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The Nebraska Declaration on Conservation Agriculture **June 5th 2013**

1. We, a group of 43 scientists from a wide range of disciplines and international agricultural research and development organizations, have discussed and debated the scientific evidence regarding conservation agriculture for small-scale, resource-poor farmers in Sub-Saharan Africa (SSA) and South Asia (SA), and we have reached consensus on the following points.

2. The goals of conservation agriculture are to concomitantly:[i]

- Improve household food security and/or increase profit;
- Achieve substantial increases in crop yields and greater yield stability on existing farmland with climate and soils suitable for sustainable intensification;
- Reverse trends of natural resource degradation associated with crop production, with particular emphasis on increasing water capture and retention in soils, avoiding erosion, and improving or maintaining soil quality;
- Contribute to mitigation of emissions by reducing greenhouse gas emissions per unit of production; [ii]
- Help farmers adapt to climate variability and change

3. Most efforts to date in developing countries have promoted conservation agriculture as a package of three practices: minimum disturbance of soil (zero / minimum / reduced tillage); retention of sufficient crop residue to provide surface coverage; and diversified cropping patterns that include at least three plant species including one legume.

4. There is little evidence of widespread adoption of conservation agriculture in SSA or SA when strictly defined as this three-component package. In contrast, there is some evidence of adoption of one or two of these components in some parts of SSA and SA.

5. Like most farming practices, the main driver of adoption for conservation agriculture is a positive impact on profit and/or household food security (including reduced risk of crop failure, particularly important for resource-poor farmers). For most resource-poor farmers, the positive impact on soil properties or ecosystem services are important determinants of adoption only through their potential short-term effect on profits or reduced risk. Technologies that simultaneously meet farmers' short-term objectives while improving provision of ecosystem services must be identified by research and extension in order to achieve widespread adoption of practices with environmental benefits.

6. There are sound agronomic, economic, and/or social reasons why farmers have not adopted the three-component conservation agriculture package in SSA and SA. Typically this is because one or more of the components is not consistent with the objectives of small-scale, resource-poor farmers in these regions, or cannot be implemented given the constraints they face. For example, such farmers may choose not to adopt conservation agriculture due to an inability to access or purchase machinery, equipment, or inputs (e.g., small-scale seeders, or herbicides) necessary for conservation agriculture to perform effectively.

7. Benefits from retention of crop residues in the soil are small at the low average yields typical of many parts of SSA and SA. While there is evidence of reduced runoff and erosion, and greater infiltration in some cases, with relatively small amounts of residues left on the soil surface (e.g. 1.5 t/ha), crop residues are of high value as fodder or fuel in many agricultural systems of SSA and SA, and can account for a large portion of total crop value. Understanding and quantifying tradeoffs between the benefits of residue retention to future crop productivity and soil quality, versus its value for other uses, is an important research priority for major agricultural systems in SSA and SA.

8. To play a significant role in low-productivity, resource-poor agricultural systems in SSA and SA, efforts to reach the goals outlined in point 2 should be broadened beyond a focus on the package of three main CA agronomic practices. Additional emphasis should be placed on diagnostic agronomy and participatory on-farm research to identify biophyiscal and socioeconomic constraints to increased crop production, and to guide farmers in finding solutions from among a broader range of sound agronomic practices that achieve the underlying or fundamental goals of conservation agriculture. An expanded list of practices would include: crop rotation, relay-cropping and inter-cropping; retention of crop residues; green manure, cover or fodder crops; zero, reduced, or minimum tillage; appropriate use of organic and inorganic nutrients; improved weed and disease management techniques, equipment and herbicides; use of physical soil or water conservation structures (bunds, drainage, grass contours and waterways, planting basins). There is no fixed recipe for how these practices should be optimally combined for a given agricultural system.

9. There is a critical need to better understand how these component practices affect yield, farmers' profits, soil quality, water consumption, ecosystem services, and the trade-offs among these factors at multiple scales of analysis (field, farm, watershed, region) in major agricultural systems of SSA and SA.

10. Systematic efforts are needed to assess the suitability and viability of management options and practices, given farmers' objectives and constraints, to better target the extrapolation domain of conservation agriculture practices and technologies within existing agricultural systems of SSA and SA. Long-term investment is required in collaborations that bring together researchers with farmers, farmers' assocations, extension agents, non-governmental organizations, community groups, public administrators, and private sector providers of CA-related products and services. Diagnostic agronomy and participatory on-farm research are useful approaches, alongside model simulations, to evaluate *ex-ante* the potential impacts of adopting CA practices and technologies on farm-level objectives and on ecosystem services. Outputs and outcomes from these coordinated research efforts will enhance effectiveness of extension approaches to support adoption of a broader range of conservation agriculture practices and technologies (outlined in point 8) at scale.

11. Rigorous studies are needed to assess and better understand the process of adoption of conservation agriculture in SSA and SA. Such studies will be instrumental in explaining who adopts conservation agriculture practices and why. Equally important in such studies is to understand the reasons for non-adoption and dis-adoption. These studies should lead to better targeting and recommendation domains for policies that address socioeconomic and biophysical constraints to adoption.

12. Also needed is a better understanding of the role that financial or in-kind incentives have played in promoting conditional acceptance of conservation agriculture practices used in some development projects in SSA and SA. At issue are the most effective kinds of economic instruments that can incentivise long-term, sustained adoption. Randomized control trials of extension programs or incentive mechanisms designed to reduce the costs or risks associated with adoption offer a rich set of targets for future studies.

13. Based on critical review of the literature on impacts of conservation agriculture on soil carbon sequestration and GHG emissions, payment for carbon credits does not appear to be a viable driver for promoting widespread adoption of conservation agriculture technologies by smallholders. However, there may be cases where economically efficient payment schemes can be established for ecosystem services seen as public goods such as reduced erosion and nutrient loss (thus preventing water pollution and siltation of waterways and reservoirs), and building or maintaining soil productivity for future generations.

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FOOTNOTES:

[i] These objectives build upon the five objectives in the "New Delhi Declaration" on conservation agriculture from the 4th World Congress on Conservation Agriculture, February 2009 by; (i) including an explicit focus on increased yields on existing farmland rather than simply doubling agricultural production, (ii) including greater yield stability in addition to increasing production, (iii) a focus on productivity rather than efficiency of resource use, (iv) excluding an objective related to avoiding indirect land use change—which is difficult to quantify and not directly linked to farm-level benefits of conservation agriculture, and (v) including an objective for increased profit as a result of achieving higher input productivity.

[ii] Emissions per unit production is a yield-adjusted variable in units of kg CO_2-equivalents/metric ton of economic yield as grain, sugar, forage, or energy depending on the crop species and desired economic product.