Abstracts

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Lessons Learnt from the Extension of Direct Seeding, Mulch-based Cropping Systems (DMC) in the Main Agro Ecological Zones of Madagascar

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Extension of Direct Seeding Mulch-based cropping systems (DMC) among small scale farmers has been tested in the main agroecological zones of Madagascar for a period of up to 7 years. These agroecological zones include climates ranging from subtropical climate at sea level to sub-tropical and semi-temperate climates at high altitude. Four main agroecological zones were identified: (*i*) the eastern coast of the country at sea level with high rainfall (1500 to 2500 mm/year) and high temperature, (*ii*) the medium altitude (800 to 900 masl) of the Alaotra Lake and the Middle West, with 6 to 7 months of dry seasons and medium rainfall (600 to 1200 mm/year), (*iii*) the high altitude areas (1000 m to 1500 masl) with a 6-months long rainy season (1200-1500 mm/year) and a 6–months long dry and cold season, and occurrence of frost in some areas and (*iv*) the dry area of the South of the Country with 3 to 4 months of rains (300 to 600 mm/year). The extension was decided after more than 10 years of adaptation of DMC systems by the NGO TAFA in the same areas and training of key field extensionists and group of farmers. Reference sites testing different systems compared with conventional tillage are maintained in these areas and are being used for training of all stakeholders. The GSDM which is a group of institutions involved in R and D was created in 2000 and aimed at capitalizing all knowledge on R and D related to DMC. A strategy document was written in 2004 and updated in 2007 for the diffusion of direct seeding on permanent soil cover at national scale. Main focus of the document was: training of all stakeholders, progressive diffusion based on community level (terroir) and taking into account all aspects of the living conditions of the communities after a short survey *e.g.* main commodities, importance of livestock and main sources of forages, use of inputs (farm manure, fertilizers, pesticides,..), main constraints, sources of income, market, etc.. This strategy document has been approved by all members of the GSDM and its main partners. Starting with a few farmers around the TAFA reference sites in 2001/2002, (5 ha, 29 farmers), the area under DMC is 3.800 ha with 7.700 farmers all over the country in 2007/2008. The main DMC adopted by farmers in the hills (*tanety*) under rainfed conditions are: (i) food crops (maize, rice) associated with legumes (*Dolichus lablab*, *Vigna unguiculata*, *Vigna umbellata*) in Alaotra lake, (ii) food crops (rice, maize) on residues of *Stylosanthes guianensis* in the Middle West and eastern coast, (iii) cassava associated with *Brachiaria* sp or *Stylosanthes guianensis* in the eastern coast and to a lesser extent, and (iv) maize associated with *Vigna unguiculata* followed by cotton in the dry areas.

Direct Drilling is Behind Agronomy of Opportunity in Tunisia

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Tunisian climate is Mediterranean, characterized by irregular, sudden, intense and relatively low rainfall. Land degradation is continuing, water resources are becoming scare, and energy cost of farm products is continuously getting high.

Consequently, cereal producers can hardly make an economic return, while practicing conventional agriculture based on tilling soils. Conservation agriculture based on direct drilling (CA/DD) gives farmers a chance to protect soils and rebuilt their fertility for an efficient use of any available form of water (rain-fall, irrigation). Such desirable efficiency does not come only by the use of the appropriate crop species, but necessarily by reducing water evaporation. To do so, a permanent mulching on the soil surface is the pivot of CA/DD. Since rain-fall fluctuates from one year to another, crop sequences should parallel with such conditions. Some couloirs have early rains (September-October) and late rains too (May-June). In 2007/08, early and late rains accounted for 26.2 and 19.9 % of the total rain for cereal growing season (September-June), respectively. These rains are not well capitalized in cereal production, when applying conventional agriculture. So, coupling the site specific approach and agronomy of opportunity is imperative to lift up farm productivity.

The climate (rain, heat) of production sites should be characterized to better define growing seasons and make the appropriate agronomic sequence. Then, the agronomy of opportunity (producing the maximum of biomass whenever the climate and the biology of the desired crop are favorable) could be applied in different scenarios, under rain-fed and/or irrigation conditions. There is no static scheme to crop the land, and it is rather a dynamic management of soil, crops, and water. A particular emphasis should be put on use of strictly seasonal (fall, winter, spring, summer) cereals and legumes in order to make a continuing cropping with two-three crops a year. A potential scenario could be a fall-barley/spring-peas/summer short season-sorghum hybrid.

Actually, few crops (barley, oat, sorghum, millet, african luzerne) are used as cover crops and others still under experimentation. So, AC/DD is a new agro-technology using the same species cropped in conventional agriculture but sometimes for a very different purpose. For example, barley may be sown first to be grazed, then according to the rain-fall a farmer has the choice to keep grazing or remove his flock out of the field and either seed a spring crop or let barley plants go to grain filling stage. Therefore, barley becomes a multipurpose crop when applying agronomy of opportunity. Some agronomic scenarios were successfully conducted, for example sorghum was grown after a feed cereal (oat) and a forage biomass between 3 t ha^{-1} and 11 t ha^{-1} was reached under rain-fed conditions. Under irrigation conditions and taking advantage of luzerne winter dormancy, oat was sown and a hay biomass of 7.5 t ha^{1} was harvested. The previous two agronomic sequences could be considered as two forms of “relay cropping” where in former case sorghum benefits of late rain coming in May-June and the stock of water left over by the prior winter crop (oat) in addition to leached nitrate (NO_3^-). However, in the late case, oat (could be triticale or barley) benefits of luzerne biologically fixed nitrogen and irrigation water too.

A Model Suiting Small Farm Diversification : A Case Study from India

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Nearly 65 per cent of the Indian population is dependent upon agriculture to earn livelihood and employment. More than 50 per cent of the farmers in India cultivate less than one ha (2.5 acre) land holding. To earn reasonable livelihood from such a small land holding for a family of 5-6 persons and an equal number of cattle is a debatable issue. Further, in the present scenario of increasing human and livestock populations; decreasing land to man ratio; conversion of productive agricultural lands for non-agricultural use; deteriorating natural resources (soil, water, climate and biodiversity) and decreasing total factor productivity (in single crop, commodity and enterprize based farming), a new research and development strategy is called upon to restore livelihoods of small and marginal farmers. Concerns of quality-conscious society with increased demand for organic food, increasing indebtedness of farmers; WTO agreement and climate change triggered frequent occurrences of natural calamities like droughts and floods, heat and cold waves are other compelling reasons of a paradigm shift in our approach from single crop, commodity and enterprize-based farming to multi-enterprize agriculture. In the past, vast synergies available with different farm enterprizes remained largely under-exploited due to crop or commodity-driven policies. Changing consumption and demand patterns and emerging marketing and trade opportunities are offering ample opportunities for greater diversification of agriculture systems to suit to the