Soil testing kit project

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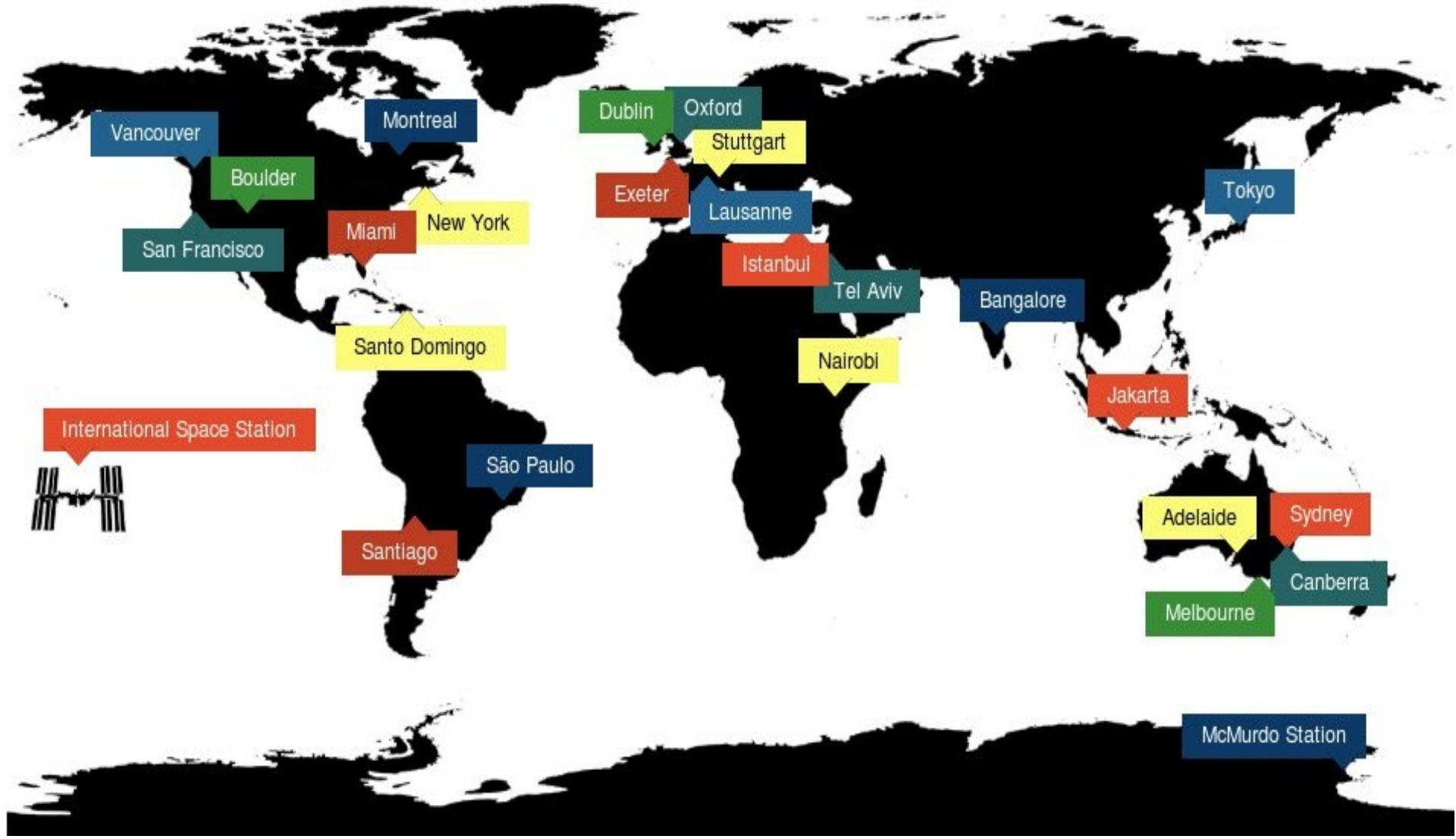
UKEOF
ENVIRONMENTAL OBSERVATION FRAMEWORK

SEPA
Scottish Environment Protection Agency

Living With Environmental Change

INTERNATIONAL SPACE APPS CHALLENGE

NASA International Space Apps Challenge, 2012



INTERNATIONAL SPACE APPS CHALLENGE

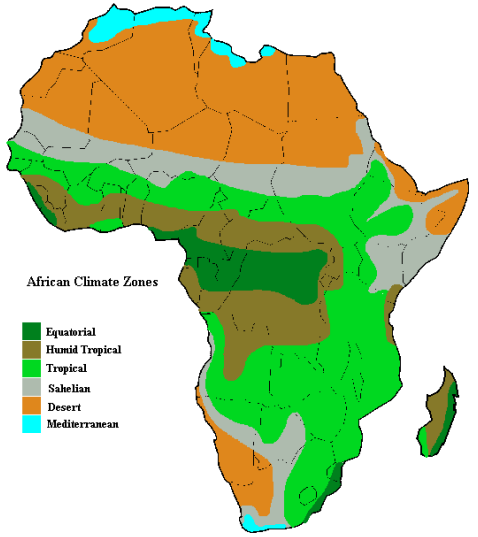
Met Office

. How it all started…

1. **What** produce can I grow where I live?
2. **When** should I sow/ plant/ harvest it?
3. **How** should I sow/ plant/ harvest it?

Geo-located data

Weather data
- First/last frost



Climate data
– temp, precip

Growing conditions data

Satellite data
-ITCZ, evapotranspiration

Soil data - PH, type

Traffic light icon in the corner of the map to display app reliability for the current location.

User clicks on image or type of produce to be presented with a further scroll menu for that category.

Traffic light system for data buttons. The user can click on each one to find out what data is currently used, and what data we require to improve the app. These links could also include a data summary, e.g. soil type, for the

Use icons for the menu options, e.g.

Grower's Nation

http://www.growers-nation.org/beta/location/

Grower's Nation

Map | Growing Info | Wiki tips | My Plot | Community

Strawberries growing info at Met Office, Exeter:

Jan	Feb	Mar	Apr	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Latest recommendations based on local observation data:

Sow: March to April

Plant: April 2 to April 25

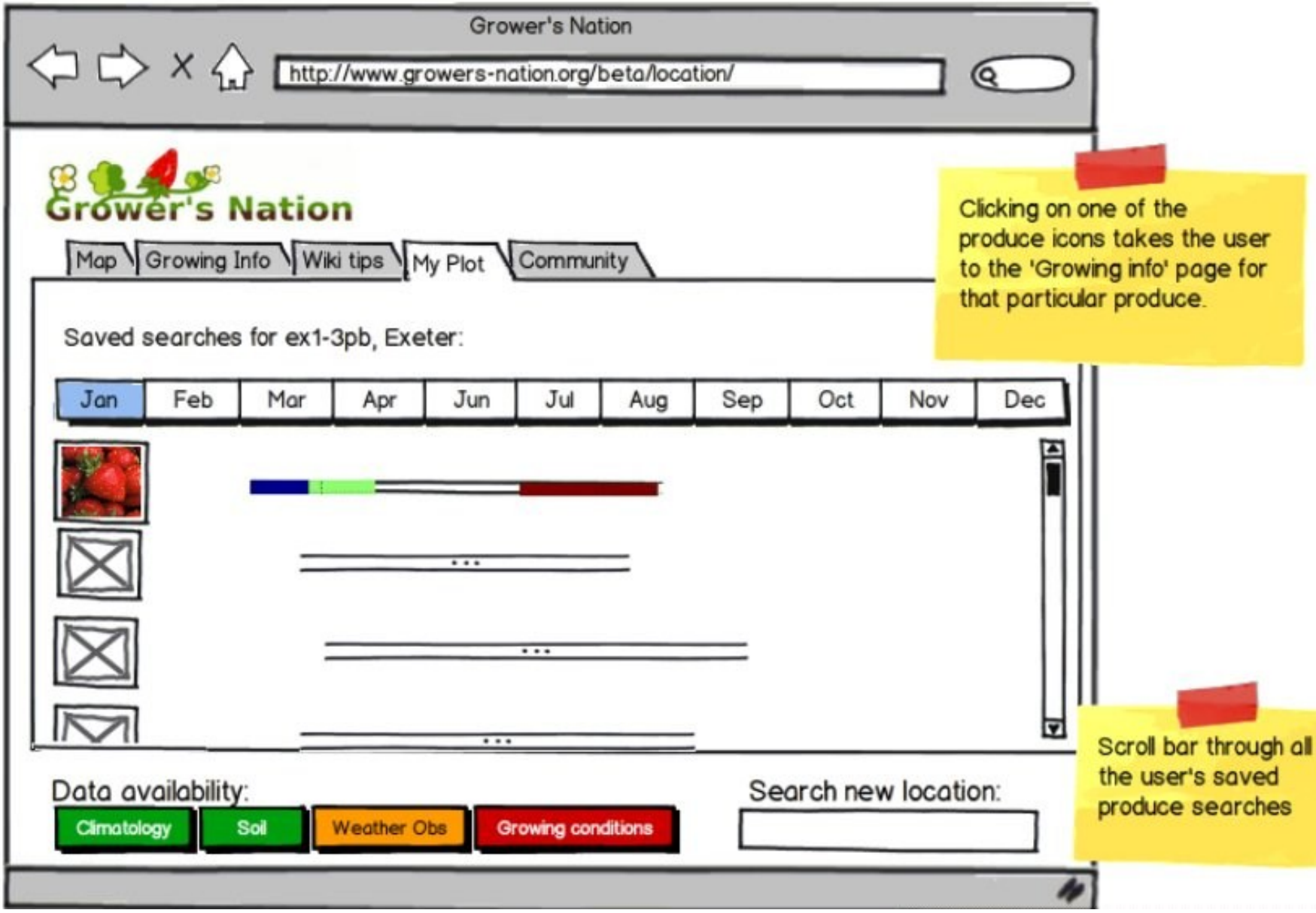
Harvest: Jul 25 to Aug 30

Add to My Plot

Data availability:

Climatology | Soil | Weather Obs | Growing conditions

Search new location:


Grower's Nation
http://www.growers-nation.org/beta/location/
Grower's Nation
Map
Growing Info
Wiki tips
My Plot
Community
Saved searches for ex1-3pb, Exeter:
Jan
Feb
Mar
Apr
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Data availability:
Climatology
Soil
Weather Obs
Growing conditions
Search new location:
Clicking on one of the produce icons takes the user to the 'Growing info' page for that particular produce.
Scroll bar through all the user's saved produce searches

Crowd sourcing data

- Harvest success/ quality of app feedback
- User's soil parameter measurements
- What pests/ diseases have affected the user's produce? – display results on a map
- User tips interface – advice/ experience.
- Aim is to develop a strong community aspect

The need to crowd source soil data

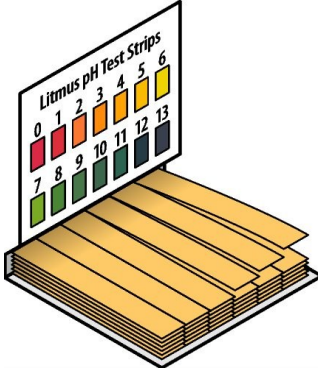
- Large variability of soil parameters over short spatial distances
- Soil observing sites are sparse
- Many existing data sets are very old, especially in developing countries
- This data is needed to decide when the optimal time is for planting crops.

The Challenge

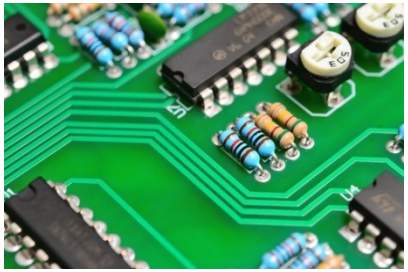
Soil type, texture, pH, moisture, temperature…

? ? ?

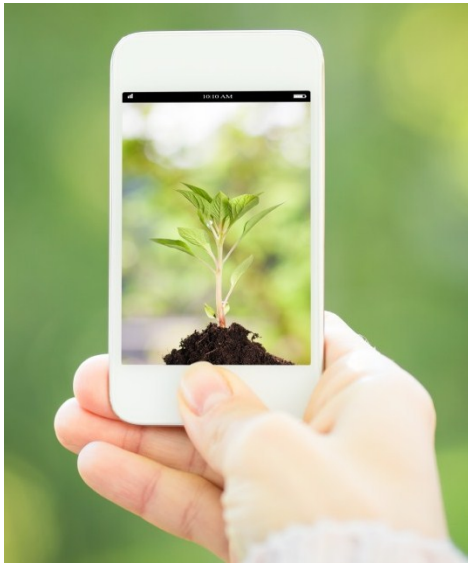
1. Design / research
- develop an easy to use, digital illustrated soil testing guide



2. Hardware development
- affordable sensor development



3. App / software development – interface to input and feedback user's soil measurements to the database



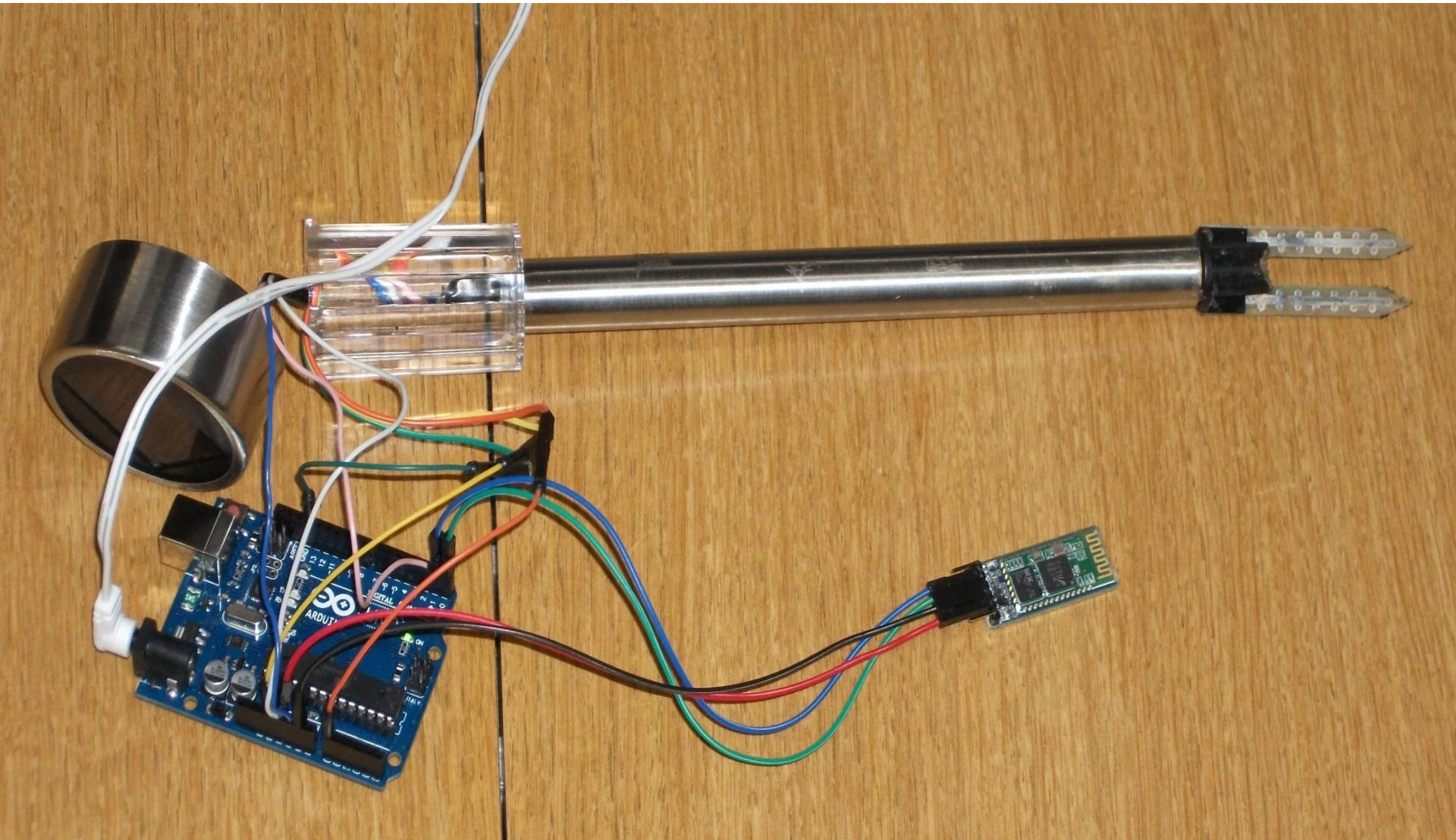
2nd NASA Space Apps challenge (2013)
2 teams, 24 hours...

The People of the Soil team (Google Campus, London)

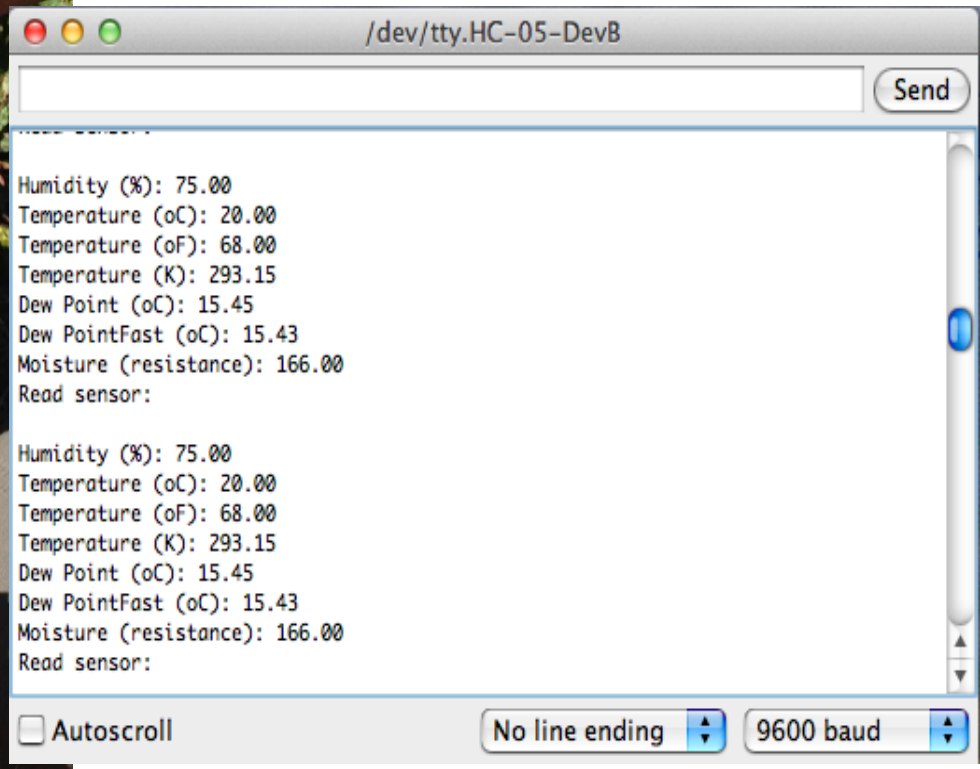
The Mud Pi team (Met Office, Exeter)

Using a solar garden light, some electronics, a phone and by coding a front end, the Met Office based team set about developing a solution...

The hardware came together in the form of a garden solar light with temperature, humidity and soil moisture sensors, an arduino and a bluetooth module:

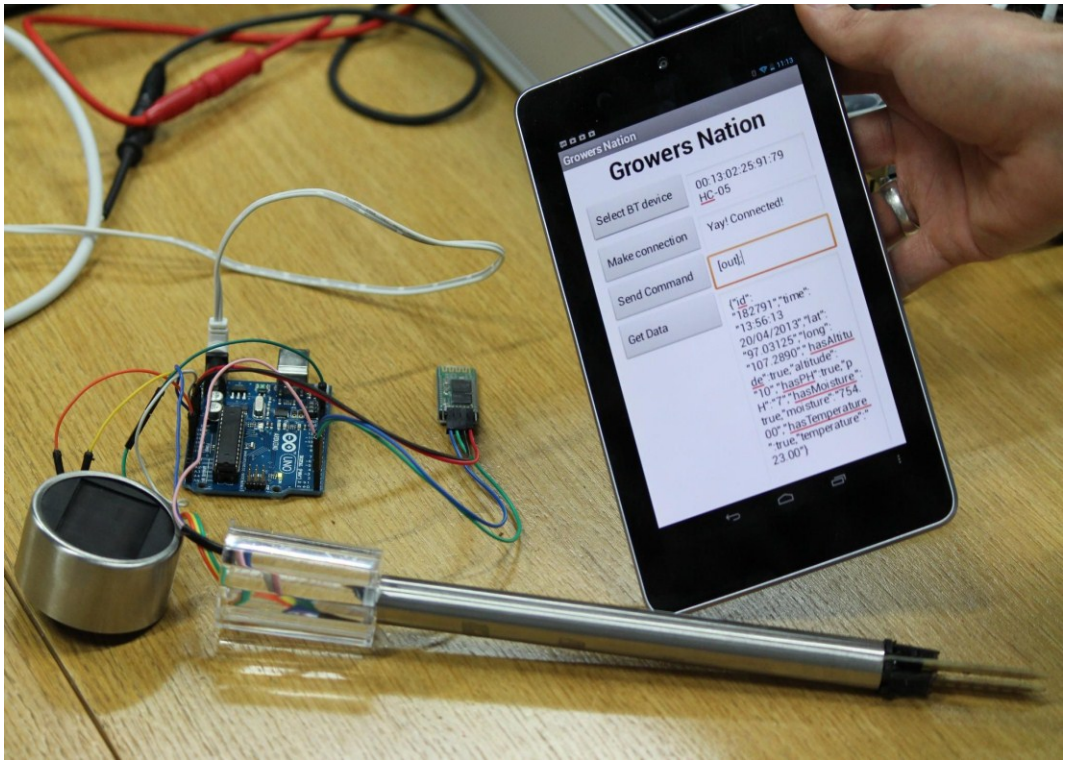


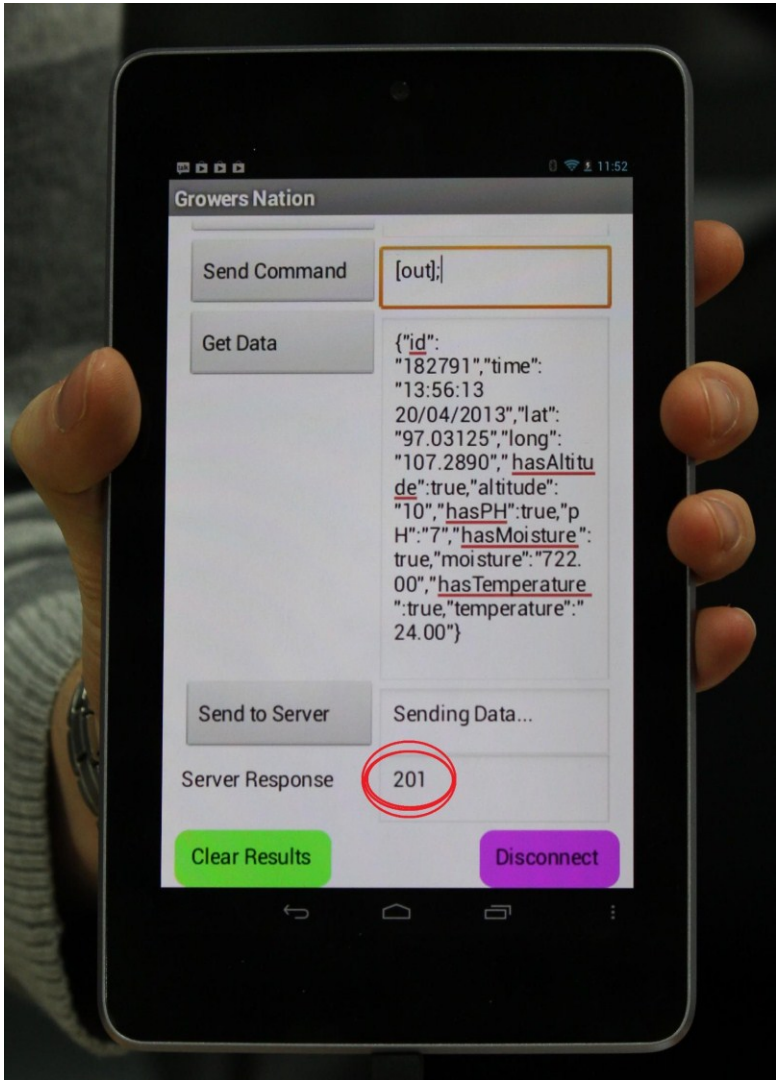
The team then tested it in the field...



An interface to the online database was then created:

The wireless data logger in action





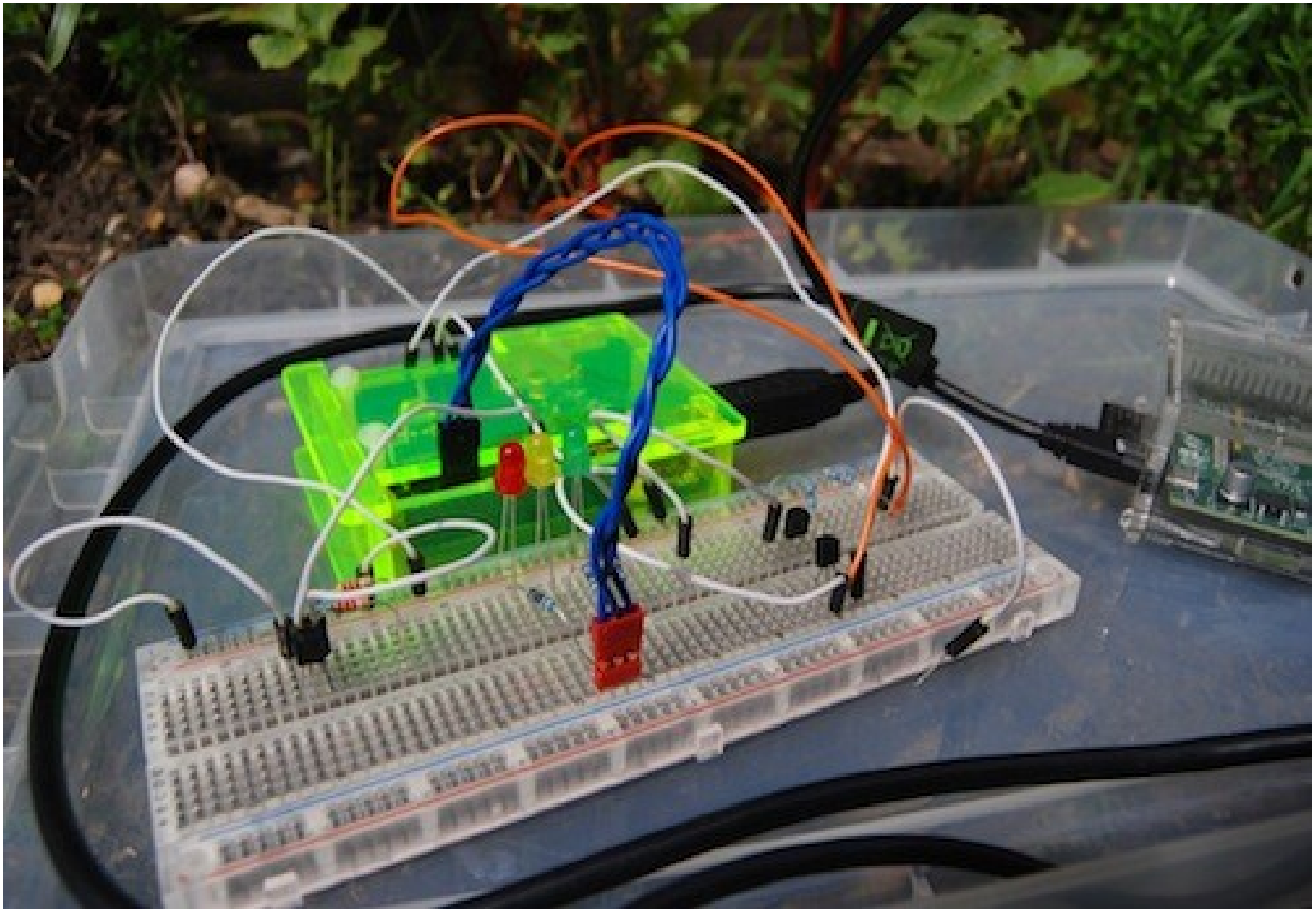
Device summary

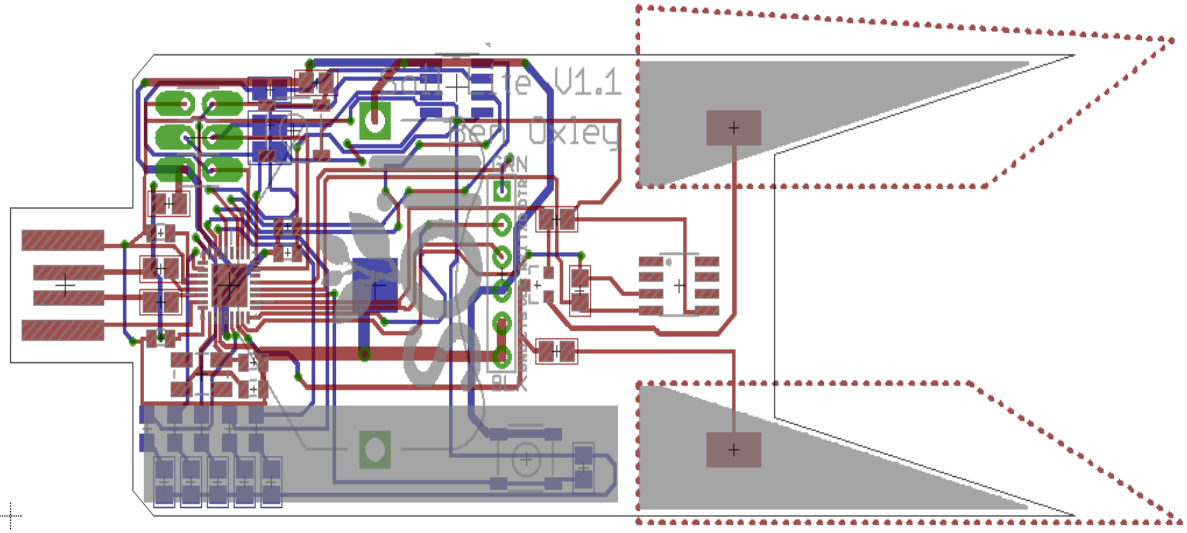
- Battery powered
- 10cm soil measurements
- Data stored on device
- Constantly listens for nearby bluetooth devices (within 20m)
- Upload soil records at any time to central database.
- Improved growing advice in return

The MudPi team

The Project Soil solution (London event)

The 1st prototype: sensors, arduino, raspberry Pi





Soil Lite V1.1
Ben Oxley
GRN
BLK
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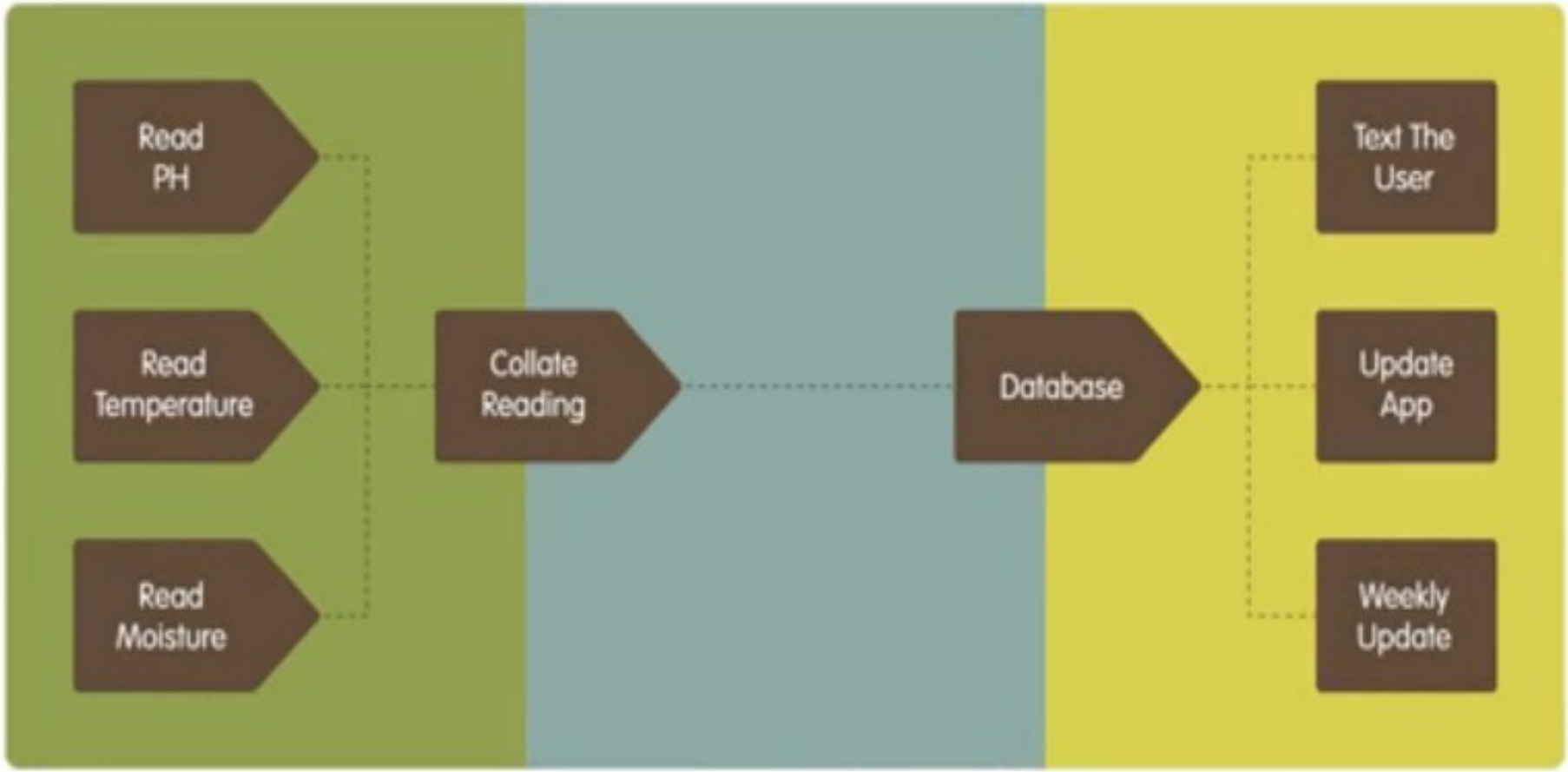
Prototype soil application front end

Capturing soil sensor data in a central database



Scope

- An achievable, low cost, wireless, self powered, maintenance free soil testing device.
- WiFi enabled comms that can upload data automatically without need for a phone.
- 2G/ 3G enabled comms to allow unattended data uploads wherever there is mobile reception.

What's Next?

- Calibration
- Optimisation of:
  - design
  - cost
  - power usage

- App development to receive the data – e.g. storing of data on a daily basis
- Compatibility with other databases, e.g. Met Office WOW, BGS My Soil

Our hackathon experience...

- A great opportunity for getting a skilled group together and working towards developing an initial prototype.
- Met Office support
- Team of volunteers, limited time
- Different technologies used
- Funding is difficult to come by for such projects
- A motivated team and continued development of the solutions
- Many lessons learnt!

www.growers-nation.org.uk

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