Low-input intensification in agriculture – changes for small-scale farmers in developing countries

PD Dr. Rolf Meyer

Institute for Technology Assessment and Systems Analysis (ITAS),
Karlsruhe Institute of Technology (KIT)

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Starting point

- Half of the world's population is living in rural areas
- Vast majority of all farmers are small-scale farmers (less than 2 ha)
- Small-scale farmers are mainly located in less favourable areas (e.g. land conditions, market access)
- Poverty and hunger are concentrated in rural areas
- Ecosystems and ecosystem services are endangered

Challenges ahead for small-scale farming

- Contribution to food security by higher food production
- Economic growth to combat poverty
- Sustainable land use to improve ecosystem services

Conservation Agriculture

Principles:

- Continuous non or minimal mechanical soil disturbance (in combination with direct seeding or direct planting)
- Permanent organic-matter soil cover
- Diversified crop rotations

Almost 100 million hectares non-tillage worldwide

System of Rice Intensification

Principles:

- Careful transplanting of younger seedlings
- Wider spacing of plants
- Keeping paddy soils moist but not continuously flooded and saturated
- Enhanced soil organic matter

Over 1 million hectares and 1 million small-scale rice farmers

Organic Farming

Principles:

- Principle of health
- Principle of ecology
- Principle of fairness
- Principle of care

Nearly 9 million hectares organic land in developing countries (worldwide 30.4 million hectares)

Agroforestry systems

Principles:

- Set of reasoning and design principles for deliberately interplanted annual crops and trees
- Aimed on diversification and sustaining of production
- Indigenous and local knowledge as an important source

Around 425 million hectares tree-based agricultural systems (worldwide)

Rainwater Harvesting

Principles:

- Decentralised water collection and distribution systems of local rainwater and surface runoff
- Various simple techniques using local materials and labour
- Applicable in every climate zone with water deficiency
- Combination with improved agricultural water use

Commonalities and similarities

Preservation and improvement of **soil fertility**:

- Maintaining and increasing soil organic matter levels
- Encouraging biological soil activities
- Maintaining and rebuilding soil architecture
- Crop nutrition by relatively insoluble nutrient sources (made available by soil micro-organisms)

Preservation and improvement of soil fertility

Example: Effect of variable mulch rates on **soil and water loss** (Nigeria):

Mulch rates (t/ha straw)	Run-off (%)	Soil loss (t/ha)
0	75,4	9,6
2	43,4	2,3
3	15,2	0,5
6	5,4	0,1
12	0,0	0,0

- De Vleeschauwer et al. 1980 as cited in Erenstein, O. 2003: Smallholder conservation farming in the tropics and sub-tropics: a guide to the development and dissemination of mulching with crop residues and cover crops. Agriculture, Ecosystems and Environment 100, 17-37

Commonalities and similarities

Retention and better use of **water**:

- Higher infiltration rates of rainwater
- Less water stress for plants through higher water retention
- Lower surface runoff and erosion
- Optimised water applications (in irrigation)

Commonalities and similarities

Improved **productivity**:

- Increased yields are reported frequently
- Better performance achieved by input optimisation
- Optimised use of agro-ecological and biological productivity
- Contribution to increased food availability and food security at different levels

Improved productivity

Example: **Yield effects** by System of Rice Intensification (SRI) (India):

Rice varieties	Conventional methods (kg/ha)	SRI methods (kg/ha)	Increase (%)
Local varieties	1,853	3,816	106
Improved varieties	3,400	5,390	60
Hybrid varieties	3,094	6,027	95

- Uphoff, N. 2009: Reports from Farmers Experience at the 3rd National SRI Symposium. In: SRI Newsletter, Issue 4

Commonalities and similarities

Complexity and **vulnerability** of production:

- High potential to reduce production risks
- Knowledge and information intensive
- Understanding of complex systems necessary
- Increased demand for local adaptation
- Higher initial work demand and investments, with delayed returns

Commonalities and similarities

General approach:

- Organised by fundamental principles and key elements
- Translation case by case into production technologies and farmer practices
- Adaptation to local diversity and complexity
- Demand longer-term strategies and learning processes

Conclusions

- Commitment to pro-poor development and enabling policy environment
- Farmer-centred, participatory research and development approaches
- Exchange between the different science and practitioner communities
- Farmer-to-farmer extension