



## CONSERVATION TILLAGE TECHNOLOGIES

### TECHNOLOGY DESCRIPTION

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Conservative agriculture reduces the disruption of soil structure by minimizing tillage. The technology allows raising soil carbon content by ensuring carbon dioxide sequestration. Additional mitigation benefits are achieved because of less intensive use of fossil fuels by agricultural machinery.

Land preparation for seeding or planting under no-till technology involves slashing or rolling the weeds, previous crop residues or cover crops; or spraying herbicides for weed control and seeding directly through the mulch. Crop residues are retained either completely or to a suitable amount to guarantee soil cover; fertilizer and amendments are either broadcast on the soil surface or applied during seeding.

The conservation tillage technology also includes such practices as cover crops and the use of mycorrhiza, which both increase soil carbon content and contribute to carbon sequestration. Cover crops most typically used in Ukraine include winter rye, lupine, lea, and oilseed radish. Mycorrhiza increases the total volume of root systems by 20-100 times improving the supply of water and nutrients.

Application of the technology results in operational savings due to less labour time required, fuel cost savings (reported savings ranges 27-44 litres per ha), lower machinery repair and maintenance costs; and reduced use of irrigation water compared with conventional practices. At the same time, there is a risk of the reduced economic efficiency due to lower yields after transition to conservation tillage practices, especially during the conversion period (3 to 5 years).

Ukrainian agricultural companies actively experiment with no-till and other conservation tillage practices and some companies operate almost exclusively applying no-till practice.

#### CLIMATE RATIONALE OF THE TECHNOLOGY

Agriculture sector is an important driver of national economic growth, expansion of export volumes, as well as food security. At the same time, agriculture sector has significant contribution to total greenhouse gases emissions in Ukraine with the total volume of emissions estimated at the level of 99 Mt CO<sub>2</sub>-eq. for 2019. The main sources of emissions include soil organic carbon loss at cropland (51%), agricultural soils (33%), enteric fermentation (8%), fuel use by agricultural machinery (6%), and manure management (2%). Ukraine's updated NDC has a target to reduce GHGs emissions by 65% compared to 1990 levels in 2030 and support of climate technologies in agriculture would support achieving the target and sustainable development of agricultural sector.

Conservation tillage contributes to the reduction of GHGs emission because of increased CO<sub>2</sub> sequestration, reduced emissions of CO<sub>2</sub> from fossil fuel combustion by agricultural machinery, and reduced soil mineralization.

Carbon sequestration rates resulting from no-tillage application are in the range of 200 – 500 kg of C per ha per year, which correspond to GHGs emission reduction at the level of 0.7-1.8 tons CO<sub>2</sub> per ha per year. Assuming the conservative estimate of carbon sequestration rate and potential for no-tillage technology application at the area of 10 million ha, total potential of reduction of GHG emissions are estimated at the level of 7 Mt CO<sub>2</sub>-eq.



## AMBITION OF THE TECHNOLOGY

### SCALE FOR IMPLEMENTATION AND TIME-LINE

The implementation of the technology has large scale potential in Ukraine. The areas of agricultural land under conservative tillage practices could be significantly extended in the medium-term perspective and reach 10 million ha by 2030 (from the current estimated level of approximately 2-3 million ha). The application of the technology and potential limitations should be analysed on a case-by-case basis, taking into account the types of crops produced and climatic conditions. Conservation tillage technologies are well suited for the plain relief, but more complicated to implement on hilly fields and mineralized soils.

### EXPECTED IMPACTS OF THE TECHNOLOGY

The implementation of technology supports national environmental priorities on the reduction of soil erosion and agricultural run-off minimization through keeping biomass residues in fields. Tillage is the main driver of soil erosion, which is a growing environmental problem in Ukraine. Conservation tillage improves the chemical, physical, and biological characteristics of the soil, as well as increases soil organic content. Cover crops also reduce the land degradation by protecting soil from wind erosion and water erosion. Conservation tillage also contributes to more efficient use of water resources because of the reduced evaporation and more efficient use of water by plants. Cover crops also improve the quality of soil by mobilizing phosphorus and micro-elements from soil increasing their availability for plants, as well as increasing nitrogen quantity in soils.

Increased soil organic content leads to carbon sequestration and climate change mitigation benefits, while higher water retention capacity creates significant climate adaptation co-benefits due to lower dependency on weather conditions and more efficient water resources use.

### POLICY ACTIONS FOR TECHNOLOGY IMPLEMENTATION

#### EXISTING POLICIES IN RELATION TO THE TECHNOLOGY

One of the goals prescribed by the Law of Ukraine On the Main Grounds of the State Environmental Policy of Ukraine for the Period till 2030 (2019) is ensuring the integration of environmental policy in the decision-making process with respect to the social and economic development of Ukraine. This includes the task of climate change mitigation and adaptation, as well as the sustainable low carbon development of all areas of the Ukrainian economy.

The agriculture sector is reflected in the existing strategic documents related to national climate policy but there is insufficient coverage of climate change mitigation activities in sector-specific policy documents and the lack of policy tools which promote climate technologies in the agriculture sector. There are no specific policies targeting conservation tillage practices, but some machinery and equipment for no-till and similar technologies are eligible for state support scheme providing partial compensation of equipment cost. New policies are expected to be developed to support the transformation of agricultural sector and achievement of updated NDC target under the Paris agreement.

#### PROPOSED POLICIES TO ENHANCE TECHNOLOGY IMPLEMENTATION

The common policy measures that could streamline the diffusion of climate technologies in agriculture in Ukraine include introduction of environmental and climate related conditions for the provision of state subsidies, strengthening and improving regulatory requirements, capacity building policies, information policies and supporting the development of project-based carbon crediting mechanisms. Specific actions and activities to support the development of conservative tillage are presented in the table below.



Actions	Activities
1. State subsidies	1.1 The amendment of paragraph 3 of the Order for the Use of Funds Dedicated in the State Budget for Financial Support of Agricultural Producers (approved by the Decree of the Cabinet of Ministers of Ukraine #77 dated 08.02.2017) with the inclusion of conservative tillage technologies in the list of activities supported.
	1.2 The adoption of the Order of the Cabinet of Ministries of Ukraine On the Procedure of the Use of Funds Dedicated in the State Budget for the State Support of Conservative Tillage (Order for the Provision of State Support for Conservative Tillage) with annual adjustment of the procedure
	1.3 Gradual increase in the financing volume for conservative tillage support in the state program of agricultural support
2. Soil quality monitoring system	2.1 The approval of soil quality monitoring standards with synchronization of approaches and methods for soil sampling and soil analysis.
	2.2 The development and approval of the Law of Ukraine On Soil Protection and Preservation of Fertility in line with the in the National Action Plan to Combat Land Degradation and Drought.
	2.3 The development of national soil quality database, including national soil organic content map, on the basis of soil quality studies and approved data sharing arrangements.
	2.4 The incorporation of soil quality studies in the concept of state scientific and technical program in the area of climate change and projects supported by the National Research Foundation of Ukraine
3. Supporting the development of project-based carbon crediting mechanism	3.1 The approval of the Decree of the Cabinet of Ministers of Ukraine on voluntary carbon emission reduction projects (with the provisions on notification of designated national authority and procedure for receiving feedback, possibility to permanently cancel national carbon units in lieu of voluntary carbon projects)
	3.2 Developing guidance on monitoring, reporting and verification of GHGs emission reductions during agricultural activities.
4. Capacity building policies	4.1 The inclusion and promotion of climate technologies in agriculture in the activities of farm advisory services (including conservative tillage), involvement of private advisory service providers, and capacity building activities for the experts of farm advisory services in line with the Law of Ukraine On Agricultural Farm Advisory Services
	4.2 Developing educational program for universities and vocational schools about climate technologies in agriculture (including conservative tillage)

## COSTS RELATED TO THE IMPLEMENTATION OF POLICIES

The implementation of actions and activities included in the TAP will require capacity building via the promotion of conservative tillage within the activities of farm advisory services and developing educational program for universities and vocational schools about climate technologies in agriculture.

The implementation of technology requires significant capital investment in the procurement of specialized planters (direct seeders or modified seeders) as well as the equipment for herbicides and fertilizers input. The scale of the required investment depends on the specific technology and equipment to be utilized and could be estimated in the range of USD 100 – 200 per ha.

Initial expenses for the implementation of activities required for the creation of the enabling framework for the dissemination of technology are estimated at the level of up to UAH 549 million per year with the most significant share of funds for state subsidies (UAH 500 million is suggested to be provided for state support scheme, UAH 30 million for the improvement of soil monitoring system and remaining funds for capacity building and information support).



## USEFUL INFORMATION

### CONTACT DETAILS

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### LINKS TO TNA REPORTS

Reports prepared within the TNA Project:

- Technology Needs Assessment
- Barriers Analysis and Enabling Frameworks
- Technology Action Plan

Full texts of the TNA reports are available at: <https://tech-action.unepdtu.org/country/ukraine/>

TNA Project page at the web-site of the Ministry of Environment and Natural Resources of Ukraine:  
<https://menr.gov.ua/news/33450.html>