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Preface
Global pioneers in soil conservation: Common elements and lessons learned

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Introduction

This Special Issue of the Journal of International Soil and Water Conservation Research is dedicated to those pioneers in soil conservation, farmers, researchers and extentionists, who questioned tradition and implemented new theories and new technologies in soil conservation. These pioneers recognized the often devastating impacts of agricultural land and soil degradation, and their observations of the impacts of intensive tillage and soil erosion led them to try new technologies such as zero till, no-till, direct seeding, stubble and residue mulching, and various other conservation tillage practices. Their successes are significant, because through these approaches, the pioneers laid the ecological foundation on which a more sustainable agriculture could be developed.

The papers in this issue include success stories from various regions including North and South America, Australia, Europe, and China. The papers are put in context with an international overview paper on global soil conservation (Kassam et al., 2014, this issue). While we recognize that there are other "No-Tillage pioneers" deserving recognition for their risk-taking, innovation and contributions, we do not attempt to provide complete, comprehensive coverage.

Healthy soils are fundamental to support all forms of terrestrial life on the planet, and they are the foundation for a sustainable agriculture and for a sustainable future. However, land degradation, including in particular soil erosion, organic matter loss, soil nutrient loss, and soil compaction, has increased severely as agriculture has moved from low input, high labor, small holder systems, to modern, large, highly mechanized, low labor systems. On these modern farms, the use of large, heavy, and often high horsepower machines, travelling at speeds higher than necessary, often mask concerns on conserving the quality of the soil on which production and environmental services depend. This is most prevalent in developed country agriculture, but the trends are similar in many developing countries. The principles that ecologically underpin sustainable soil and production management, as described in the papers in this issue, are potentially applicable to large or small farms, rich or poor farmers, tropical or non-tropical agro-ecologies (Jat et al., 2014).

Efforts to control land degradation and soil erosion can be traced over millennia. Although some local successes have been achieved, on a global level results have not been significant. Montgomery (2007a) explains the impacts of poor soil management on civilizations that have arisen and then vanished. Many once thriving civilizations eventually collapsed due to, amongst other things, soil erosion, salinization, nutrient depletion and other types of land degradation. Are we any different? In modern history, land and soil degradation has continued unabated, in fact, it has increased severely over the past century, sometimes to the point that it has threatened the continuation of agriculture in countries most susceptible. This may appear alarmist, but the evidence is there.

Mechanical tillage, leading to destruction of soil life, loss of soil organic matter and soil structure, along with reduced water infiltration and soil moisture holding capacity, is recognized as one of the most significant root causes of soil degradation and erosion. The damage to the soil system caused by mechanical tillage cannot

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be put right by simply adding more agrochemicals and pesticides, and even more mechanical soil disturbance. So, what to do? Recently, some significant successes have been achieved, and perhaps we should look here first and follow the examples of the successful pioneers. This is the purpose of this Special Issue. In this, we have brought together for the first time, the evidence of how this is happening and where. Also, we honor those pioneers, farmers, researchers, and extentionists, whose work, dedication, and innovation have made this possible. Their stories must be preserved before it is too late; we have much to learn from these forward thinking people.

In most cases, the original pioneers were individual farmers who observed tillage-induced erosion on their farms and questioned and challenged traditional agricultural practices, in particular the need for soil cultivation (inversion tillage) prior to seeding. In their minds, it was better to do it the way nature intended. The no-tillage pioneers were keen observers of the resources of their farms. Their creativity and innovation led them to the conclusion that there must be a better way to manage their soils for greater productivity and resilience. These farmers, with close support from dedicated researchers and extensionists, devised solutions to replace these soil and landscape degrading practices. The solutions were radical for their time (and still are to some), and the practitioners were often ridiculed by their peers and by some scientists, but they stuck to their convictions, and over time these pioneers demonstrated what was possible with the new approaches.

So what did they do right, and what can we learn from them? Why, after millennia of past efforts in soil conservation, which at best were only marginally successful, these pioneering efforts are much more so? What are the common elements? What are the lessons learned? What more do we need to know?

This Special Issue reports on these success stories at the country level. Each story is unique; each pioneer (s) began his efforts for personal reasons. In the early years, their efforts were local and individual, but as the interest spread and more farmers came on board, they formed farmer-led local and national farmer associations, cooperatives and clubs to promote the philosophies and concepts based on working together and leaning by doing. These progressive farmers, doing some of their own on-farm research, shared their lessons and experience with fellow farmers with similar interests. Much of the success is attributed to this farmer to farmer communication and sharing of information and experimental knowledge. Eventually these local associations (clubs) coalesced into national and international associations, and progressed to a global movement for Conservation Agriculture.

The papers illustrate and reinforce the value and coincident knowledge gained when combining analogue observations of farmers with relevant scientific studies. In fact, it is in this combination of farmer-scientist collaboration that the biggest gains have been made.

Definitions and concepts

Each paper in the Special Issue reports the technologies that are used in their countries in terms common to them. Therefore, there are terms such as zero-till, no-till, conservation tillage, Conservation Agriculture, and so forth. Originally, it was thought that perhaps these terms should be standardized, but then this may cause some local confusion. In the final version, the terms were left as they are used in their respective countries.

Effectively, all these terms fall under the umbrella of the FAO definition of Conservation Agriculture (Friedrich et al., 2012). This is based on three interlinked principles of: minimising or avoiding mechanical soil disturbance (no-till seeding), maintaining a continuous soil cover of organic mulch, and cropping system diversification. The latter involves sequences and rotations of annuals, perennials and cover crops, all aimed to improve and sustain a healthy soil capable of responding optimally to modern crop, nutrient, water, pest and energy management practices. The concept also includes precision and controlled traffic farming.

There is no universal recipe, formulae or prescription for Conservation Agriculture, nor should there be. However, the three interlinked core principles are potentially applicable to most land based rain-fed and irrigated production systems, including annual and perennial cropping, horticulture, plantation, agroforestry, and crop-livestock systems. In all cases, these principles are implemented based on locally formulated and locally adapted practices to address local biophysical and socioeconomic constrains and locally relevant multiple farming goals. At the same time, there are no short cuts; the aim is to eventually reach the point where all three principles become complementary and where the synergy gained can assure success. Collectively, the practices contribute to enhancing soil quality, soil health, and soil resilience. They become the ecological foundation for sustainable production intensification and the continued flow of ecosystem services. The concept of Conservation Agriculture is increasingly being accepted throughout the world.