

MULTITEMPORAL SATELLITE IMAGING TO SUPPORT NEAR REAL-TIME PRECISION FARMING

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ABSTRACT

This paper presents a 2014 update on the DMC constellation of optical satellite sensors and how they are exploited for precision farming. Thousands of farmers around the world are exploiting this powerful data source for the management of crops, enabled by specialist service providers which convert the imagery into meaningful biophysical measurements and spatially variable nitrogen/irrigation recommendations.

Keywords: Precision Farming, Satellite, Imagery, Leaf Area Index, Arable Crops, Nitrogen, Irrigation

INTRODUCTION

DMC is an international programme of satellite ownership and ground stations, with joint campaigns being coordinated centrally by DMC International Imaging (DMCii). All sensors in the constellation are rigorously calibrated to enable them to be used interchangeably throughout the season, and to enable quantitative biophysical information to be estimated from the data.

The DMC satellites are built in the UK by Surrey Satellite Technology Ltd and each carries a very wide swath (650km) optical sensor which makes them collectively capable of capturing fresh imagery the world's agricultural regions on a regular basis. The first generation satellites had 32m resolution sensors, but now the second generation satellites generate 22m resolution imagery which is suitable for a great many precision farming applications on broad acre crops. It is the rapid revisit and timeliness of data acquisition that is the primary advantage of the DMC constellation. For example, since the 2011 season the Deimos-1 and UK-DMC2 satellites have been covering the whole of the mainland USA every 15 days, 90% cloud-free on average. This dataset is used by USDA for their annual crop classification and by other organisations for precision agriculture services.



Figure 1. Artists' impression of the UK-DMC-2 satellite in orbit.

The DMC constellation provides an imaging opportunity several times per week anywhere in the world at 22m resolution and with three visible/NIR spectral bands. The capability to cover huge areas of land on a regular basis enables a different approach a number of remote sensing applications that are either difficult or impossible with other data sources, with precision farming being a prime example.

The DMC user community for precision agriculture includes service providers in more than 10 countries in Europe, North America, South America and Asia. These service providers are delivering guidance to many thousands of farmers based on timely satellite imagery, coupled with other ground-based information layers and models. Case studies will be presented.



Figure 2. Leaf Area Index map for a winter wheat crop, derived from DMC Imagery (courtesy of Geosys S.A. and SOYLSense)