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EVALUATING CARBON FARMING PRACTICES: A SYSTEM DYNAMICS MODEL FOR SOIL ORGANIC CARBON MANAGEMENT IN AGRICULTURE

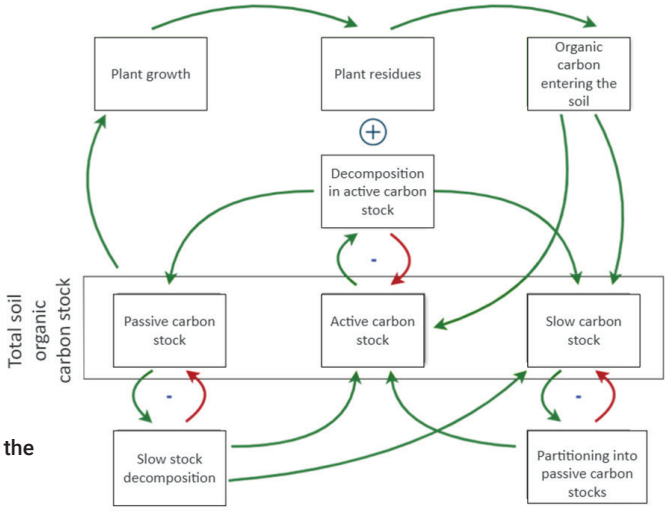
Vanda RAGOVSKA[1], Pål Ingebrigt DAVIDSEN[2], Jelena PUBULE[3]*, Dagnija Blumberga[4]

[1–4] *Institute of Energy Systems and Environment, Riga Technical University, Azenes iela 12/1, Riga, LV-1048, Latvia*

* ***Corresponding author.*** *Email address: jelena.pubule@rtu.lv*

Abstract – Agriculture generates a significant number of emissions. Most of the emissions from agriculture are emissions from soil management. Carbon farming practices are being proposed in the industry to promote sustainability and mitigate climate change. The aim of the research was to create a system dynamics model capable of predicting and representing changes in the amount of organic carbon in soils under the influence of various agricultural practices and, using the created system dynamics model, to find out the influence of various agricultural practices on changes in organic carbon stocks. The tasks included literature analysis, creating and simulating a system dynamics model, and obtaining results on the effectiveness of selected agricultural practices. A system dynamics model was created based on the data obtained from the literature analysis and the IPCC guidelines on emission inventories. It was obtained from the model that using direct seeding in combination with the inclusion of cover crops in crop rotation planning over 10 years increases the total amount of soil organic carbon the most – by 7.5 tons/ha or 12. It was concluded that reducing the intensity of tillage and increasing the amount of plant residues contributes to the greatest increase in the total carbon stock. The greatest losses or emissions occur when the intensity of tillage and the amount of plant residues increase.

Keywords – Agriculture practices; carbon farming; carbon sequestration; emissions; modelling



The main causal relationships of the system dynamics model

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