

Using GIS to measure impact of tractor intervention

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Background to the intervention

In 2014, Propcom Mai-karfi (PM), a DFID-funded market development project in Nigeria, introduced an innovative tractor financing mechanism whereby different stakeholders including tractor associations, banks, tractor vendors and tracking companies were brought together to provide mechanisation services to rural farmers on a commercial basis.

Problem statement

The intervention has gone from deploying 27 tractors in 2014 to over 400 in 2017. Measuring impact of this intervention became very complex as new tractors were being added every year. Specifically, the project needed to:

- Measure outreach (# of farmers reached) through hundreds of tractors over time.
- Estimate size of farmlands (in hectares) to estimate cost savings accruing to farmers.
- Measure repeat usage and overlap over time.

Why use GIS?

Solving the above problems using traditional methods proved extremely challenging. Thankfully, each of the tractors had GPS trackers installed on them to help tractor owners and banks monitor the tractors in real-time. By analysing the GPS data from the trackers using GIS software, the project was able to solve all the problems listed above and do so in a way that ensured:

- Timely availability of the data for analysis.
- More accurate results which depended less on using assumptions and multipliers.
- Lower costs since field staff did not have to follow tractors to collect data.

Tools used

- QGIS, an open-source GIS software
- Microsoft Excel

Workflow for the analysis

The task was carried out in 3 distinct steps:



Step 1: Data review

- Download GPS data from the server.
- Standardise data format.
- Add relevant attribute fields (columns).
- Export the data as a 'csv' file (comma separated values).

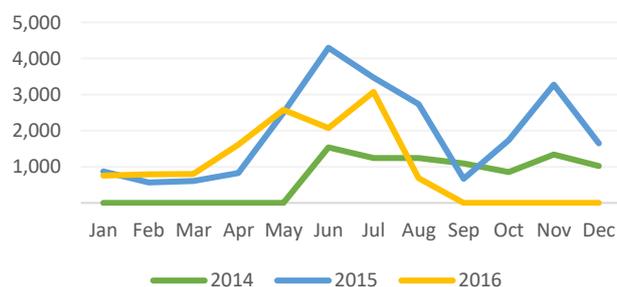
Step 2: Data preparation

- Import GPS data into QGIS and convert them to shape files.
- Segregate data for different years and seasons into different layers.
- Convert GPS points to lines.
- Edit line shape files by deleting road tracklogs, leaving only farmlands.
- Convert lines to polygons (areas).

Step 3: Data analysis

- Calculate the area of the polygons (farmlands) using 'field calculator'.
- Combine layers for different tractors.
- Add location attributes (LGA, state) using spatial join.
- Estimate repeated farmlands (overlap across years) through intersection between farmlands.
- Export data to Excel for further analysis.

Farmers reached per month



Challenges faced

- Data was not always complete for every tractor and therefore required extrapolation based on historical trends.
- Data cleaning and pre-processing was very time-consuming.
- Some of the analysis needed to be done by hand, requiring additional time and resources.
- Consecutive farmlands got merged in some instances leading to underestimation of impact.