

Empowering Data-Driven Farming

Participative Agriculture Growth Engine (PAGE)

Essence of the Proposal

Participatory Agriculture Growth Engine (PAGE) is a dynamic system that will enable crop plot data in every growing season to get stored on a real time basis and weather and market information to be integrated to this on a daily basis. It will also facilitate farmers' interaction with a Data Repository through technological means so that data is input and they receive appropriate advisories.

Data of every growing season along with other related dynamic attributes fed through technological means by farmers, scientists and the government will add to the incremental growth of data. Gradually, big data related to agriculture built over space and time will enable farmers to adopt appropriate cropping and farming practices. PAGE is expected to revolutionize data-driven farming and participatory approaches.

Why it is unconventional or creative?

Conventional crop statistics based on sampling do not provide insights into practices and constraints to cultivation at individual holding level; moreover the data is only available after harvest. Mapping individual crop plots using geospatial techniques provides reliable and real time information about cultivation patterns, sources of water and other inputs to farming, including farmers' socio-economic status. It is creative in terms of technology adoption by farmers' and unconventional since visual estimates are avoided. Data can be generated at all crop stages.

The geospatial technology to be used brings in **efficiency** in the process of generating agricultural statistics. Plot-level inventories are **effective** in capturing information on mixed cropping practices and extent as well crop condition and stage. All the **relevant** information – dimension of the holding, soil type, slope, sources of water, farming inputs, and cultivation practices are captured. The process results in capturing accurate information of **acreage** of different crops, thereby improving the **expectancy of yield** of diverse crops. The technology is devolved in a simple manner so that the farmer himself can continuously feed the details of his land through simple messages (SMS or even a photo) using the simple software application loaded on to normal mobile phones or smartphones. Farmer participation in data feeding and in return getting useful information related to local weather and market conditions makes the process **sustainable**.

Hypothesis for the proposal and why it is expected to succeed?

High resolution satellite imagery enables the accurate plotting of crop plot boundaries that can be conveniently registered with individual holding. GPS-based smartphones enable geo-stamping of a plot and collect relevant information on the spot since the device allows loading of geo-fenced crop plot map. Crop data can be collected any time during the growth stage and data integration and analysis happens in the background with real time data supported by collateral information. Farmers being well acquainted with the use of mobile phones, technology devolution and their gradual participation in providing data about their farm using mobiles is expected to bring in a paradigm shift in data-driven farming. During the initial stage, one-time spatial data related to crop plots and their correlation with individual holdings and field inventory will be generated with the assistance of scientists; concurrent training on data capturing will build the confidence of farmers.

PAGE would be a centralized facility with open source relative database engine energized with robust application architecture for handling big data.

How will ICRISAT pilot it?

ICRISAT along with its research partner PIXEL Softek will generate spatial data on 5000 ha of drylands in any state of India. Latest high resolution satellite data will be used to extract the crop plot boundaries. Information on individual revenue holdings will be collected, vectorized and systematically correlated, and a controlled digital mosaic of crop plots and ownership details evolved in a Geographic Information System (GIS) environment. A suitable web-based software application will be developed in open source platform, which together with the spatial database of crop plots will be hosted on cloud. The crop plots with revenue holding details will be transformed into geo-fenced map tiles for loading on to GPS-based smartphones. An Android application will be developed for GPS-based smartphones to geo-stamp each crop plot and to collect crop details and other attribute data in the field. The data gathered will be transmitted to the server every day. During the field inventory, each farmer will identify and authenticate his/her ownership details and provide information on the farming practice and inputs used to grow crops. ICRISAT will interface with the government department to provide and link the daily weather data to the server. The local Agriculture Produce Market Committee (APMC) will be involved in linking day-to-day market information with the server. A library of standard advisories for different sets of crop conditions will be developed and integrated as reference data in the server, with which any query from the farmer will be compared and fed back to the farmer.

The GIS–MIS application integrated with PAGE will facilitate visualization of spatial data related to crops in different growing season and allow spatial and attribute queries for administrators, researchers and even the farmers.

Each farmer will be provided a map of holdings, with each plot numbered as integrated in the PAGE database. Farmers will be trained in the use of Android application to provide information on sowing, fertilizer inputs, watering and any pest/diseases in their farm. Alternatively, a simple option will be provided to farmers to make available data through SMS, wherein he can indicate his/her plot number and other details.

Inspire Challenge Project: PAGE				
Sl.No	Activity	Budget in US\$		Time schedule in months
		Staff remuneration	Out-of-pocket expenditure	
1	Creation of Digital Crop Plot data and correlating with revenue records	8000		T0 to T1 month
2	Development of Online GIS-MIS application	30000		T0 to T5 months
3	Plot-level crop mapping and collection related attribute data	46000		One month for each growing season
4	Cloud hosting (one year) of PAGE	4500		T0 to T12
5	Field studies, collateral data collection, travel and logistics		11500	For entire duration of 12 months
7	Total	88500	11500	

Essential data to be generated in the project area during this pilot

- Geo-referenced crop plot boundaries with clear ownership details as per revenue records
- Plot-level crop data and land use data of three growing seasons - Types of crops grown and total extent
- Land holding details – Size of holdings and ownership details
- Land holdings map

- Data on irrigation assets in the project area with details of location
- Farming inputs – Use of fertilizers/pesticides
- Daily market data (collected and consolidated with variations in rates) for one year
- Analytical report on rainfall and other climate data.

If the pilot is successful, what are the next steps?

Scale up the experiments to block, district and larger areas

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