ABSTRACT

The decline in the honeybee population is a worldwide problem concerning farmers and scientists as a significant threat to the agriculture. These flying insects are the backbone of pollinations around the world and the work done by them is a critical step in the life cycle of plants. To use a small science as most effective as possible, the scientists have conducted research in pollination areas with thousands of kilometers to the same soil in the remote-cultivating flowers. However, algorithms for optimizing and monitoring the pollinating impact on their health, that is, choosing the side of a colony of the flower, is empirically measured to avoid any negative influence on the bees. In the case of travelling, it must be achieved by visualizing the migration paths and scheduled to decrease the time the bees spend on the way.

In our work, we applied remote-sensing techniques to acquire more information to improve the scheduling of migratory apiaries. In particular, we compared normalized difference vegetation index (NDVI) with standard deviation in the agriculture to determine a potential condition. The scope of our work is based on Sentinel Application Platform (SNAP) and Sentinel NDVI imagery to detect areas of interest, where migratory apiaries should be. The goal is to detect the optimal apiary transfer time, based on the estimated value for the future work, is in progress to use the optimization algorithm, such as Genetic Algorithm, to identify the optimal areas of interest and schedule the best migration.

INTRODUCTION

The European Food Safety Authority reports that in the past 15 to 18 years, honeybees have been reporting around worldwide of bee numbers and honey production, specifically in European countries, United Kingdom, the Netherlands, Switzerland, Spain, the US, and Italy. The Food and Agriculture Organization of the United Nations (FAO) and researchers that the 10% area is a place that provide 90% of the global pollination. It is estimated that by 2050, the growth of NDVI image in agriculture depends on the vast area of pollenization, in which the values of pollenization for maintaining biodiversity, the European annual crop values/pollenization has been increased by about 20-25% of total area (in a global it is a hundreds of area).

According to the Polish Ministry of Agriculture and Rural Development expert pollinators, like honeybees (Apis mellifera), have positive influence even on self-pollinating plants. They can increaseStmt<0.05 mking crops by 25%, in the strawberries by 60%, and even 80% for red clover, in beans.

The negative effects of decreasing number of bees and climatic changes include:
- decrease in pollination (a significant decrease in amount of food, decrease in amount of honey, decrease in protein content, decrease in carbohydrates and fats), and so on.
- The above effects have negative impact on the tourist interest, economy, and eventually, it may affect human health. The higher cost of food, the higher poverty and hunger.

OBJECTIVE

The main objective is to help beekeepers to manage their apries and further help them to increase the agriculture industry (in Poland and Europe).

We wish to achieve that by creating a remote sensing system for scheduling the migratory apiaries to detect the optimal apiary migration, based on NDVI imagery. Our main initiative is to finish this part of the systems with average existing crop species (e.g., potato) and detect the multiple-flying vegetation data based on satellite imagery.

METHODS

For all areas, a satellite-based sensor imagery has been made (Table 1). Satellite data has been chosen for the research, because of temporal, spatial and spectral resolution. A spectral resolution is the amount of visible areas, especially rapid resolution, are enough to provide valuable research results. In large area of crop species.

As a second step was dimensioned and located of significant data in field was determined. Then, four indices of NDVI was calculated: pre-flowering, flowering, post-flowering and post-pollination. Sentinel-2 products platform (SNAP) was used to process images. Normalized Difference Vegetation Index (NDVI) was calculated.

RESULTS

Although measurements are in the very first stage, current methods are promising. Data was analyzed as a base example for measurements, because at its one of the reasons why is based on the index, threshold of NDVI images shows that values of vegetation index are divided in growth stage (from 0.15 to 0.65). At the end of post-pollination stage NDVI chemical, changed and histogram peak was between 0.75 and 0.85. During flowering stage NDVI value was between 0.45 and 0.65, and in post-pollination value range back to 0.15.

The behavior of NDVI characteristic confirms it is possible to detect flowering stage and the place where migratory apiary should be led by beekeepers, that is, the major advantage of the project.

DISCUSSION

No doubt, there are couples of link points in the project. Realization of Sentinel-2 MIP (minimum error) especially spatial resolution, are enough to provide the result in research results, but may be insufficient for smaller areas of interest, what is essential in this new case, temporal-resolution data does not guarantee correct detection of flowering stage.

CONCLUSIONS

Communications and workshops were held with beekeepers and farmers for deep understanding of need of interest in agriculture and apiculture industry and that approach will be continued.

For the future work it is planned to be used for detecting areas of interest and optimization algorithm to schedule best migration path.

MAJOR REFERENCES