

**Technical Working Party on Testing Methods and Techniques**

TWM/1/8

**First Session****Virtual meeting, September 19 to 23, 2022****Original:** English**Date:** August 29, 2022

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**DEVELOPMENTS ON THE IMPROVED COYU METHOD (SPLINES)***Document prepared by experts from the United Kingdom**Disclaimer: this document does not represent UPOV policies or guidance*

## EXECUTIVE SUMMARY

1. The purpose of this document to give an update on developments on the improved version of the Combined Over Years Uniformity (COYU) criterion using splines. It reports on a test campaign for the software implementing the new method, and the subsequent software development.
2. The document should be read along with document TWP/6/11 “The Combined Over Years Uniformity Criterion (COYU)”.
  - (a) The TWM is invited to note the developments.

## BACKGROUND

3. The Combined Over Years Uniformity (COYU) criterion is a method used to assess uniformity on the basis of measured quantitative characteristics (see document TGP/8/3 “Trial Design and Techniques Used in the Examination of Distinctness, Uniformity and Stability”). Previously, the development of an improved method has been reported. For further background on the improved method using splines, see document TWC/38/6 “The Combined Over Years Uniformity Criterion (COYU)”.
4. Previously, it was noted that software had been developed to support the implementation of COYU with splines. This software is available in two forms: as a package for R, and as a module in DUSTNT.
5. DUSTNT is a software package for the analysis of data from DUS trials, and is freely available (see document UPOV/INF/16/9 “Exchangeable Software”). This software is not only used routinely by a number of members, but has been used for benchmarking software for COYD and COYU. As part of the process of incorporating the new module, the installation process has been updated to fit the current Windows model.
6. The version in the form of an R package is suitable for those members already using R software for DUS analysis. R is freely available as is the COYU package. The COYU package is available either as source code or as a more easily installed R library binary.

## EVALUATION OF THE NEW SOFTWARE

7. In early August 2021, a circular was sent out by the UPOV Office to seek participation in the testing of the new software. This campaign was due to be completed by the end of December 2021. Both forms of software were made available for evaluation.
8. Many members took part in the exercise, as evidenced by downloads of the evaluation version of DUSTNT. The following gave feedback following their evaluations: Czech Republic, Finland, Slovakia, United Kingdom. The development team is very grateful for these valuable responses.

9. Whilst overall feedback was positive, a number of software improvements were identified for the DUST version.

#### FURTHER DEVELOPMENT OF SOFTWARE INCORPORATING THE NEW COYU METHOD

10. The following improvements to the DUSTNT software were identified from the testing campaign:

- Improvements to the reports, including formatting and extra information;
- Criteria for flagging data sets that are too small;
- Extra tables in csv format;
- Improved graphics;
- Modification of flagging of cases with extrapolation;
- Managing diacritics in file and directory names.

11. At the time of writing, many of these identified improvements have been coded. An update will be given at the TWM.

12. Once the improvements have been incorporated and tested, a new version of DUSTNT incorporating COYU with splines will be launched.

#### INTRODUCTION OF COYU WITH SPLINES IN THE UNITED KINGDOM

13. The United Kingdom has started a process of introducing COYU with splines into DUS testing.

14. This year, comparisons have been made between the old COYU method (moving average) and COYU with splines using historical data. Crops covered included perennial ryegrass, pea, onion, swede, and oilseed rape. Few differences in decisions were found, and in only a small number of marginal cases which was to be expected. The work highlighted the importance of the extrapolation issue (see below).

15. Following this study, the United Kingdom is considering the way forward.

#### EXTRAPOLATION

16. Extrapolation is a key issue for COYU and is discussed in document TWM/1/7. This is an issue particular to both versions of COYU, but was not identified with COYU (moving average).

#### GUIDANCE ON COYU WITH SPLINES

17. Guidance for the new method of COYU with splines has been drafted (see document TWP/5/11 The Combined Over Years Uniformity Criterion (COYU)).

18. The testing exercise indicated two areas for improvement to the draft guidance:

- To the criteria for indicating whether a data set is sufficiently large to allow use of COYU;
- To guidance on extrapolation.

19. The authors intend to propose improvements to the draft guidance following the session of the TWM.

*The TWM is invited to note these developments.*

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