



Farmers' Perceptions of Conservation Tillage Practices in Israel: Constraints to Adoption and Tools to Solve Them

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Thriving and sustainable agriculture depends on healthy and resilient ecosystems. Tillage has a significant impact on agro-ecosystems. The intensive use of the plow throughout the years has caused serious soil erosion, which has degraded many ecosystem services. Soil loss is irreversible in the near future. In Israel it has been estimated by experts that soil loss varies on average between 0.5 to 4 mm annually.¹

Conservation tillage practices have evolved as an alternative to conventional tillage, and their goal is soil conservation and enhancement of water percolation capability. Their guiding principle is reducing soil tillage practices to the minimum necessary. They include mainly: minimum tillage, no-tillage and addition of organic matter. By 2010, no-till was practiced on about 111 million hectares globally, an annual growth

rate of 6 million hectares (Derpsch et al. 2014). A review of conservation agriculture shows that no-till technologies are known to be very effective (Palm et al. 2014; Lal et al. 2007) and the awareness of their advantages is growing. Nevertheless, many farmers still struggle with conservation tillage adoption (Coughenour & Chamala 2010) and the body of research on constraints regarding its adoption is continuously growing (see Knowler & Bradshaw 2007; Wauters & Mathijs 2014) but has not been thoroughly studied in Israel yet (except for general studies such as Banded et al. 2014, and Sagie et al. 2015). In Israel, the development and spread of conservation-tillage began in the 1990s. The Ministry of Agriculture is making efforts to expand its implementation by providing monetary support to the farmers, but these efforts have succeeded only partially.

This research focuses on the farmers, as they are the chief decision makers in soil conservation and therefore the key to succeed in these efforts. Thirty-one farmers have been interviewed from two regions chosen for the research: 1) North of Israel: the Harod Valley, the Jezreel Valley the lower eastern Galilee and Ramat Menashe. 2) South of Israel: the Northern Negev, Shikma Park and the surrounding area. The sample of farmers comprised about 70% of the farmers in each area chosen. The total area of the interviewees' fields totaled more than half a million dunam. The total area farmed by those interviewed in the South was 3.5 times larger than that of the farmers in the North. The research also included background interviews with additional stakeholders working with the farmer such as agricultural extension service instructors, heads of the regional agricultural organisations and Ministry of Agriculture officials, which also supported and escorted the research process.

The results show that: 65% of the farmers interviewed implement conservation tillage practices, while 30% implement them slightly and 5% do not implement them at all. Only half of the farmers implement the practice of no-tillage, while in the North the implementation is much higher than in the South. All farmers feel personally committed to the principle of soil conservation and believe it is the responsibility of the farmer and the country together to conserve the soil. Most of the farmers are aware of soil erosion incidents, but awareness of the link between conventional tillage and erosion incidents is lacking. Three-fourths of the farmers applied for the Ministry of Agriculture's monetary support for conservation tillage. The reasons given for not applying were: lack of awareness of its existence, belief that they were not eligible based on the criteria, or a process that was too complicated. The farmers interviewed prioritized three policy tools as most effective for conservation tillage implementation: larger monetary support from the government, research and development and personal agriculture guidance.

By conducting statistical correlation tests we have identified characteristics of 'adopting' vs 'non-adopting' farmers. The outstanding traits of 'adopting farmers' are: a strong ideology regarding soil conservation; a tendency to believe that the country should impose soil conservation practices; awareness of the damage caused by conventional tillage; experience of

severe erosion incidents in their fields and in the infrastructure surrounding them; close collaboration with the soil conservation unit at the Ministry of Agriculture; and participation in several soil conservation seminars.

The 'non-adopting farmers' are characterized by: a tendency to be conservative and risk averse and a tendency to view agriculture as a business which should only be influenced by market forces. They feel they lack guidance in conservation tillage, and know few farmers that implement it. They have not attended conservation tillage seminars or attended only a few. Nevertheless they do acknowledge the importance of conservation tillage.

The research concludes with the following recommendations:

- 1) Continuation and expansion of the process of exposing farmers to erosion incidents and the benefits of conservation tillage through seminars, close collaboration with the regional soil conservation unit, and agricultural extension service instructors;
- 2) Designation of agricultural instructors that will specialize in conservation tillage, gather all existing knowledge in the field and promote research and development on conservation tillage practices complying with the farmer's region/field, with emphasis on issues such as: pest and weed management, climate change and soil cover solutions;
- 3) Implementation of policy tools to alleviate the risk in the transition to conservation tillage. One option entails adjusting the existing field-crops-insurance-programs to fit conservation tillage criteria and increase the country's monetary participation in the insurance. In addition, increasing the existing monetary support and simplifying the application process will help to expand conservation tillage implementation;
- 4) Finally, we suggest a 'conservation tillage transition basket' that will include: monetary support, designated-individual guidance and programs constructed on the basis of analyzing the existing knowledge and research.

One of the main products of the research is the collection of valuable data regarding the farmers' experience with conservation tillage and their perceptions on soil erosion and conservation tillage. We believe that the findings of the research and the data gathered will effectively serve stakeholders and decision makers in their work for improving soil conservation.