Digital advanced models to estimate working times in agricultural operations

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Keywords: DTM, LiDAR, GIS, Working times, Fuel Consumption

Introduction
The estimated working times related to agricultural processes are traditionally made using terrain models that do not take into account the altitude and slope component.
Of course this is disadvantageous because it underestimate all the variables that have an impact on the processing (speed,turn time, total times of work, consumption).
The recent availability of a sufficiently accurate elevation model, made with LIDAR techniques for the entire territory of the Piedmont Region, allows to approach a new solution to the problem, such as to improve the estimates of the parameters mentioned above.

Materials and Methods
Will be used the digital model level 4 intesa GIS whose characteristics are.

Type	DEM or DSM
Accuracy: bare ground $PH(a)$	0.30
Height accuracy: with tree cover> 70% $PH(b)$ (DEM)	0.60
Height accuracy: buildings (DSM) $PH(c)$	0.40
Height tolerance: bare ground $TH(a)$	0.60
Height tolerance: with tree cover > 70% $TH(b)$ (DEM)	1.20
Height tolerance: buildings (DSM) $TH(c)$	0.80
Planimetric accuracy: PEN	0.30
Planimetric tolerance: TEN	0.60
Cellsize:	5

LIDAR survey has been carried out by the employment of ALS 50 II sensor (Leica Geosystems) with MPIA (Multiple Pulse In Air) technology with the following features:

- *Maximum Pulse Rate: 150000 Hz (150.000 points/second);*
- Maximum scanning frequency: 90 Hz (90 lines/second);
- 4 echoes (1º, 2º, 3ºand last);
- Flying height: 200 - 6000 m above ground;
- Field Of View (FOV): 10º – 75 º;
- Side overlap: 200 - 600 m;
- Intensity measured each echo.

At the level of the individual particles will be extracted the slope parameters such as to allow the calculation process.

Results
The information of the DTM are used as input in the simulation model.
The best accuracies are estimated granted with respect to traditional modeling.

Acknowledgements