

Participatory farmer-led identification of change

It is assumed that national SLM, BLH, and NT development plans would build progressively, starting from local and sub-national plans.[2] This second phase draws upon two concepts, 'gateway' and 'pathway of change', and a change strategy selected by

1. From available studies and specific surveys, e.g., using PRA methodologies.

2. In some cases, related plans have already been (or are being) formulated (e.g., through stakeholder consultation during the Soil Fertility Initiative (SFI) in Sub-Saharan Africa, or the formulation of CCD action plans). Where appropriate, advantage can be taken of already formed teams that could extend their activities to NT development.

Box 1. Key issues for discussion ibn stakeholder consultations

- Are sustainable farm productivity, food security, and income perceived as linked to the quality of land?
- Do herders perceive that they need a sustainable forage supply as opposed to maintaining grazing rights?
- Do farmers perceive elimination of erosion and soil fertility losses as vital to sustainability?
- How do women and man perceive links between current farming practices and human health and other environmental issues?
- What are the demands of other sectors of society to reverse land degradation and adopt SLM/BLH approaches (e.g., NGOs, urban communities, decisionmakers)?
- Do farmers of different size farms and systems perceive SLM/BLH and NT farming differently, and what are the common denominators?
- What is the range of financial investment within which individuals and producer organizations see the limits of their actions?
- Is there a willingness to undertake joint actions to improve sustainability?

farmers and their organizations. Ideally, they should drive the change process while other stakeholders are gathering momentum. Identifying pathways of change is achieved through piloting activities, initially with a few farmer groups in the most suitable and representative areas, so as to eventually allow expansion of successful achievements.

Gateway and pathway of change

A gateway is the critical and concrete first step that farmers make to overcome constraints that prevent adoption of NT farming. It cannot be assumed that farmers, although aware of this new opportunity, will automatically embrace NT because it is inherently beneficial. There must be locally appropriate triggering mechanisms that help producers and other stakeholders begin the transition to NT. This triggering mechanism is a gateway, and must be identified by the producers — an operational gateway is a producer decision. Examples of gateways include:

direct planting on crop residues to prevent soil erosion in south Brazil;

development of improved fallow with *Pueraria phaseoloides* in central Côte d'Ivoire to control an obnoxious weed (*Imperata cylindrica*) and to allow women farmers to cultivate yam in (initially) compacted soil; or

development of live fencing in pastoral areas, and the establishment of an inter-village bush fire control committee in southeast Côte d'Ivoire.

When farmers select their own gateway, they are empowered to chart their own future, while at the same time providing workable solutions to critical issues (land tenure issues, customary rights) that may appear out of reach through an administrative top-down approach.

Identifying a gateway must be followed by enabling actions that permit pathways of change — roadmaps of staging points along the way to NT farming. The pathway of change concept recognizes that producers and communities vary, thus strategies geared toward NT farming need to be developed and customized to fit existing initial conditions. The pathway concept implies that there is no single approach nor prescriptive technical packages. On-the-ground realities determine the successful adoption of SLM/BLH and NT practices by communities. The pathway must be identified jointly by farmers and other

stakeholders, but driven by farmers. This process should be flexible to allow for adjustments that consider experience gained by the farmers. This is critical to ensure that the strategy of change is tailored to local circumstances and farmers, risk averse, and perceived as feasible by potential beneficiaries.

In northern Côte d'Ivoire, cotton and cereal growers recently initiated a pathway of change that began by collecting seeds and seedlings to plant living fence (60 km were planted in less than 16 months by the farmers). In addition, they acquired cover crop seeds, tested no-till and direct seeding on the cover crop; had discussions with herder groups, patriarchal landowners, and producer associations; and made contractual agreements with extension agents and researchers to develop a cost-effective integrated production and pest management strategy to reduce fertilizer and pesticide needs. More advanced pathways of change developed through a participatory technology development (PTD) process in Paraná, Brazil are presented in Box 2.

Piloting

Piloting is required to start NT development actions in selected areas to be identified by stakeholders. The main objectives of piloting are to:

develop suitable pathways of change — adapt, test, and validate improved NT farming practices by innovative farmer groups and support service providers;

identify research priorities needed to support NT farming systems development;

test the feasibility of new local institutional and funding arrangements and shared responsibilities, particularly between producer organizations and local government; and

test partnerships among the various stakeholders, including the private sector.

These pilot efforts are also necessary to provide all levels of decisionmakers with facts on the qualitative and quantitative benefits of SLM/BLH and NT farming with a view toward expansion. The best argument is to present positive results.[3] An example of a pilot process for NT farming proposed for Sub-Saharan Africa is outlined in Figure 1 (FAO and World Bank, 2000).

Piloting is also needed to find an institutional home for the NT approach at a national level. Local momentum and enthusiasm created by the NT local core group during the awareness activities will not generate strong support for a nationwide strategy unless there is a highly visible project, government program, or an influential producer-led private institution that will support it. A dedicated and influential NT pilot group can be instrumental in overcoming institutional and policy constraints and create useful synergies among stakeholders.

Many countries may already have a geographical database or framework that would be useful to pre-select areas with a good potential to develop NT systems. This can be based on physical features (soil and climate), typology of production systems, and major rural landscape forms. To avoid using a top-down approach and ensure that farmer organizations are the major driving force, a complementary and pragmatic approach is to consult existing farmer organizations and the NT core group to select the areas with the best opportunity using the following criteria:

explicit demand from rural communities to test new land management systems;

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3. In Brazil, the small pilot watershed of Ribeirão das Pedras, Santa Catarina, and the Santa Catarina Land Management II Project (World Bank, 1998) led to larger programs.

presence of producer organization(s) capable of driving the change process; and

on-going farmer group activities or programs consistent with BLH approach and interested in changing from conventional to NT systems.

Box 2. Examples of smallholder no-tillage pathways of change in Paraná state

Small-scale farmers (maize and beans)

Main characteristics. **Use of animal traction, family labor, low use of inputs, subsistence, and market-oriented.**

Cropping system. Planting black oat *(Avena strigosa)* and field peas *(Pisum sativum)* in mid-May (120 days from planting to milking stage/full flowering). Biomass management with animal-drawn knife-roller in mid-August and planting maize in early September with animal-drawn no-tillage planter. Harvesting maize in April, management of crop residues with knife-roller and sowing rye (*Secale cereale)* in May, cover crop management and planting common beans in mid-September.

During the transition period. Runoff control with contour bunds built with animal-drawn moldboard plow and planting elephant grass (dwarf variety) on the contour bunds. During summer, this material can be cut twice for livestock (e.g., horses and dairy cattle for home consumption). In February, the last sprouting can be used to prepare a silage mixture (60 percent elephant grass + 40 percent maize).

Small-scale farmers (tobacco)

Main characteristics. **Use animal traction, family labor (in this system, labor is a strong constraint due to tobacco cultivation and processing), marketed-oriented.**

Cropping system. Sowing black oat in April/May (120 days from planting to milking stage). Biomass management with animal-drawn knife-roller in mid-August, furrow opening with animal traction and manual transplanting of tobacco in September. Manual harvesting of tobacco and planting beans in January. Manual harvesting of beans in April, sowing black oat and vetch (*Vicia sativa*) and biomass management in mid-August. Planting maize with animal-drawn no-tillage planter.

During the transition period. Runoff control with contour bunds built with animal-drawn moldboard plow and planting of *Phalaris hibrida* on the contour bunds.

Small-scale farmers (handicrafts and beans)

Main characteristics. Use of animal traction, family labor, low labor availability, low use of inputs, subsistence, and market-oriented.

Cropping system. Planting vetch (*Vicia villosa)* in April-May; planting sorghum for brush making; harvesting sorghum and planting black oat. Management of black oat with animal-drawn knife-roller and planting beans in mid-September. Harvesting beans by late December/January.

During the transition period. Runoff control with contour bunds built with animal-drawn moldboard plow and planting *Phalaris hibrida* on the contour bunds.

Small-scale farmers (dairy cattle and soybeans)

Main characteristics. Use of mechanical power (owned or hired), family labor, medium use of inputs, marketed-oriented.

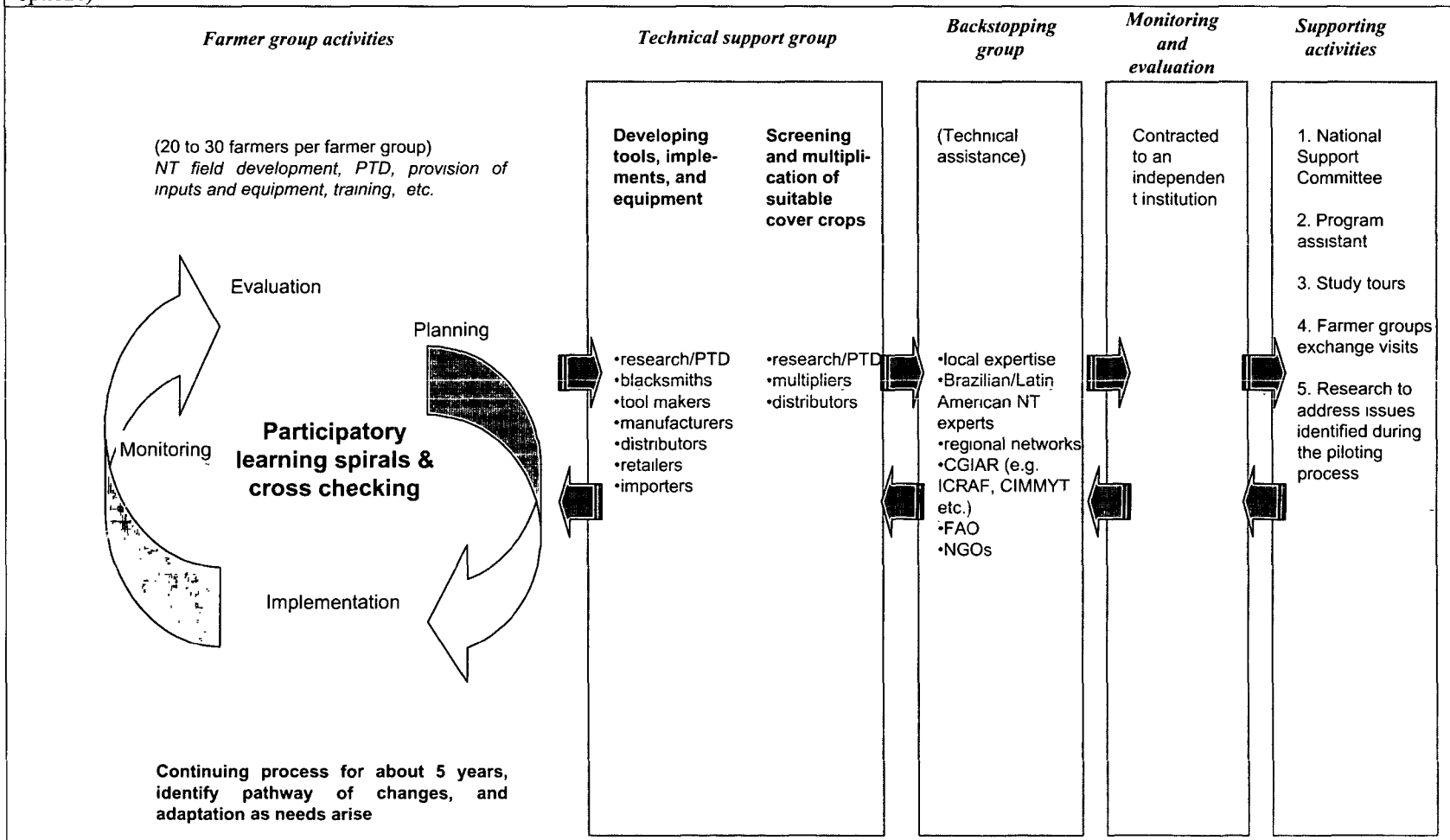
Cropping system. Sowing black oat or ray grass (cycle of 150 days from planting to milky stage). Depending on soil and climate conditions, 2-3 controlled grazings beginning 40 days after planting. The biomass is used as pasture on a rotational basis. The last sprouting is left to produce soil cover for no-till. Biomass management with knife-roller only or knife-roller and herbicide depending on the amount of oat residues left and weed infestation. Planting soybeans in November, harvesting in February-March. Planting black oat and vetch *(Vicia villosa)* and controlled grazing. Biomass management in November and planting maize for silage. A dwarf variety of pigeon peas can be sown between maize rows 40 days after planting to replace part of nutrient extraction of maize harvesting, promote soil decompaction, and provide nitrogen to the system.

Source: Adapted from Ribeiro et al., 2000

Figure 3. Example of a framework for piloting no-till farming

Preparatory activities. Information and sensitization; clarify NT farming systems development approaches and practices, selection of 'best opportunities areas', agreement with participating communities on objectives and expected outputs. Local meetings (organized by National Support Committee)

Piloting. Learning and training through community-based farmer groups, together with other stakeholders (testing, validation and adaptation of technical NT options)



Dissemination of findings, scaling up successful pilots, national and regional networking of NT practitioners

Source: Adaptedfrom FAO and World Bank (2000)

The **selected areas** must not be too small or large, preferably an identified administrative unit with common land management issues and with farmer-recognized individual **champions** (producers, technicians) or groups (producer organizations, NGOs). It would be advantageous to identify existing and dynamic farmer groups that are ready for new challenges such as participatory extension, technology development groups, or integrated production and pest management (IPPM) Farmer Field School (FFS) groups.[4]

Consultations with stakeholders to define SLM/BLH change strategies can be organized in the concerned areas, ideally by the producers themselves to agree on an action plan of action for NT pilot activities and a provisional institutional setup for their implementation.[5, 6] After this consultation process, activities would be coordinated by a local NT core team to:

prepare a work program to implement the decisions taken during the local stakeholder consultations;

develop monitoring and evaluation (M&E) indicators (Herweg et al., 1998);

agree on partnership arrangements and shared responsibilities among participating stakeholders; and

establish coordination and communication mechanisms among stakeholders, a schedule and funding mechanism, and support by pioneer farmers or rural communities already committed to NT adoption.

Local government support would be critical in poor communities and/or marginal areas during this phase, and probably more important than agribusiness links. This role should be part of a governmental participatory support strategy to:

provide communities with technical support and facilitate land conflict resolution and agreement among producers,

support SLM/BLH and NT information gathering and dissemination to help identify realistic pathways; and

ensure that agreements among stakeholders consider the interests of diverse groups, particularly women and youth, and ensure that M&E arrangements are in place and will provide the expected information to document the outcome of pilot activities.

Knowledge and information systems

In the past, much agricultural knowledge and information came through pre-determined technology packages provided by technical experts working for public agencies. Much of the information was not used because it didn't meet the site-specific needs of the local growers. Today, many public agencies in agriculture are in the process of reform, encouraging local empowerment by producer groups to provide

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4. Such as the IPPM/FFS groups in Kenya, Uganda, and Tanzania, established under the IFAD/FAO project on piloting FFS in Eastern Africa (1999-2002).

5. This has been successfully done in Côte d'Ivoire with a cotton grower association and coffee-cacao cooperatives. Where producer organizations are weak, such meetings would be better managed jointly with other stakeholders, such as extension and/or research services, NGOs, etc. In any case, a farmer organization must be the host or co-host, to clearly indicate that it is a farmer-led consultation.

6. In northern Côte d'Ivoire a Commission Régionale GDS (SLM Regional Committee) was created as a sub-committee of the Regional Committee for Rural Development. In southern Côte d'Ivoire a Commission Régionale GDS- Environnement (SLM-Environment Regional Committee) was similarly created, emphasizing the importance of linking SLM and environmental matters. Both committees are chaired and managed by farmer organizations, with support from the national extension service.

demand-driven extension and advisory services, with direct interaction with researchers to design experiments that meet their specific needs. This emerging trend should provide a conducive environment for, and can be strengthened by, moving from conventional to NT farming.[7]

People and organizations that have a vested interest in a thriving agriculture-based economy should also be involved — local community groups, representatives of equipment and chemical manufacturers, and private and marketing cooperative specialists. They should respond to specific requests from farmers, and not merely promote their own agendas. This integrated agricultural knowledge and information system approach has been successful for the adoption of NT in Brazil, where the academic system has also become involved. For example, in 1983 the University of Ponta Grossa, Paraná, developed the first course on NT systems, which now is part of the rural development curriculum. Adjustments required for NT development would include:

realignment of research programs with NT requirements;

training practitioners in NT concepts; and

development of a producer-centered communication strategy.

Realignment of research programs

No-till adaptive research also requires adopting appropriate on-farm methodologies, such as the Participatory Technology Development (PTD) approaches, and associated on-farm and on-station complementary research. Successful PTD would require working with farmer groups that have already been empowered through participatory extension and experiential learning activities, such as FFS. Synergies can be exploited by selecting PTD farmer groups from those involved in pilot activities. PTD methodologies are already used by international research organizations[8] and by some national agricultural research systems for land and soil management. Research and development on NT systems would need to adopt a farming systems approach where cross-cutting issues (e.g., land, soil, mechanization, weed management, socioeconomics) and new NT-specific challenges (e.g., cover crop screening and management) receive adequate priority in terms of human and budget resources. A major change may be required to move away from individual, isolated, largely commodity-based programs toward more collaborative work to address a specific development challenge. Indeed, these changes are generally not specific to SLM/BLH and NT, but are a condition for successful NT development. Box 3 presents possible priority domains for NT research.

Some NT research would occur on-station, particularly more basic research such as preliminary screening of cover crop species[9] and IPM issues, as well as the initial multiplication of cover crops. It is anticipated that research institute land would also be gradually converted to NT farming.[10]

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7. In Brazil, farmer organizations pressured state and federal governments for a higher priority on NT research. Today, the technical director of EMBRAPA (national research agency) has publicly declared that "there is no justification for any more research on conventional tillage". It took over 20 years for this to happen.

8. Such as CIRAD in Brazil, Côte d'Ivoire, and Madagascar; ICRAF in Western Kenya; AHI in the East African highlands; CIMMYT and IRRI in South Asia; CIAT in Uganda; IITA in Nigeria; and ICRISAT in Zimbabwe.

9. It should be noted that many cover crop species are generally available in the country, whether indigenous or already introduced for different purposes such as forage, green manure, improved fallow, etc. Therefore, an inventory of available species should be made prior to considering import of exotic species.

10. This would add credibility to NT development efforts and constitute a learning-by-doing exercise for research staff. In Tanzania, the Department of Research and Development agreed to start converting its land to NT farming as part of its NT

In many developing countries, research and extension emphasize production. The BLH approach and NT systems emphasize the role of market forces in the adoption of these land management practices. This calls not only for increased expertise within research and extension bodies on how to produce quality products for the market, but also how to transport these products more efficiently and how to organize their marketing (Cheatle et al., 1998).

Box 3. Priorities for no-till adaptive research

Cover crops — collection of locally-available germplasm and introductions as appropriate, screening species with emphasis on elimination of herbicide applications; seed production (certified seeds).

Management of crop residues — on the field, both mechanical and with herbicides.

Integrated production and pest management (IPPM) — integrated insect pest, weed, and disease management (including soil-borne pests such as nematodes), herbicide evaluation, and soil fertility enhancement with crop rotations, including mixed cover crops, allelopathic effect of cover crops and nutrient recycling, associated with agroforestry systems, spatial field and crop pattern.

Fertilizer — (mineral, organic) requirements, liming across cover crops and in the crop rotation (needs, timing, and methods of application).

Machinery/tool adaptation — Adaptation and fine tuning of NT planters, knife-roller, sprayers, etc.

Integration of crops and livestock production — screening double-purpose cover crops; best crop rotations and cropping patterns; increase biomass, e.g., through agroforestry.

Pathways of change — on-farm test of pathways best suited to local/zonal typology of farming systems.

Land/soil benchmark — characterization of representative on-farm and on-station soils for future monitoring and evaluation activities and better understanding of interactions, e.g., among chemical, physical properties (including compaction and erosion) and soil biological diversity and activity.

Soil as a rooting environment — rooting depth, root distribution for crops and cover crops.

Socioeconomic studies — reasons for adoption and non-adoption; gender considerations; generation of production cost data; comparison between conventional and NT on-farm income; cost-efficient effects indicators, including socioeconomic and environmental effects.

Finally, the NT approach also provides an opportunity to implement new research and extension mechanisms promoted in several countries such as Brazil, Colombia, and Uganda by funding agencies such as the World Bank and IFAD, including competitive grants for delivery of services, and public-private cooperation.[11]

Management skills for no-till practitioners

Implementation of NT systems would require specific management skills, for example, cost-efficient weed management using crop rotations and cover crops possibly complemented by herbicides, and how to adjust planter and seed drill coulters under different soil moisture and residue cover conditions. Producers

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activities (through the World Bank-funded Tanzania Agricultural Research Project – Phase 2) (United Republic of Tanzania, 2001).

11. Examples of public-private cooperation in Brazil include co-funding of on-station research (product-related); co-funding of on-farm research, demonstration, and training programs; participation in technical/promotional and training events; and co-financing of publications.

and support staff would have to acquire these skills and be able to transmit them to others. This requires specialized courses and on-the-job training.[12]

No-till practitioners also need to increase their knowledge of agroecosystem dynamics and farming systems management. Time saved from the adoption of NT systems may allow them to spend more time scouting their fields (above and below ground level) to observe and assess the effects of NT farming practices on plants, insect pest and disease relationships; recognize indicator weeds and insects; and assess soil biology activity. With time, NT practitioners would become experts on what constitutes soil and crop health and become increasingly committed to environmental and food quality issues.[13]

Communication strategy and networking

As repeatedly discussed in this paper, the adoption of a BLH approach and NT farming practices requires a profound change in mindset, perceptions, and behavior.[14] There is risk of failure if poorly-prepared or under-supported farmers embark on NT, which can set back adoption in an area for years. While education, learning, and capacity building should be integral parts of the change strategy, early communication among farming communities is equally important. Although not specific to NT, experience in many countries with all types of farmers has shown that farmer-to-farmer contact is the most cost-effective means of introducing new concepts. On-farm demonstrations and visits, field days around NT piloting and PTD activities, and farmer exchange visits and study tours are some of the common tools for communication.

A farmer-to-farmer communication strategy is a step to developing a comprehensive dissemination strategy, including rural radio and television, technical pamphlets, newsletters, and more comprehensive training courses. However, at an early stage of NT development, emphasis on farmer-to-farmer communication would lead to farmer networking and the possible creation by farmers themselves of SLM/BLH or NT associations, such as the Friends of the Land Clubs and land care groups that have proven to be foundations upon which institutions are progressively built from local to watershed and national levels. Networking among NT farmer groups and practitioners from public and private organizations would lead to developing a shared philosophy about NT farming and commitment to its development.[15] However, unless an institutional support framework is built in parallel, its achievement may prove difficult.

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12. In Brazil, the Friends of the Land Clubs at the municipal level reduced the learning period by promoting exchange of both positive and negative experience among farmers.

13. In 2000, the 7th National Symposium organized by the Brazilian Federation of NT farmers focused on Agriculture in Harmony with Nature: A Challenge for the 3rd Millennium. The symposium was attended by about 1,750 participants, of which 1,500 were producers.

14. Called by some Brazilian practitioners 'brain de-compaction'. It is not unusual to hear from non-NT practitioners that "NT fields are untidy" or "NT farmers are lazy". Besides, many regions or countries are proud of the quality of the agricultural products harvested from painstakingly managed land, and proud of the human values attached to farming activities. The deep man-nature bonds have been recorded, illustrated, and glorified by many European painters by showing the bounty of the land and the strength and courage that man needs to exhibit to tame nature. The plow epitomized this relationship between 'honest' man and fertile nature. An efficient strategy needs to be developed to counter the deep-rooted belief that tillage is the only way to create soil fertility. Selling such a strategy will not be an easy task or a short-term undertaking (Pieri, 2001).

15. For example, a network of over 100 Friends of the Land Clubs has been created in Brazil with private sector participation that supports state, regional, and national umbrella entities. Some of these clubs have evolved into research/extension foundations with highly interactive links to all sectors, others organize joint purchase of inputs, or establish cooperatives.

Building an institutional and incentive support framework

Countries that are decentralizing would be in a better position to develop institutional support to promote SLM/BLH approaches and NT farming, as well as farmer networking. Although more difficult, it may be possible to encourage local empowerment of rural communities in more centralized economies. For example, in the Loess Plateau Project in China, devolution of responsibility to, and strengthening of, local governments in an area improved support services necessary for NT farming adoption.

Two set of actions could be jointly developed to make this institutional support strategy effective:

Local governments responsible for providing support services for SLM would need: (i) training for technical personnel; (ii) administrative strengthening; and (iii) establishment of easy communication channels with rural communities and producer organizations.

Other supporting actions may include government service contracts for NGO and private sector or other independent organizations, and networking with education institutions and NGOs.

Sustained efforts should be made to spread and scale up SLM/BLH and NT activities from the farm to community, administrative, and watershed units by:

establishing local commissions (administrative unit or watershed commissions), with representatives of key stakeholders;

supporting reliable input and output produce markets;

expanding NT producer-led institutional support groups such as producer associations, and NT networks/clubs with members from producers, research and extension, educational institutions, NGOs, business enterprises, etc; and

raising funds and resources for community watershed actions.

Financing the transition from conventional to no-till farming

Funding is needed to support the NT farming development process and to directly assist smallholder farmers during the 3-5 year transition phase.

Funding the no-till development process

The independent funding mechanism developed by Friends of the Land Clubs with medium and large farms has proven to be successful for the adoption of NT systems in Brazil. For small-scale and subsistence farmers, however, alternative mechanisms would be necessary through financial support from programs and projects. By mobilizing and channeling funding, NGOs can also help by providing technical services and acting as intermediaries between government agencies and local groups. Funds would generally be required for sensitization, participatory rural appraisal and planning, NT piloting, and financial incentives for farmers, PTD and competitive research grants, training, study tours and exchange visits, communication and networking, M&E, and local and international technical support (from countries with NT experience).[16]

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16. This translates largely into equipment and materials, mobility, travel, allowances, honorariums, etc. It has been estimated that NT piloting and PTD involving 10 farmer groups over 5 years would cost about US$ 1 million.

No-till farming and SLM/BLH approaches would both contribute to increased agricultural productivity and rural development, and bring environmental benefits. Funding support from international financing institutions and other donor agencies could therefore be sought through one or more related entry points, such as:

rural development and community driven development projects (CDD);

watershed and river basin management;

agricultural services support (education, research, extension/advisory);

drought preparedness/fight against desertification (UN Convention to Combat Desertification);

biodiversity conservation (UN Convention on Biological Diversity);

climate change, reduction of gas emissions, and carbon sequestration (UN Framework Convention on Climate Change, Kyoto Protocol); and

Integrated Planning and Management of Land Resources (Chapter 10 of Agenda 21 of the Rio Summit).

The promotion of NT in Brazil has built on intensive technical assistance to all participating farmers. Results have been encouraging where innovative and resourceful farmers met enthusiastic and committed research and extension teams. Following closure of the World Bank-supported micro-watershed management project in Santa Catarina, concerns were raised about sustainability of the system because a large number of support staff paid for by the project were now no longer available to assist farmers with NT development. Where the NT development is funded by external resources, careful consideration should be given to phasing out incremental support services, which is key to sustainability.

Farmer incentives

Experience in Latin America shows that while more advanced, large-scale farmers are generally able to finance their change toward NT farming,[17] financial incentives (subsidies) are needed for resource-poor farmers. Short-term subsidies played a significant part in supporting small-scale farmer adoption of no-till practices. In Paraná, much of the hand-held or animal-drawn equipment was acquired with financial support from the state in the context of development programs funded by the World Bank. In some instances, private companies (e.g., the tobacco industry) also provided equipment for small farmers. Such incentives, which should be linked to the transition process and phased out after a short period,[18] may include:

acquisition of inputs such as cover crop seeds, soil amendments, or new equipment related to NT systems;

one-time subsoiling for soil de-compaction;

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17. One salient feature of the Brazil NT development experience is the lack of production subsidies. To survive with low commodity prices, the medium- and large-scale farmers had to find lower per-unit cost production methods. The combination of zero tillage with the use of cover crops and rotations reduced their cash outlays for fuel, labor, equipment depreciation, and purchased chemicals. This approach required more knowledge about how to maintain healthy soils, less dependence on quick fixes, and the patience of 3-5 years to allow the benefits to be fully realized. In Western Europe and the United States, these incentives do not exist because farmers are able to fall back on production subsidies that do not encourage lower-cost innovation. The situation in Brazil may be unique, but the NT innovators there (who primarily came from larger farms) worked with the private sector, extensionists, and researchers to develop equipment and know how for resource-poor farmers. In other countries, this rather egalitarian attitude may not exist, so some transition funds may be required for poor farmers.

18. For example, up to 3 years for production (equipment or inputs), and up to 5 years for other aspects such as training and technical assistance.

contribution to decrease the cost of farmer access to information;

on-farm adaptation of NT farming practices; and

acquisition of specific NT farming skills.

A specific 'NT window' can be conveniently opened in existing social funds and/or community development funds to prevent the proliferation and costly management of specific funds. Several financial mechanisms may be considered, including: (i) grants and special credit lines for purchase of collective NT equipment or development of small rural infrastructure; (ii) matching grants, particularly to support piloting activities; and (iii) taxes rebates[19] or exemptions.

These public financial incentives would generally not be sustainable beyond a donor-supported project closure. There is therefore concern that production subsidies may distort the estimate of private benefits from NT that could lead to a backlash as farmers are suddenly confronted with full market prices. It would be economically justified to compensate farmers for environmental and other benefits that NT adoption generates outside their farms, but in that case a regular transfer system from beneficiaries to farmers should be developed. Subsidies for pre-defined, specific technologies should be avoided in order not to stifle innovation.

19. In Brazil, NT adopters benefit from a 1 percent point reduction in crop insurance premiums.

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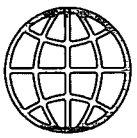

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