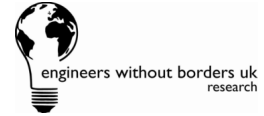


**engINDia & EWB-UK Research**

Project Proposal: Soil Testing Kit

Full description of Problem:

Farming is the major industry in the rural area around Pabal, Maharashtra, accounting for 70% of the labour force. The majority of these farmers use chemical 'NPK' fertiliser (containing nitrogen, phosphorus and potassium) to restore nutrients to their soil. The farmers prefer to use natural manure but there is limited livestock in this area (this could be limited by the implementation of human waste disposal). However, without adequate training on chemical fertiliser use, overuse of this chemical fertiliser can be a problem. The cost to farmers is unnecessarily high and the soil gets damaged with years of overuse of fertiliser. This threatens future yields of crops. The overuse also creates problems in the local ecosystems, with increased algal blooms and problems associated with eutrophication. The farmers seem to be aware of these problems, but are naturally more worried about supporting their family.

If a low-cost method of soil testing for nitrogen, phosphorus, potassium and other minerals were available, then farmers could know the right amount of fertiliser to use. This would reduce all the previously mentioned effects.

How the local community will use the proposed solution:

Vigyan Ashram is a local NGO, and one of its roles is a local community centre. They have the facilities and adequate personnel to store and operate a low-cost soil testing kit. Vigyan Ashram could act as a centre for local farmers to come with samples of their soil, pay an affordable amount and then learn the exact mineral content of their soil. They could also then be told exactly how much fertiliser they would need to use per unit area of land.

Estimate of the economic benefit anticipated and plans for training of the local community:

With a soil testing kit, less fertiliser would be used, as an optimised solution can be achieved. In the short term this would save the farmers a lot of money as 'NPK' fertiliser costs Rs. 325 for 50 kg, thus contributing a large part of a typical farmer's costs. A long term economic benefit would also be felt if less 'NPK' fertiliser is used; the soil will not be damaged so quickly and future yields will not be compromised.

Vigyan Ashram owns and is able to operate a simple soil testing kit which estimates nitrogen, potassium and phosphorous values in the soil by means of a simple electrode set. However, the results obtained are crude. With detailed, clear instructions on its workings

and operations, the staff of Vigyan Ashram will be able to test local soil relatively cheaply. Vigyan Ashram predicts the maximum cost for testing should be no more than Rs. 50.

The use of 'NPK' fertiliser is not a sustainable solution, as fertiliser has to be bought in from another area, causing the local community to lose money. Also, the soil and local ecosystems get damaged because of the use of chemicals in the soil. A soil testing kit would limit the use of NPK fertiliser in the current situation. Importing natural, organic manure is more expensive than using chemical products (chemical fertilizer is imported from Pune for Rs. 325 for 40 kg). Therefore any use of chemical fertiliser would have an impact on the local environment, but its impact both short term and long term on the local community can be reduced to an acceptable level.

Full description of the local situation:

At the present time Vigyan Ashram provides a soil testing service. However this is a simplistic and crude method for testing nitrogen, phosphorus and potassium levels (by the use of an old electrolysis device) and therefore is not accurate. A more accurate analysis, in which the amount of nitrogen, phosphorus and potassium is exactly determined and the content of 13 other micronutrients is deduced using polymer sensors, can be obtained by sending the sample to Pune. Here, the test is carried out at a cost of Rs. 100 and there are additional costs of Rs. 100 - 200 for the transportation of the soil sample. This cost is too high for local farmers to afford, even taking into account the amount of fertilizer that is saved, and so this service is not used.

A kit that could be designed on previous technology (using polymer sensors and potential differences) or a completely new method that would reduce the cost of soil testing would be tremendously useful. The kit itself would have to be low-cost for Vigyan Ashram (and perhaps other local NGOs and/or government agencies) to afford it. The current cost of the sophisticated kit (located in Pune) is Rs . 30,000 - 40,000 . Vigyan Ashram would like to offer this service at a maximum price of Rs. 50 for local farms.



Local Farmer Eknat Pingley's Farm

Full description of relevant infrastructure and resources available locally:

Electrical Component	Cost (Rs.)
Resistor	1
Capacitor	7
Transistor	10
Diode (LED)	2
Transformer	25
Switch	7
Printed circuit board	5
Wire	1-8 per wire
Light bulb	10
Dry cell battery	100

'NPK' fertiliser costs Rs. 325 for 50 kg (enough for about one acre of land).

Organic, natural fertiliser costs Rs. 325 for 40 kg when bought from Pune; a limited supply is available free from the farmer's own cows, goats and buffaloes. However a typical farmer

would only have a total of about 10 of these animals and this is not sufficient for the farmer's fertiliser needs.

Useful background reading or resources:

See engINdia Website: <http://www.engindia.net/resources.htm>

Organisation Contact Details:

Name of Organisation engINdia

Contact engindia@mit.edu

Web site www.engindia.net

Background information engINdia exists to promote appropriate and sustainable engineering solutions in developing areas. Currently the program focuses on Pabal, Maharashtra, a rural village in India located 80 miles east of Mumbai. Pabal is home to Vigyan Ashram (see details below), an educational institution that focuses on rural technologies. The existence of Vigyan Ashram and Pabal's proximity to Mumbai made it the perfect starting point for engINdia.

engINdia is a partnership between 6 students from the University of Cambridge, Massachusetts Institute of Technology (MIT) and the Indian Institute of Technology Bombay (IITB). An expedition was conducted during the summer of 2005 to the area of Pabal, Maharashtra. There, the engINdia team worked with Vigyan Ashram and the local community to gain an understanding and appreciation of the development issues faced by rural India which could be tackled through engineering.

Name of Organisation Vigyan Ashram

Web site <http://vigyanashram.com/>

Background information Vigyan Ashram is an educational institution situated just outside Pabal, Maharashtra, about five hours east of Mumbai. The focus of the institution is on rural education and enabling the rural population of Pabal and the surrounding areas to learn

about technology and start their own businesses. The facility includes classrooms, labs, workshops, and living quarters for students. There is also a Fab Lab installed at the site (for more information, see <http://fab.cba.mit.edu/>). VA is striving to become an internet service provider for the area and to that end many of the organization's activities are becoming focused on internet-related projects, such as internet kiosks for rural farmers. A few people at VA speak English, but some knowledge of Marathi or an interpreter will be needed in order to carry out work in the area.