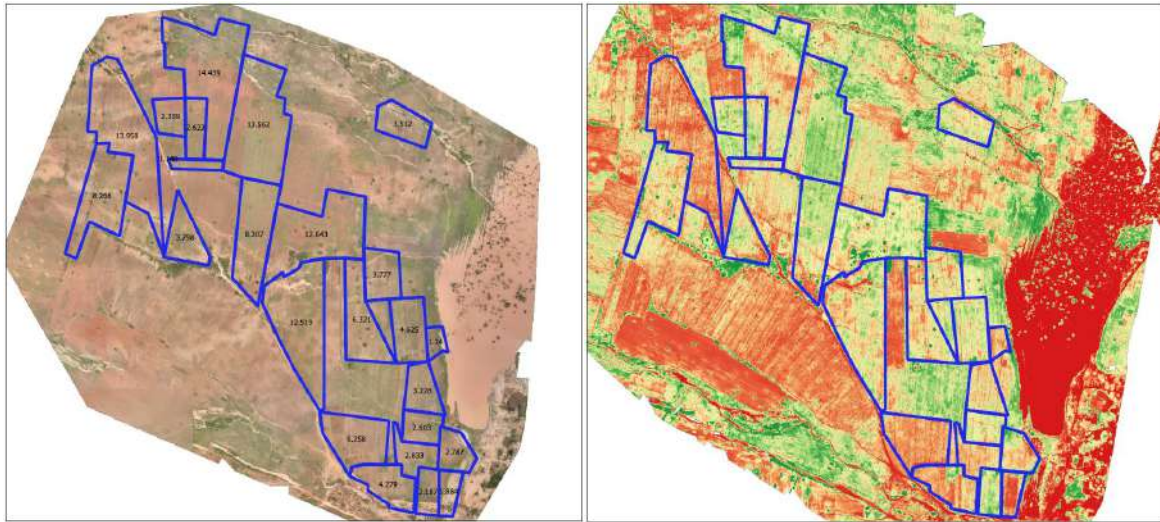# Pre-harvest loss estimation using satellite images calibrated with drone data

Boundaries and areas of smallholder farms obtained after drone data collection

NDVI index map of the same area

Officials and smallholder farmers of Chandama Village learning more about drones for agriculture

OVERVIEW	
Flying Labs	Tanzania Flying Labs
Geographic area	Chemba District in Dodoma Region, Tanzania
Date	March - May 2018
Sector program	EcoRobotics

SCOPE	
Stakeholders (clients)	IFPRI Local government: Office of Agriculture for Chemba District - Chandama Area (Dodoma region) Local smallholder farmers
Challenge	Many smallholder farmers do not have a possibility to precisely estimate the yield and pre-harvest loss, even though their income solely depends on it. Wrong expectation of yield comes also from the fact that many farmers do not know the exact size of their farms and often over- or underestimate it.
Scope	The aim of the project is to investigate the use of drones, GPS and a self-reported survey of farmers in Tanzania to validate satellite data in order to better understand crop production and loss. The ultimate goal is to influence and stabilize market prices before harvest. Crops included in the project are maize, millet and sorghum.
Outcome	Two rounds of drone data collection were conducted before harvest in order to track the growth and estimate yield at various stages of the growth cycle. The project targeted around 300 smallholder farms and included data collection of multispectral and RGB drone images as well as the type of crop and yield history of each farm. The data was then used to calculate estimated crop yield as well as to map the farm boundaries and precisely calculate their sizes. There was a significant discrepancy between farm sizes from the self-reported survey and the ground survey. Obtaining timely satellite images clear from cloud cover along with drone data proved to be a challenge in hard to reach rural areas during the rainy season.
Next steps	Analysis and verification of correctness/usability of satellite data with ground-truthing, comparison between the two different resolutions of drone data (20cm vs 10cm), creation and publication of research paper between all project partners.

DATA ACQUISITION	
Size of area	1130 ha (11.3 km2)
Drone	eBee Plus
Sensor(s)	Parrot Sequoia, RGB/SODA
Flight plan software	eMotion
Flight height	up to 410m above the ground
GSD	20cm/pix and 10cm/pix (multispectral); 7cm/pix (RGB)
Number of images acquired	67145 (RGB + multispectral)
Number of flights	30
Time invested in data acquisition	4 days
Georeferencing	RTK

DATA PROCESSING & ANALYSIS	
Processing software	Pix4Dmapper
Processing time	2 weeks
Data products	Orthomosaic, NDVI
Analysis tools	-
Analysis outputs	-
Final outputs shared with stakeholders	Orthomosaic, NDVI, raw imagery
Data sharing	Soft and hard copies