

Soil testing kit project

Selena Georgiou, Growers' Nation

NASA International Space Apps Challenge, 2012





. How it all started...

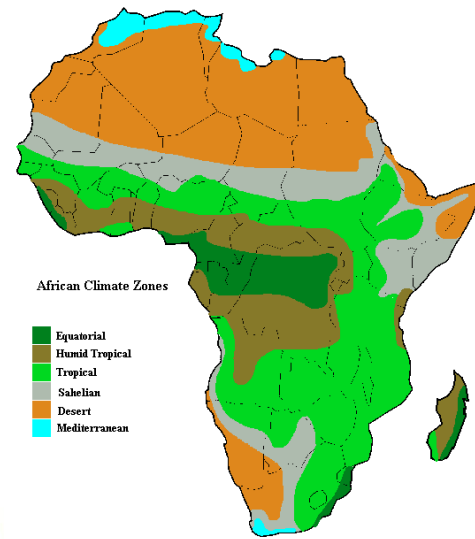


1. **What** produce can I grow where I live?
2. **When** should I sow/ plant/ harvest it?
3. **How** should I sow/ plant/ harvest it?

Geo-located data



Weather data
- First/last
frost



Climate data
– temp, precip



Growing
conditions
data



Satellite data
-ITCZ,
evapotranspiration



Soil data - PH, type



Use icons for the menu options, e.g.





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:



Add to My Plot

Sow: March to April

Plant: April 2 to April 25

Harvest: Jul 25 to Aug 30

Data availability:

Climatology

Soil

Weather Obs

Growing conditions

Search new location:



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



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



...
...



...
...



...
...



Clicking on one of the produce icons takes the user to the 'Growing info' page for that particular produce.

Data availability:

Climatology Soil Weather Obs Growing conditions

Search new location:

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

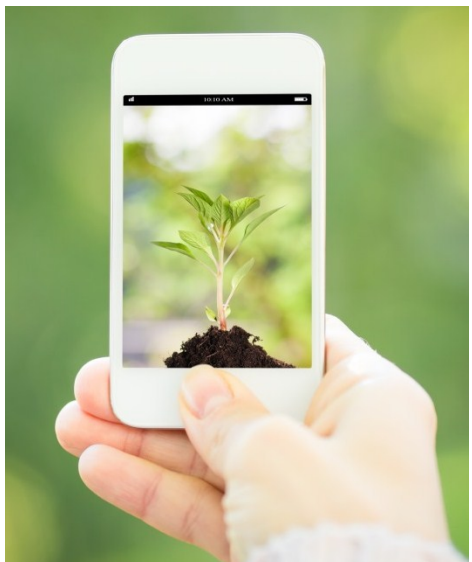
- Large variability of soil parameters over short spatial distances
- Soil observing sites are sparse
- Many existing data sets are very old, especially in developing countries
- This data is needed to decide when the optimal time is for planting crops.

The Challenge

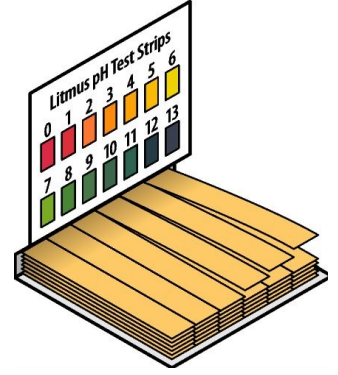


Soil type, texture, pH, moisture, temperature...

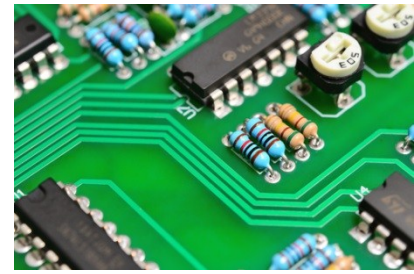
???



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



2. Hardware development
- affordable sensor development



Source: google.com



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)

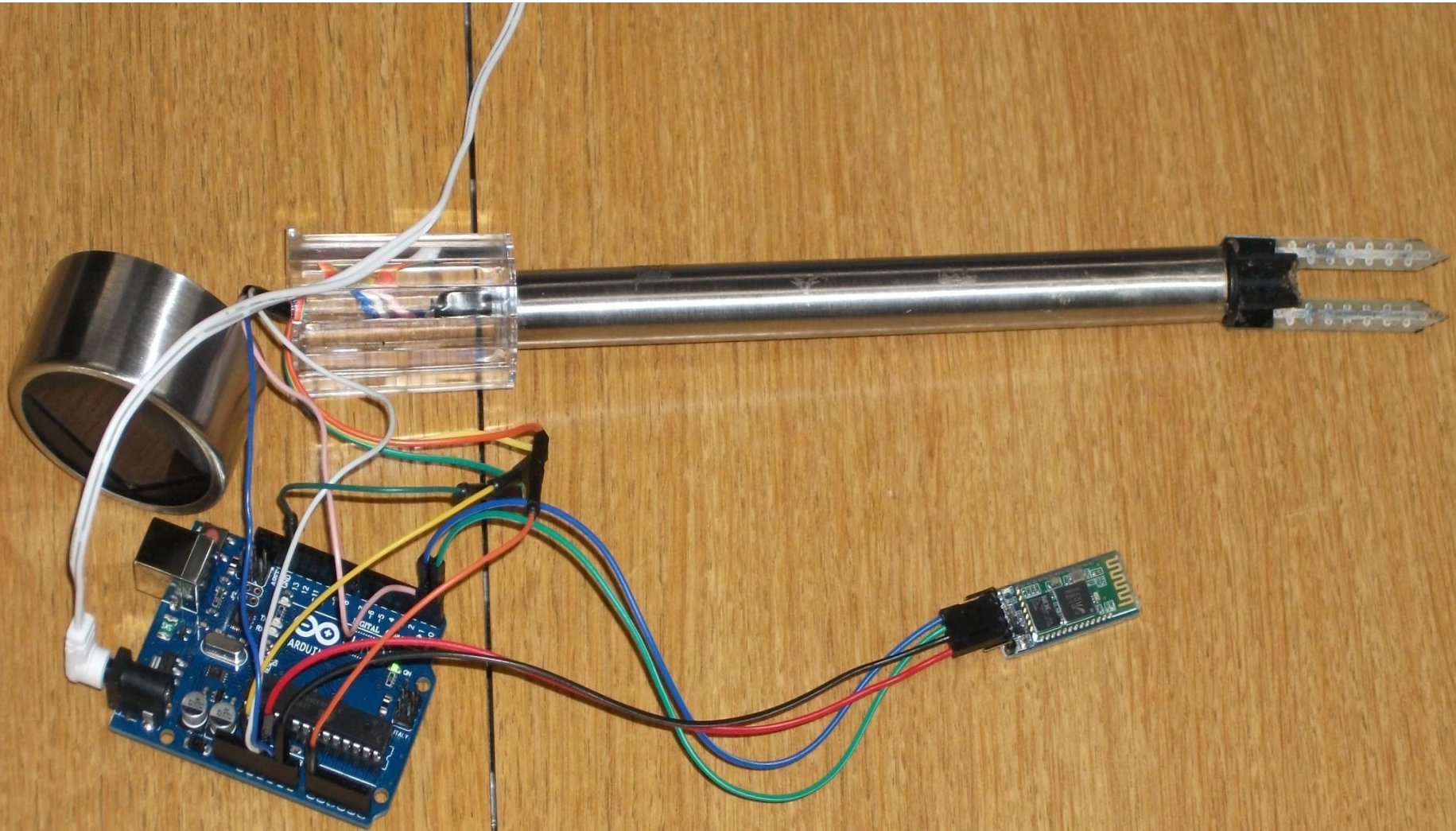
The Mud Pi team (Met Office, Exeter)





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:

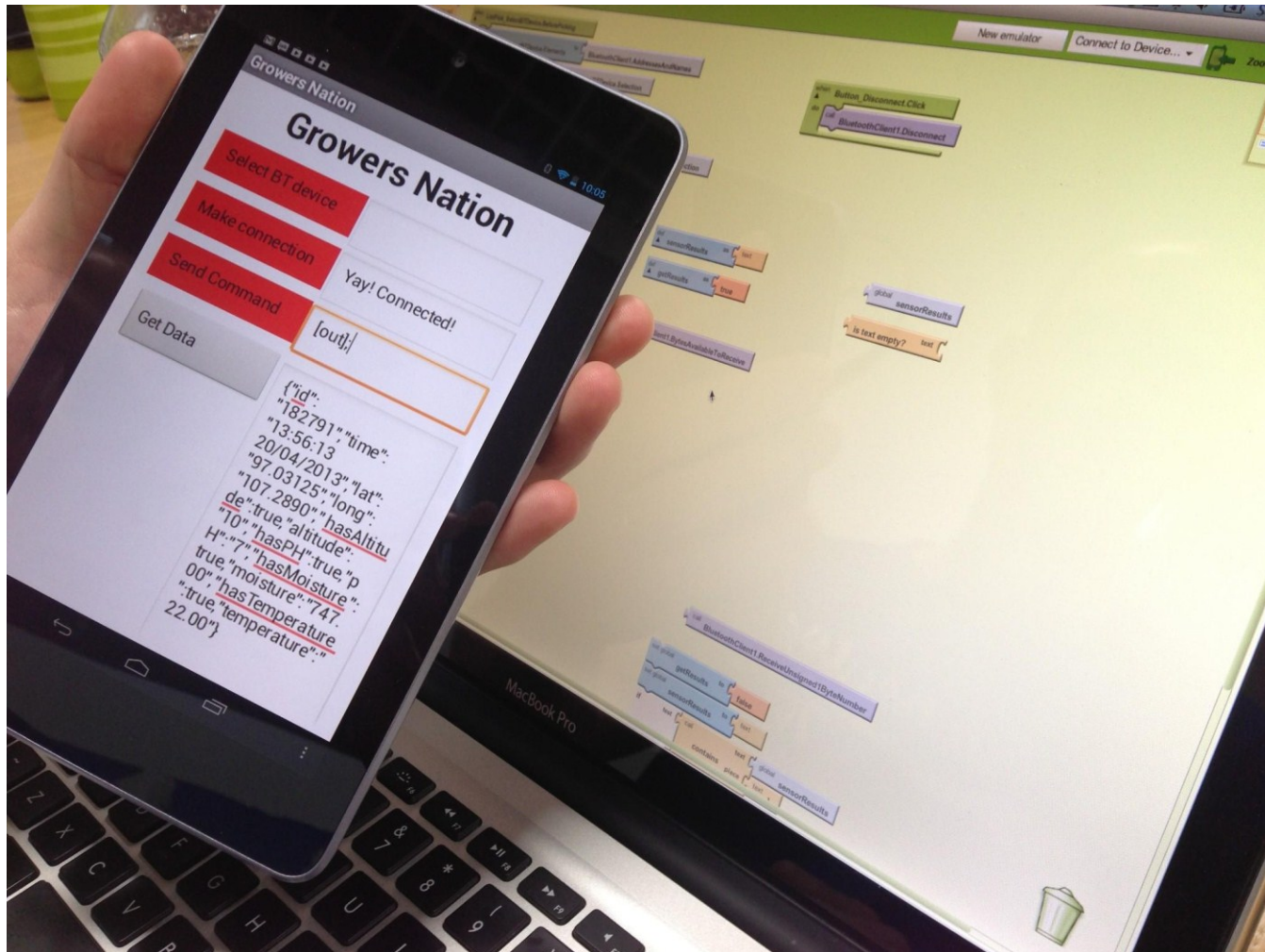


The team then tested it in the field...

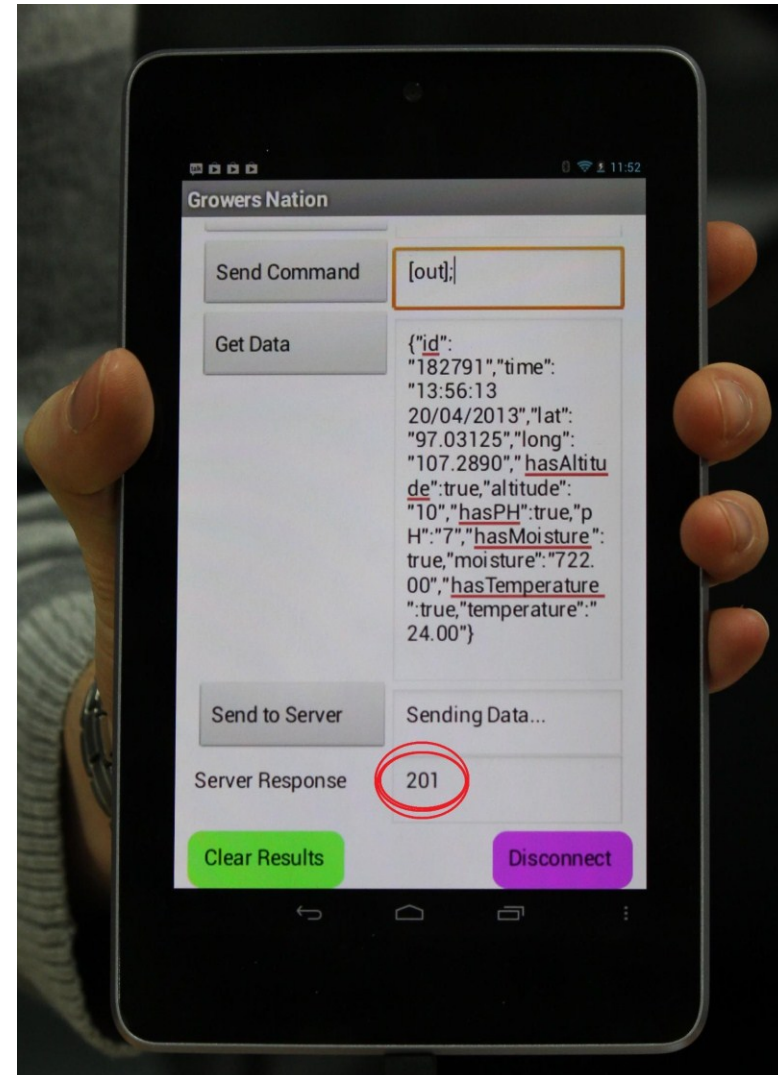
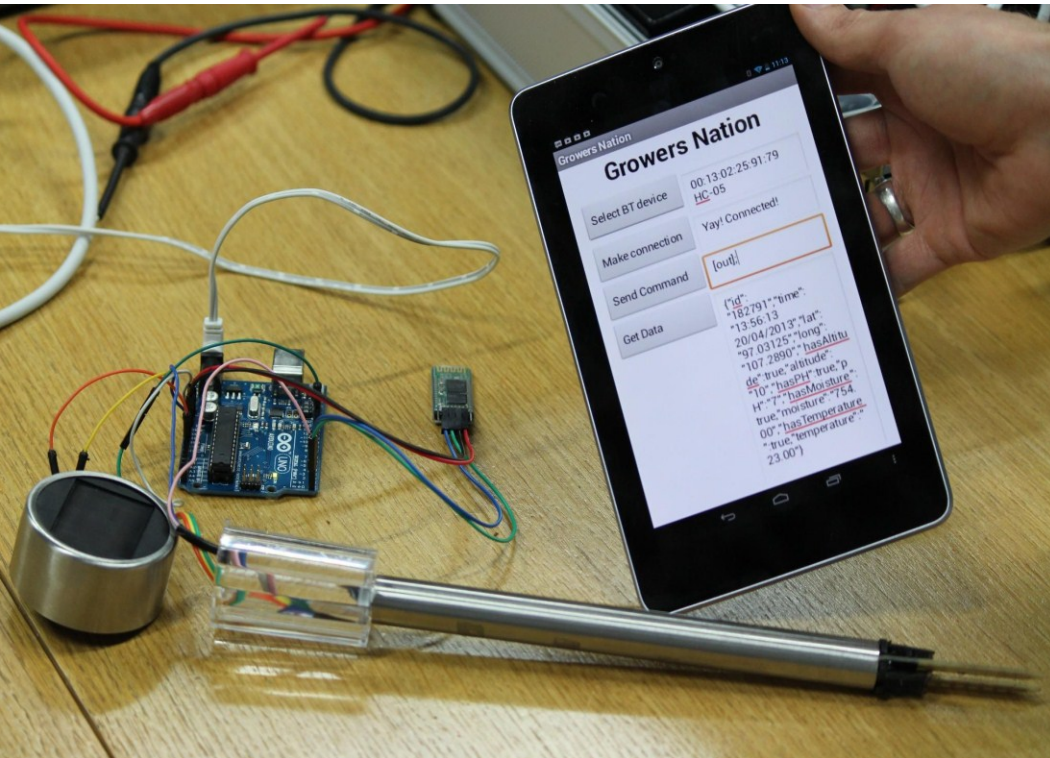


```
/dev/tty.HC-05-DevB  
-----  
Humidity (%): 75.00  
Temperature (oC): 20.00  
Temperature (oF): 68.00  
Temperature (K): 293.15  
Dew Point (oC): 15.45  
Dew PointFast (oC): 15.43  
Moisture (resistance): 166.00  
Read sensor:  
  
Humidity (%): 75.00  
Temperature (oC): 20.00  
Temperature (oF): 68.00  
Temperature (K): 293.15  
Dew Point (oC): 15.45  
Dew PointFast (oC): 15.43  
Moisture (resistance): 166.00  
Read sensor:  
  
 Autoscroll  
No line ending  
9600 baud
```

An interface to the online database was then created:



The wireless data logger in action





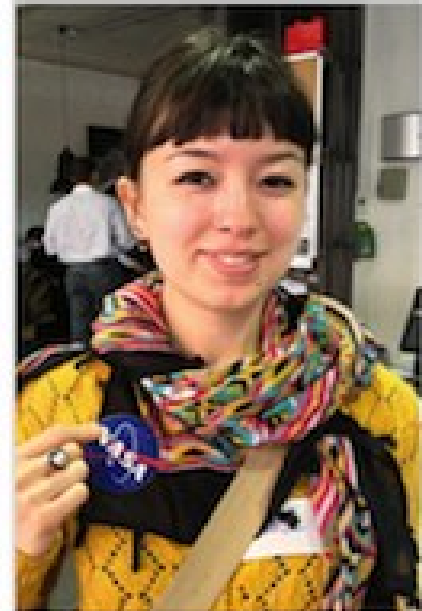
Device summary

- 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

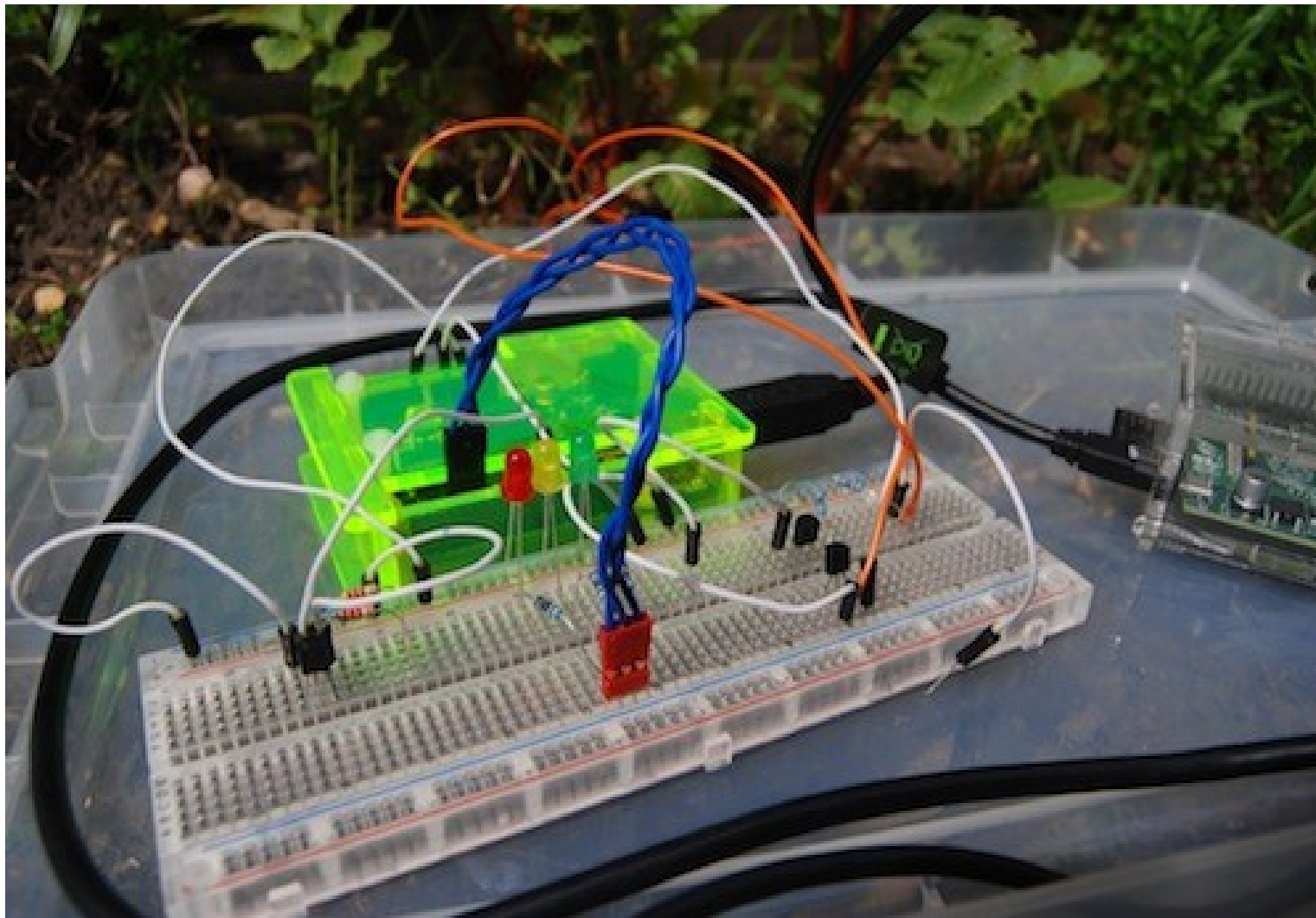
The MudPi team

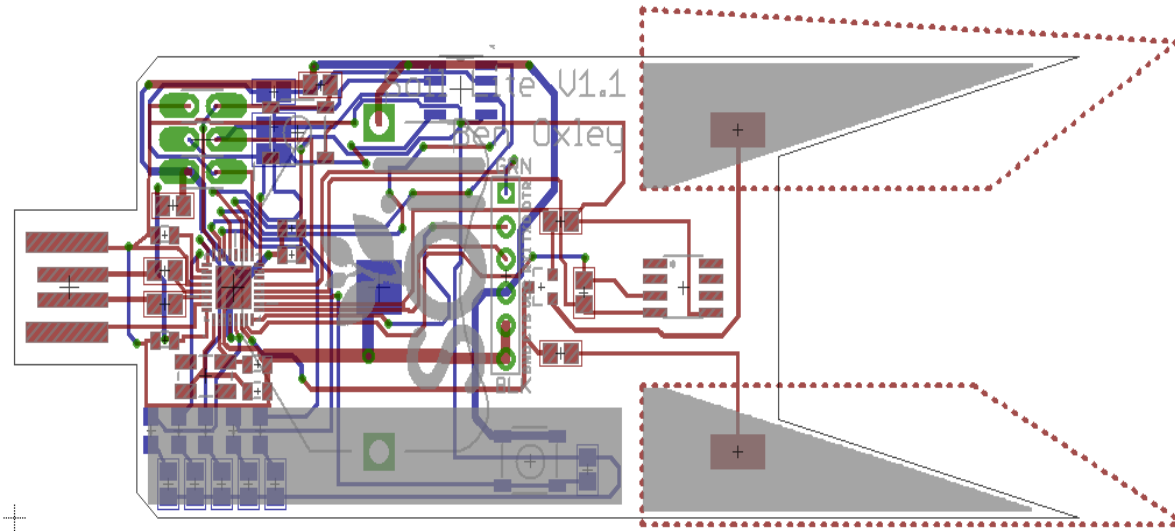


The Project Soil solution (London event)

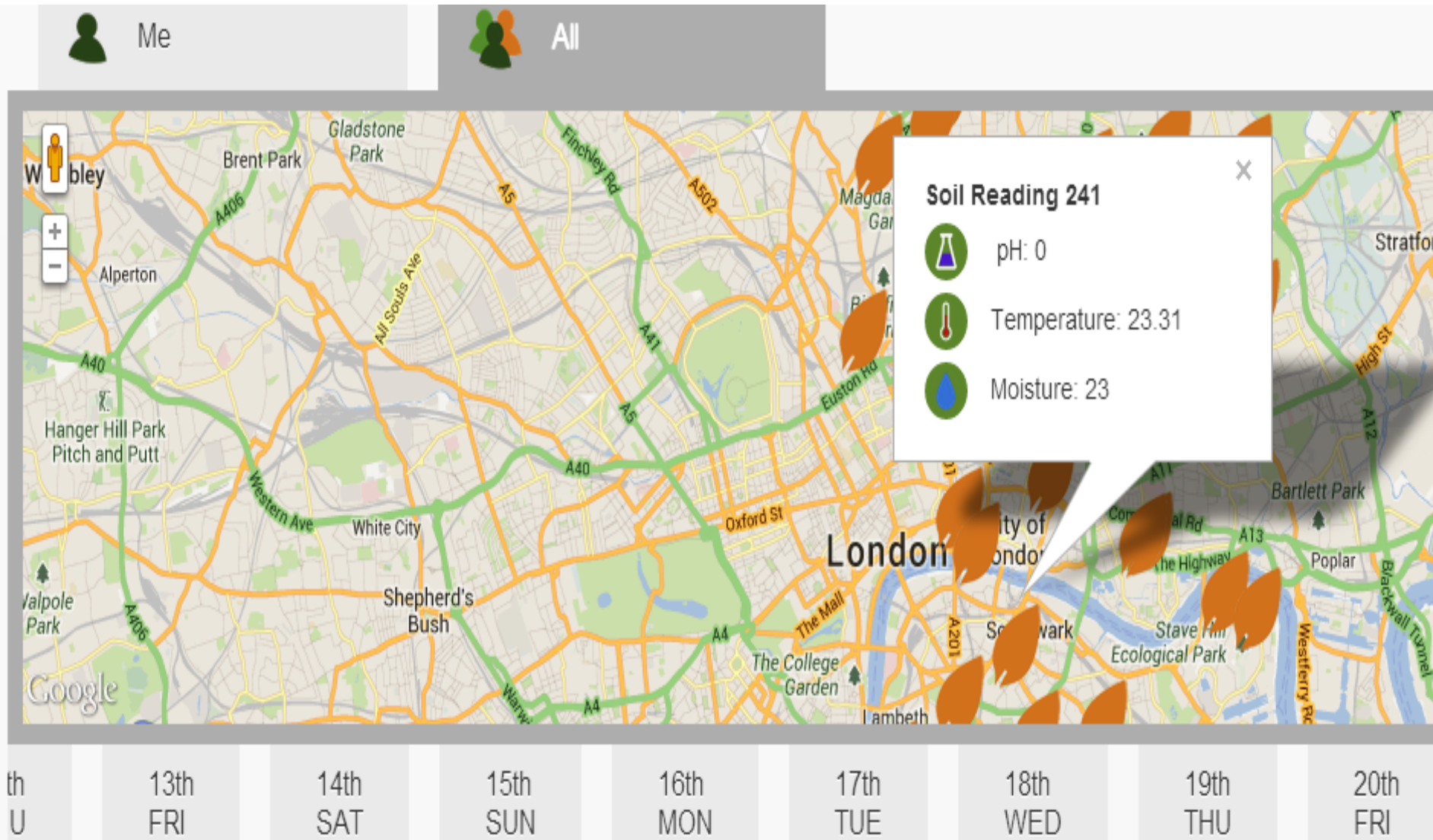


The 1st prototype: sensors, arduino, raspberry Pi

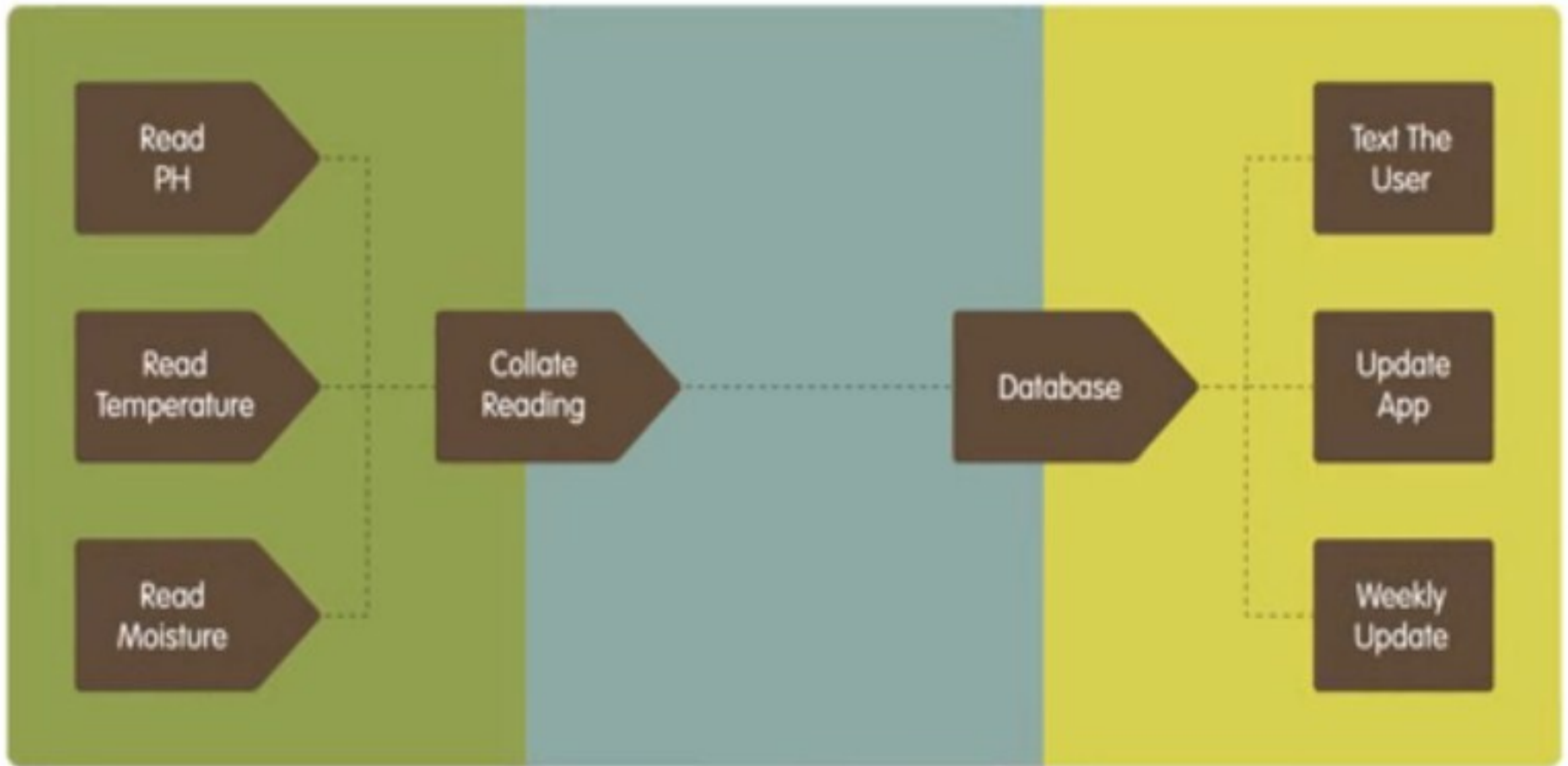




Prototype soil application front end



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!



Grower's Nation

Planting the seeds locally for a more sustainable future

[Home](#) [About](#) [Participate](#) [Links](#) [The Future](#)

Search...

WELCOME

Grower's Nation - a global map based app to determine what produce to grow and when given the soil type and current seasonal conditions. Can be used on both web and mobile based devices. Twitter @GrowersNation

Twitter feed

- @meganthefoodie @realfoodexeter we'll soon be looking to expand our outreach and happy to register interest from related organisations! 2 months ago
- The 6 Space App Challenge winners that want to change the world dvice.com/archives/2012/... via @dvice #spaceapps 2 months ago
- @dougiekinnear Thanks! Good luck with the

Background

On April 21st 2012, as part of the International Space Apps Challenge, NASA challenged us to create an app in a weekend that would have societal impact in the world!

[Space Apps Challenge – Grower's Nation](#)

The Grower's Nation app is currently under development and is the result of a dedicated team who are passionate about exploring the potential of unused land for the growing of fruit, vegetables and other crops. The app has been designed to reduce the barriers to growing by taking location, climate and growing data into consideration and to give more people the information they need when selecting what to grow.

The Grower's Nation team are based in Exeter, UK. During the Space Apps weekend, held at the Met Office, we collaborated with teams from around the world including San Francisco, New York City, Chile, Nairobi and the Dominican Republic.

What can I do with the app?

With this app, you can search for your location by post code or town and be presented with a list of produce which is suitable to grow in your climate and soil type. The app will show you when to sow, plant out and harvest your crops.

What data will this app use?

Climate data – monthly temperature and precipitation;
Soil data – pH, soil type and soil moisture;
Forecast weather data – first, last frost;
We have started compiling an open source [data set of produce growing conditions](#) especially for this project as the data wasn't freely available prior to the weekend.

Who will the users be?

This app has the potential to reach a wide range of users, from someone new to growing produce in their back garden, to schools who are starting or maintaining allotments, to crop farmers in developing countries.