A European Dataset of Artificially Drained Agricultural Areas

G.O. Hughes[1,#], S. G. Anthony[2]

[1] GeoSpatial Analytics Ltd, Wolverhampton, UK; [2] RSK ADAS Ltd, Wolverhampton, UK
Corresponding author: Greg.Hughes@GeoSpatialAnalytics.Consulting

ADAS

GeoSpatial Analytics

Introduction

The use of artificial pipe drainage in agriculture is an important control for soil waterlogging and shallow groundwater tables. A well-designed drainage system will reduce the risk of detrimental waterlogging to acceptable levels, increasing crop yields and the number of available machine working days (Figure 1). While the drains rapidly remove excess soil water they also facilitate the rapid movement of soil pollutants, like nutrients and pesticides, to surface water. An inventory of the extent to which soils requiring drainage have actually been drained using pipe drainage is an important input for spatially distributed models seeking to investigate the fate and behaviour of agricultural chemicals. In the absence of such data a gross assumption of complete drainage of all soils requiring drainage is often made. In addition, it is assumed that all drains are fully functional and operating as intended on the day of installation.

Methodology

The national estimates of artificial drainage for rainfed and irrigated agricultural land from a global dataset[1] were previously the most appropriate for use in European scale simulation modelling. However, this dataset is restricted for commercial purposes, utilises older data from the 1990's and considers both pipe and ditch drainage (it is not always clear what is included in the national estimates). A literature and dataset survey covering 32 countries was conducted, comprising the 27 European Union Member States, 3 European Economic Area countries (IS, LI, NO) as well as Switzerland and the UK. National estimates of the extent of pipe drainage estimated using diverse approaches ranging from agricultural surveys of farmers/drainage contractors to digitised field maps of historic installations were compiled into a revised agricultural drain database. From those publications that included data on the installation of drainage over time, a summary of the age of drains installed in various countries as an indicator of the likelihood that drains are still operating optimally was produced. Estimates of drain effectiveness/required maintenance as well as depth and spacing were also compiled.

Results

An interim updated digital map of the extent of pipe drainage in arable agriculture across Europe has been produced (Figure 2). The latest available figures for 2 countries are still being sought (DE & LT). For most countries the revised map represents a marked improvement over existing spatial datasets of artificial drainage as more recent and/or sub-national data is available. Analysis of possible drain age (Figure 3) indicates that many drains are likely >20 to 40 years old (CH, DK, FI, LT, LV, RO, UK). Estimates of drain effectiveness or state of maintenance were scarce (BE, NL, HR, UK). Limited information describing drain depth and spacing (NL, HR, UK) was identified.

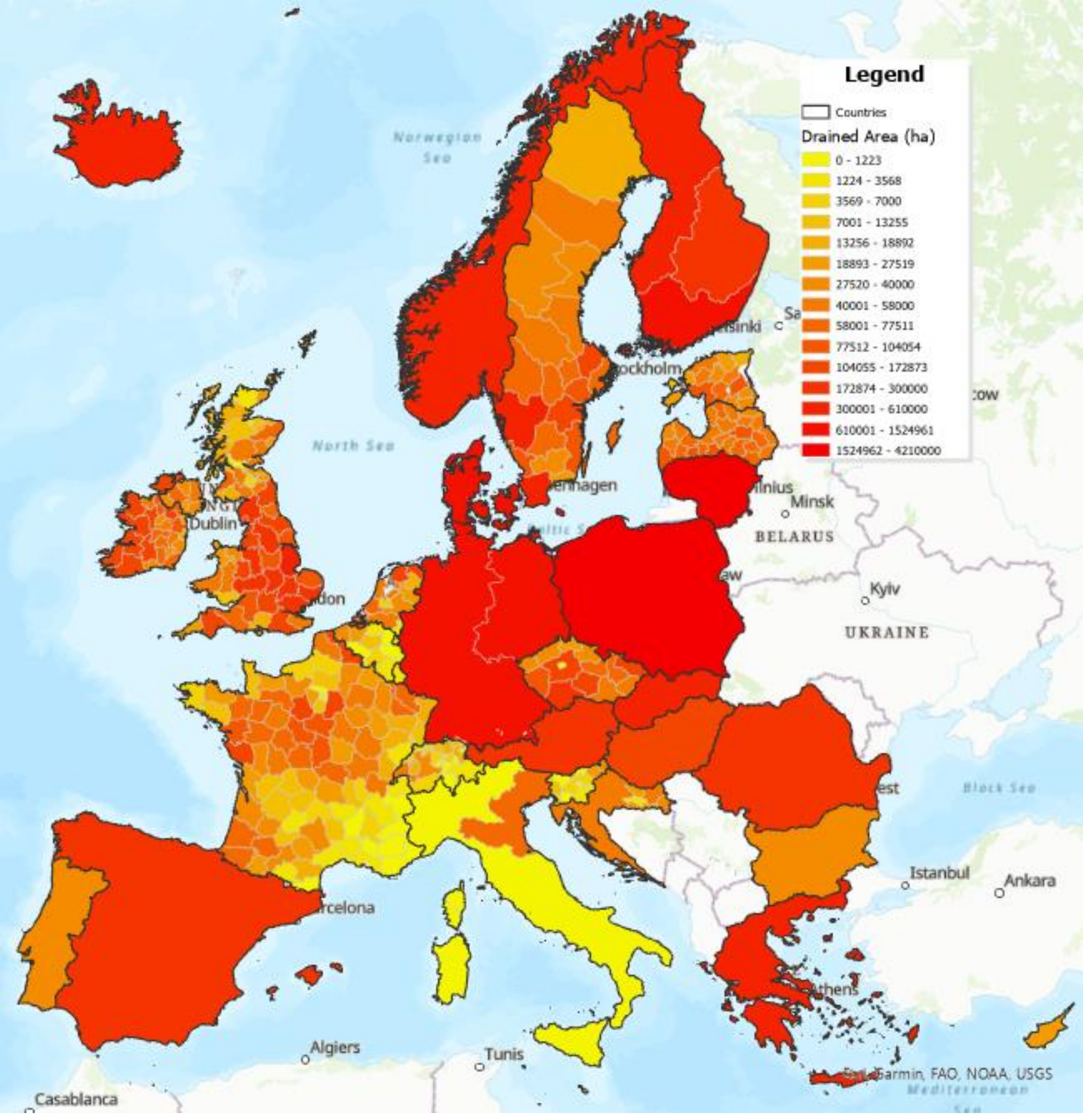

Figure 2: Interim map of the extent (ha) of agricultural pipe drains

Figure 1: Agricultural pipe drains increase available machine working days

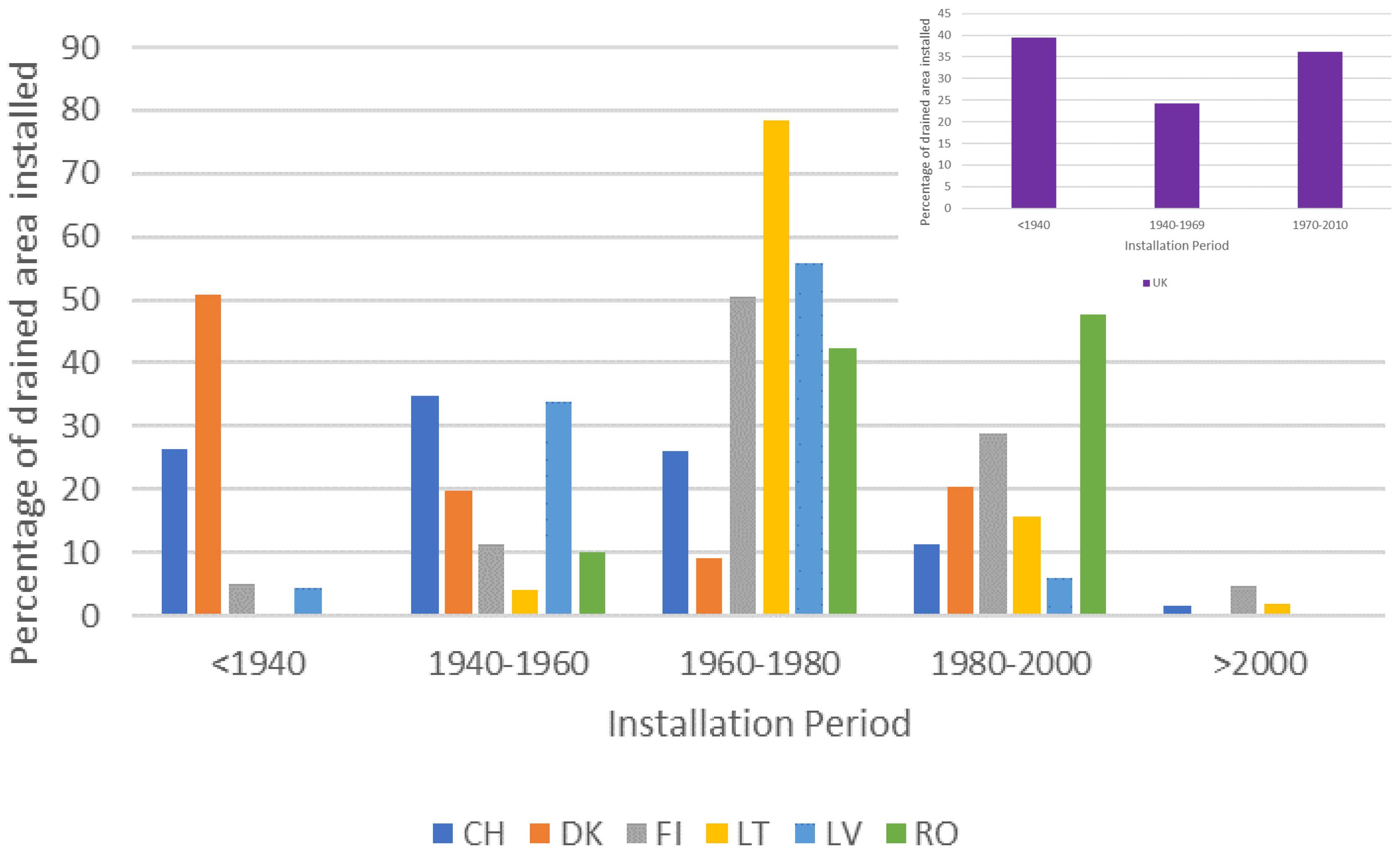

Figure 3: Histogram of drain installation area (%) by period

Conclusions and Next Steps

An updated digital map of the extent (ha) of pipe drainage in arable agriculture across Europe for use in spatially distributed simulation modelling is being produced and will be made publicly available upon completion. For most European countries the revised map represents a marked improvement over existing spatial datasets of artificial drainage as sub-national estimates have been incorporated. The analysis of drain age suggests that most areas are served by pipe drains that are >20 years old, with large areas having drains that are >40 years old. When considered along with the estimates of drain effectiveness the assumption that all drains are fully functional should be considered as highly precautionary.

Acknowledgements

This work was funded by GeoSpatial Analytics Ltd for possible use in the SETAC EMAG SDLM project as part our Squaring the Environmental Risk Circle Initiative. We are grateful to various government agencies and authors for the supply of agricultural pipe drain datasets and publications.

Squaring the Environmental Risk Circle

Better data driving improved models and decision support tools leading to location and situation specific decision making producing more sustainable outcomes for agriculture, nature and people.

References

Feick *et al.* (2005). A Digital Global Map of Artificially Drained Agricultural Areas. Frankfurt Hydrology Paper 04, Institute of Physical Geography, Frankfurt University, Germany.