

A holistic approach of Conservation Agriculture that unites engineering, research, on-farm demonstration and extension in Cambodia



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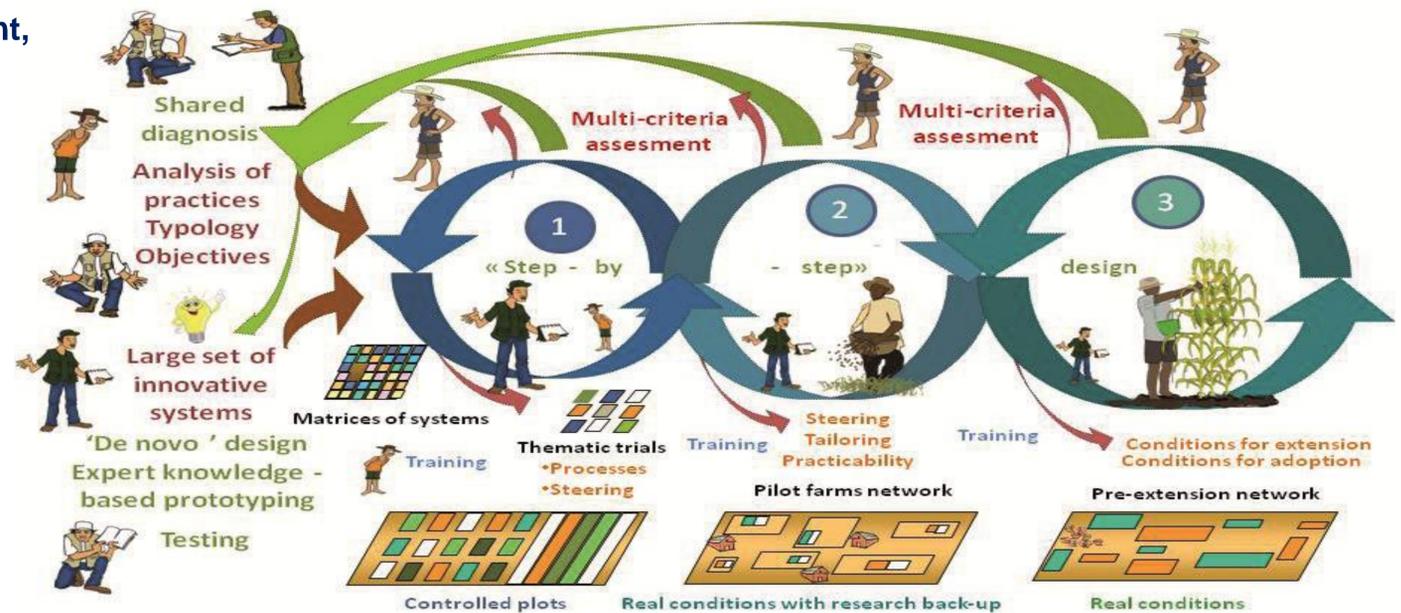


Context and objective

In Cambodia, after the restoration of peace, the area of annual upland crops soared from 120,000 ha in 2000 to about 800,000 ha in 2012. This development has been promoted by migration from populated central regions to forested peripheral regions, the illegal clearing of forests, and strong regional demand for maize, cassava and soybean. Today, the production of annual cash crops (i.e., soybean, maize, cassava) is an important dimension in the development of smallholder agriculture on the western and northern provinces. In combination with the harsh climate, and high rate of soil organic carbon (SOC) mineralization, mechanized farming exacerbated the problem of soil degradation. Maintaining productive capacity of the soil is a crucial element for long-term improvement of livelihoods. In 2009, the Cambodian Ministry of Agriculture and Forestry has hosted a research and development program led by North Carolina A&T, CIRAD and funded by the USAID through the Feed the Future Innovation Lab for Collaborative Research on Sustainable Agriculture and Natural Resources Management (SANREM), directed at local smallholders and based on conservation agriculture (CA) and diversified direct seeding mulch-based cropping (DMC) systems.

A Holistic Approach based on Diagnostic, Design, Assessment, Training and Extension (DATE)

DATE is a multi-scale, multi-stakeholder participatory approach, integrating scientific and tacit knowledge. The approach combines *de novo* innovation through expert-based prototyping, keeping the range of possible options wide open, and a *step-by-step* design, favouring adaptation and learning processes. DATE is built on four main components: a diagnosis and three loops of cropping system design. The diagnosis provide a multi-scale analysis of the agricultural systems. On this basis, a large range of cropping system are designed and tested at different scales, with three successive learning loops (Husson et al., forthcoming).



Experimental Units for diversified DMC systems

The first loop is conducted by agronomists and researchers, in experimental plots. A large range of high biomass-C input under DMC systems (i.e., cover/relay crops successions, associations, rotations and different levels of intensification) are assessed to anticipate market changes.

On-farm assessment

The second loop takes place in farmers' fields where the most promising systems are tested by farmers in interaction with researchers. Precious information on practicability and management principles are developed. A process of on-farm assessment is used to match DMC systems to smallholders' conditions and strategies. Feed-back from the smallholders is recorded throughout the process, so that every constraint can be taken into account during the experimental phase.

Network of pre-extension

The third loop takes place through a network of pre-extension, managed by extension agents with agronomists/researchers' backstopping. At this stage, a detailed record of cost, labour requirements and economic performances is made on a sub-sample of representative farms. The changes in technical and economic performances are assessed in real conditions and the constraints to adoption are reviewed, to identify and test measures to facilitate the dissemination process.

The integration of these three loops into a holistic innovation approach feeds the overall learning-by-doing process. At all levels, multi-criteria evaluation feeds back into the successive loops of technical adjustment and improvement.

The DATE approach was implemented since 2004 (Kampong Cham), starting with experiments in controlled conditions and demonstration plots (first and second loops). Although no rural development project was associated to this research, a pilot extension network was initiated in 2009 (third loop). In Rattanak Mundol (Battambang province), this network covered 4 villages and involved 64 households, applying DMC systems on 200 ha (35 ha of spontaneous diffusion) in 2012.



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This publication/presentation was made possible by the United States Agency for International Development and the generous support of the American People for the Feed the Future Innovation Lab for collaborative research on Sustainable Agriculture and Natural Resources Management under terms of Cooperative Agreement No. EPP-A-00-04-00013-00 to the Office of International Research and Development at Virginia Polytechnic Institute and State University"