

## ABSTRACT OF DOCTOR OF PHILOSOPHY THESIS

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Name of thesis: **“Research to determinate the quality model of soil erosion suitable for typical agricultural system on sloping land”**  
Specialization: Water Resources Engineering  
Code: 9-58-02-12  
Postgraduate organization: Vietnam Academy for Water Resources

### CONTENT OF THE ABSTRACT

#### 1. Object and purpose of the thesis

##### 1.1. Research purposes

- Evaluation of quantitative soil erosion models, determining factors affecting soil erosion and applicability in conditions in Vietnam.
- Study the characteristics of the agricultural farming system, the distribution of ground cover by crops and the distribution of rainfall to correct the crop factor (C) in accordance with the typical farming system. on sloping land in the Northern mountainous region of Vietnam.
- Evaluate and propose a model for predicting soil erosion suitable for farming systems on sloping land in the Northern mountainous areas of Vietnam.

##### 1.2. Research object

(i) Sloping land and popular agricultural farming systems on some of the main soil types in the Northern mountainous region of Vietnam; (ii) Typical agricultural farming models on sloping land in the Northern mountainous region; (iii) Quantitative models such as USLE, MMF models and some other models.

#### 2. Research Methods

- Experimental method
- Inheritance and data collection method
- The quantitative models Methods
- Calibration and validation model methods

#### 3. The main results

##### 3.1. The scientific meaning

- By conducting research to apply quantitative soil erosion models to farming systems on sloping land of the world in the conditions of Vietnam, using experimental studies, forecasting models in Vietnam to study and calibrate the model from which to select a model for predicting soil erosion suitable for the Northern mountainous region of Vietnam.
- Proposing specific calculation methods to apply the model appropriately for typical agricultural farming model on the steep slopes of the Northern mountainous region of Vietnam.
- Completing the calculation methods, determining the parameters of the quantitative model on sloping land, providing the scientific basis of sustainable agricultural management production by structural, non-structural or combination methods.

##### 3.2. The practical meaning

- The research results have provided a method to correct the crops factor (C) and a suitable soil erosion prediction model for the Northern mountainous region of our country.
- Forecasting is more accurate than currently applied conventionally. The prediction of soil loss due to erosion and analysis of factors affecting soil erosion at the soil erosion test sites will be the basis for making appropriate farming and tillage techniques to minimize soil erosion.

### **3.3. New contributions of the thesis**

- The crops factor (C) has been adjusted based on the distribution of crop cover, rainfall and soil impact techniques suitable to farming conditions in the Northern mountainous area of our country.

- The conventional and corrected models of erosion prediction and crops factor (C) have been tested, based on the test results, a suitable soil erosion prediction model has been developed for the Northern mountainous area of Vietnam.

## **4. Conclusions and further researches**

### **4.1. Conclusions**

- The results of evaluation, calculation and correction of the C factor from the monitoring plots with 39 experiments with the C factor, look up from the table of the ISSS, show that the C factor looked up from the table is higher than the C factor calculated from the erosion monitoring plots from 1.32 to 20.0 times, an average of 6.07 times. This large difference will lead to errors compared with actual observations in forecasting and assessing erosion.

- The results of using the universal soil loss equation to test show that using the corrected C factor gives better forecasting results than using the C factor, looking up the ISSS table. This is shown by the value of the correlation coefficient R, the forecast results with the coefficient C look up the table of the ISSS and correct it as 0.69 and 0.8 and the RMSE is 82.09 and 11.0,1 respectively. The correction method has overcome limitations due to the fact that the distribution of canopy cover is not taken into account, the arrangement of the crop structure (monoculture, rotation, intercropping), rainfall, and tillage techniques compared with the common method.

- The results of using two models to predict soil erosion show that the USLE model predicts the amount of land loss ranging from 1.28 - 67.64 tons/ha/year; MMF model is 2.85 - 10.84 tons/ha/year compared to the measured amount of soil erosion ranging from 0.63 - 64.45 tons/ha/year. The mean square error (RMSE) of the USLE and MMF models compared to the observed values is 11.01 and 21.62, respectively, which shows that the USLE model is better predictor than the MMF model.

- Comparing the forecast results of the USLE and MMF models using the corrected C factor shows that using the USLE model with the C factor after correction applied to the Northern mountainous area Vietnam gives a better forecast of soil loss due to erosion.

### **4.2. Further researches**

- Research on solutions to expand the technique of crop rotation and intercropping (compared to monoculture) to reduce the amount of soil being eroded.

- It is recommended to continue to study in more detail with the coverage and rainfall in each month of the year to serve as a basis for more accurate erosion prediction and solutions to reduce soil erosion.

Supervisor



**Prof., Dr. Nguyen Trong Ha**

Hanoi, June 25, 2021

Graduate student



**Tran Minh Chinh**