Summary for the general public

Remote evaluation of vine maturity in potato breeding trials

Potato is the third most important food crop after rice and wheat and is the most important vegetable crop worldwide. Potatoes play an important role in cropping systems in many countries throughout the world, including Poland ranked 9th in world production in 2020. Its market is worth about 1 million Polish zlotys annually.

Potato breeding is a time-consuming and expensive activity. The selection of a new potato variety is a long (10-12 years) procedure. Potato cultivars are screened for about 70 traits, among which maturity class is a critical aspect of commercial potato production. Potato cultivars are classified into early, medium, late, and very late maturity classes, which describe the length of the vegetation period from seeding to harvest. According to the breeder of the Zamarte Ltd. company located in Poland, nowadays the best table cultivars are those with a short growing season, as potato production for early harvest is the most profitable.

Despite much of progress in potato breeding, the classification of potato lines and cultivars into maturity classes is still done on thousands of experimental plots visually. This time- and work-consuming procedure can be additionally limited by unfavorable ground conditions, such as rainy weather, soil wetness, and changing light conditions which affect the plant color description by human eyes. Potato breeders need innovative, easy, methods that will make the classification of the potato cultivars into maturity classes much more efficient. **The goal of our project is to determine if the use of images from unmanned aerial vehicles (UAV) will speed up the evaluation of potato maturity class within huge breeding trials.**

Our research will be located on regular breeding trials of the Zamarte Ltd. company. The trails will include remote estimation of maturity class with the UAV on 4240 plots of potato lines and 1400 of potato cultivars in both years 2023 and 2024. This kind of approach is unique because research on the use of UAVs for the evaluation of maturity class in potato has not been previously done. We hope that the use of a UAV will successfully replace the time-consuming, visual estimation of potato maturity classes.

The limited information on how UAV-based sensors can be used for remote evaluation of potato maturity classes makes our study on one hand very challenging and on the other hand unique and very innovative. The company Zamarte Ltd. with which we will closely cooperate within the duration of the project is very much interested in speeding up the selection process of their cultivars with the shortest possible time of maturity. Our longtime experience in using precision agriculture tools and recently also in using a UAV for on-farm research, and the potato breeder's interest in the application of the UAV in the potato genotype selection process made us keen on cooperation during this innovative project. **We are convinced that this cooperation will have a positive effect on the use of remote methods for the evaluation of vine maturity in potato breeding trials which will result in significant time and cost savings.**