Common Sense Net 2.0 - Minimizing uncertainty of rain-fed marginal farmers in semi-arid India with sensor networks

The main aim of the common sense net 2.0 project is to empower farmers in semi arid areas in their farming decision making process. Marginal farmers in these regions mostly rely on rain for their crop. Draughts are common and farmers are faced with large uncertainty about their yield at harvest time (typically expressed in kilogram per hectare) due to the influence of the amount and duration of rain fall, pest and diseases of the crop and the availability of fertilizers and pesticides. Agricultural research has created powerful crop simulation models that can be harnessed to predict crop yield. Their accuracy depends on the availability of environmental parameters such e.g. soil type, soil moisture and temperature, ideally over the life-time of the crop. Such a diary of local environmental data is currently not available. For example, the geographical resolution of data on rainfall as measured by official weather stations is too coarse. Last but not least the predictions from crop models reflect the uncertainty of the input parameters. Even in the presence of localized environmental data the farmers have to deal with the influence of uncertain weather conditions and are struggling with making good decisions in the face of uncertainty.

In order to help the farmers that only have limited access to electricity our project is developing a low power sensor box, which collects daily data on rain, soil moisture, humidity, soil temperature, ambient temperature, atmospheric pressure in the farmer's field. The farmer uses a mobile phone application to retrieve the sensor data via low-power communication protocols e.g. Bluetooth. The phone relays this information along with some manually entered parameters about e.g. the crop being farmed, on what soil and the sowing date to a server via the GSM network. We are planning to use NOKIA's life tools service that is targeted at farmers in India. Their interactive information system, which includes for example current market prices for crops and farming inputs, is based on the exchange of SMS messages. Revenue sharing with the provider makes for a sustainable usage based business model. The crop simulation model takes the sent data along with weather forecast information and computes yield scenarios (in kg/hectare) that are easy to understand for the farmer, e.g. best, worst and most probable case. Further effects on the yield if fertilizers and pesticides were applied or if more water could be supplied to the crop are also included. Depending on the farmer's literacy rate the scenarios are forwarded to the mobile phone through text messages (SMS), multimedia messages (MMS) or voice mail. This allows the farmer to repeatedly review and ponder the scenarios in his decision making process.

For this to come through the system has to be designed such that the potentially illiterate farmers with little technical background can perform the following user interactions: pairing the sensor box with the mobile phone, installation and calibration of the sensor box, manual data entry, retrieving data from the sensor box, receive and review outcome scenarios, re-installation of the sensor box on a different plot, understanding when and how to change the batteries in the sensor box.