

FieldTrialGIS: A Geo-reference Mapping and Data Management System Developed for Agronomic Field Trials

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The challenges of effective storage, management, and presentation of field trial data led to the development of FieldTrialGIS. This system integrates database software with an interactive web-based mapping service. Field data from south India demonstrates the potential capabilities of this working model.

Data management of field trials has been a challenge to agronomists and extension specialists while appropriately archiving, displaying, and analysing the vast amount of information that can be generated from these activities. Our experience has been that the pains taken and money spent on organising trials, collecting data, and the subsequent analysis are at risk of becoming a point of short-term market development interest only. Over time, there is a tendency to lose track of data from individual sites or to consider it obsolete or irrelevant. Given an adequate data management system, the collective power of field trial data should prove its value in identifying gaps in research—both in terms of subject matter and geographical location, as well as identifying trends in yield response, gaps in productivity, economic viability of nutrient application, or spatial and temporal trends in soil fertility.

The objectives set for the project were to standardise data input, arrange and archive data efficiently for easy retrieval, standardise site evaluation through programmed data analysis, and provide a dynamic and interactive web-based interface which can display both the scope of the data collection and key results from the site evaluations. The project began with available documented results from a network of field demon-

strations with site data. This project has continued to evolve and become more refined in its design and presentation. Each revision has added new ideas into its design and the potential for incorporating more functions and outputs has not likely been fully explored to date.

Data Requirements and Flow

The data collection process is initiated by providing field research collaborators with a standard form designed to gather a list of key data from each experimental site. This core data set includes: basic descriptive information, soil test data, details on the series of fertiliser treatments, the resulting yields, and individual price data for all nutrients applied and crops harvested. Presently the system facilitates comparisons of any four treatments. Field workers are asked to provide a global position for the site using equipment now commonly available.

Use of electronic collection forms facilitates a simple integration of the site data into a Microsoft® Access™ database. Once imported, each site is subjected to a series of programmed queries which compose the treatment comparisons for yield, economic viability, partial nutrient balance, and nutrient use efficiency (specifically calculated as partial factor productivity

Table 1. Compiled yield and income data from FieldTrialGIS for a total of 67 field sites conducted in southern India.

Crop (Sites)	Farm practice			Generalised state recommendation			Site-specific nutrient management		
	Yields, kg/ha	Net income, Rs/ha		Yields, kg/ha	Net income, Rs/ha		Yields, kg/ha	Net income, Rs/ha	
	Mean	Mean	---- Range ----	Mean	Mean	---- Range ----	Mean	Mean	---- Range ----
Chickpea (10)	2,043	35,232	33,808-36,555	2,271	39,553	35,395-58,615	2,570	42,960	40,260-46,020
Chili (5)	1,928	51,741	49,419-54,860	2,124	56,922	51,490-60,450	2,374	61,940	59,028-64,908
Cotton (5)	2,136	35,716	32,603-37,642	2,434	40,752	38,880-42,480	2,830	45,445	43,825-47,425
Maize (10)	6,130	27,114	23,357-31,262	6,740	29,845	26,190-33,600	8,140	33,028	28,384-36,288
Rabi Sorghum (10)	2,045	15,666	14,749-17,320	2,281	17,173	16,045-18,125	2,739	19,102	17,670-20,310
Rice (7)	6,191	35,162	18,474-47,057	6,929	39,238	21,554-55,675	7,794	42,723	21,533-59,565
Sunflower (10)	2,019	21,777	19,972-23,702	2,304	24,933	23,085-26,565	2,755	27,279	24,699-28,899
Wheat (10)	3,045	25,262	22,370-28,040	3,358	27,200	24,105-28,785	3,886	30,804	28,770-33,360

Abbreviations and notes for this article: N = nitrogen, K = potassium.

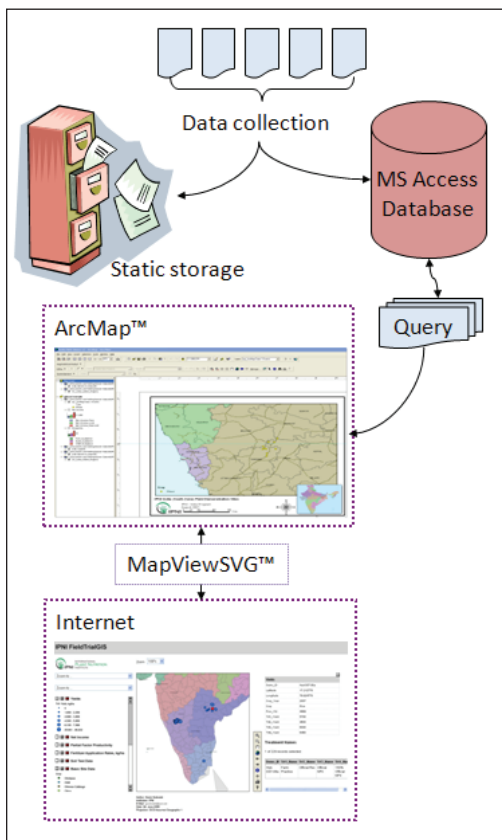


Figure 1. Schematic representing the flow of data for the FieldTrialGIS. Data is diverted from static storage into Access and the GIS data layers are based upon its query results. The web-based product is uploaded via export, using MapViewSVG™ software.

for N). This series of queries is linked to a Desktop GIS via ESRI® ArcMap™. Finished maps are, in turn, exported via uismedia® MapViewSVG™ and uploaded to an internet environment (**Figure 1**).

The web environment allows for user interactivity through a number of embedded tools supporting the selection of data points and querying of data layers to obtain filtered attribute tables of results. The map window includes a selectable legend used to activate any data layer. Most layers include an attribute table, and an ability to make a GIS data query. One can zoom and pan using toolbar selections, or one may use pre-defined bookmarks and quickly “Zoom to” desired features. The attributes of any feature are available by mouse click, which appear as either a Table or Chart.

Evaluation of FieldTrialGIS

FieldTrialGIS was evaluated using available datasets collected from 67 field trials conducted by collaborating institutions within the peninsular region of south India, including the States of Andhra Pradesh, Karnataka, and Tamil Nadu. The non-replicated demonstrations largely included treatments evaluating site-specific nutrient management (SSNM), a generalised state recommendation, and a common farmer

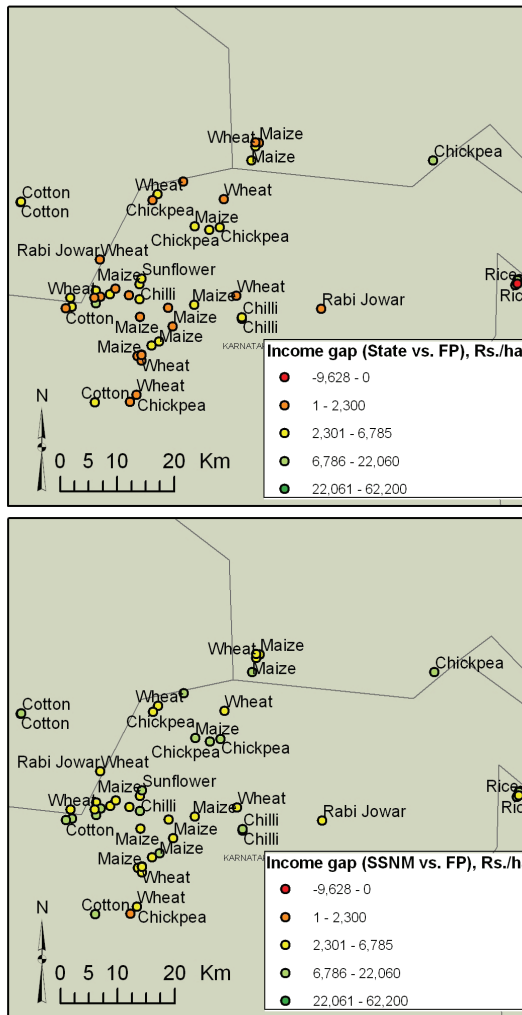


Figure 2. Comparison of the net income gaps between the State recommendation and farmer practice (top) and SSNM and farmer practice (bottom) for a selected group of field demonstration sites located in Dharwad District, Karnataka.

practice. **Table 1** presents a summary which isolates results from field sites comparing the treatments. Crop-wise yields and net incomes are highlighted for data collected between 2005 and 2007. Averaged across sites and years, SSNM has consistently improved yields and incomes for a range of crops compared to either the traditional farmer practice or generalised fertiliser recommendation for the state.

The use of the GIS allows for the data to be projected spatially. For example, in the case of profitability, a visual assessment of the relative effectiveness of State or SSNM fertiliser recommendations at raising the income potential for a region can be obtained (**Figure 2**).

Testing has found the system to be effective from data entry to the generation of its interactive map output. The database has been supplemented with field sites located elsewhere in Asia and there is potential to expand the scope of data coverage to a global-scale. Readers are encouraged to view the program’s results available to date. Please find the link to FieldTrialGIS within the

IPNI India Programme Portal found at <http://www.ipni.net/ipniweb/portal.nsf/dx/India>

Important notes on viewing SVG maps Firefox™, Opera™ or Safari™ users do not need the SVG plug-in to see SVG maps while Internet Explorer™ users have to install a free browser plug-in. The free Adobe® SVGViewer is the best to use with Internet Explorer™ which is available at <http://www.adobe.com/svg/viewer/install/> **BC-INDIA**

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