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

Growing conditions data

Satellite data - ITCZ, evapotranspiration

Climate data – temp, precip

Soil data - PH, type
Traffic light icon in the corner of the map to display app reliability for the current location.

Data availability:
- Climatology
- Soil
- Weather Obs
- Growing conditions

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.
Strawberries growing info at Met Office, Exeter:

Latest recommendations based on local observation data:
- **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:
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

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

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

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 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!
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.