

A model and preliminary interface of precision agriculture in date palm production – 2006/7 summary

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The recent years' development of precision agriculture (PA) takes advantage of the progress obtained in the computer applications and data collection and processing, to identify the spatial and individual variation within a field, and to enable an optimum use of inputs and manpower at the individual tree or at a predefined-plot management level in an orchard. Although developed for field crops, the methods of PA spread recently to orchards (e.g., vineyards). In date palms (*Phoenix dactylifera* L.), the revenue potential is very high; analyses of the profit gained from an individual tree suggest that it could be further increased by the improvement of the data-collection process and the consequent precise inputs. Date palm growers struggle with limited resources such as manpower, height-access machinery and water availability. Nevertheless, in spite of the significant variability within an orchard between plots and individual trees, the decision-making by most growers is founded at the arithmetic mean level. To examine the possibility to promote and disseminate the PA approach among the date palm growers, we have made arrangements for a preliminary test whether and at which conditions the spatial variability in a date palm orchard justifies a more dissected attitude either at the tree, or at the sub-plot level. Additionally, means and methods to ease the data collection and applications at those levels have been developed.

During 2007, a model which divided an orchard in Ein-Yahav into two plots that were divided further into 3 sub-plots on a basis of satellite and aerial photographs in which possible growth variations could be identified. A year-round follow-up of data collected from those sub-plots and soil quality parameters, counting of palm frond bases at 20% of the trees, ripening in tagged sample trees, and quantity and quality of the yield at harvest, revealed no significant differences between the sub-plots. However, the uniformity found at each stage of the examination demonstrates that at least in this case, the spatial analysis of the data correlated well with the final

quantity and quality of the yield. The examination of additional plots will enable to improve the model of the terms that justify sub-plot division.

Three archetypes have been developed for the following means: 1) A pocket-size logger aimed at on-site data collection and inputs recording, including data harvesting at the level of the individual tree. The system is based on a commercial palmtop computer with navigation and data collection software assisted by GPS and detailed maps of the plots and the trees for an accurate identification and resolution. The collected data are transmitted directly to an MS Excel table. The advanced version will include the ability to record instructions for the workers at the orchard; 2) A barcode-based system to assist the management of produce pallets during the primary sorting process. The system allows for a continuous track of the pallets arriving from the orchard to the packing house, where the produce is sorted and forwarded to various post harvest processes while preserving the original plot identity until the final sorting step. Simultaneously, the quality parameters of the produce at the primary sorting step of each plot is dissected on a time scale; 3) A barcode-based system for the automatic counting of the packages of the final product, which provides the dissection of the final produce quality parameters according to plots, thus saving time and manpower.

In parallel to the technological development, a process of mapping and categorizing the future required performance of the system was undertaken, including the examination of various data collection methods currently employed by growers, aiming at assisting the development of an application that will enable a uniform data assemblage. Towards 2008, we plan to continue the data collection from various plots for the improvement of the model, focusing on solving the problem of weighing the yield of individual trees, to examine the correlation between various single tree parameters with its actual yield.