Smart Monitoring System For Beekeeping Farms

Why we selected this topic?

Beekeeping (or apiculture) is the maintenance of bee colonies, commonly in man-made hives, by humans. Most such bees are honeybees in the genus Apis, but other honey-producing bees such as Melipona stingless bees are also kept. A beekeeper (or apiarist) keeps bees in order to collect their honey and other products that the hive produce (including beeswax, propolis, flower pollen, bee pollen, and royal jelly), to pollinate crops, or to produce bees for sale to other beekeepers. A location where bees are kept is called an apiary or "bee yard".

Beekeeping farm

1. **Uses of honey bee:**

   In addition to providing man with very valuable materials as honey and beeswax, the honey bees are also useful to him in aiding in pollination of many of his crops. In fact, it has been claimed that the value of bees in pollination of crops is ten to twenty times the value of honey and wax they produce. Certain crops like apples, alfalfa and clover almost entirely depend upon bees for their pollination. Even among some regularly self-pollinated crops, the yield is considerably increased after visit of bees.

2. **Uses of Honey:**

   Honey has value as a food, as a medicine, as a cash crop for both domestic and export markets and as an important part of some cultural traditions.

   i. **As a food**: Honey is valued everywhere as a sweet and tasty food. At times of food shortage it is a useful carbohydrate source that contains trace elements and adds nutritional diversity to poor diets. Honey often has an important place in traditional food preparation.

   ii. **As a medicine or tonic**: In many parts of the world, honey is used as a medicine or tonic and as a special treat for children. Modern medicine is increasingly using honey for a variety of treatments.

   iii. **As a cash crop**: Fresh local honey is always more highly valued than imported honey. Many beekeepers sell their product directly to consumers. Honey is often used as a barter

commodity in villages, especially in remote areas or areas isolated by war or sanctions. Honey is a stable commodity with a long shelf life. If harvested carefully, it will remain wholesome for many years.

iv. **As an export crop**: As standards of living rise, honey consumption increases. Most industrialized countries import honey to meet demand. This requirement can provide developing countries with a useful source of foreign exchange from honey exports. The countries with the highest honey exports are Mexico, China and Argentina. Because beekeeping does not use land, production of honey for export need not conflict with growing crops for local consumption.

3. **Uses of Bees Wax:**
   i. Mainly used by candle industry.
   ii. Used for preparing comb foundation sheets.
   iii. Used in cosmetics like cold creams, lipsticks and rouges.
   iv. Used in pharmaceutical and perfume industry (ointments, capsules, pill coating and deodorants).
   v. Used for preparing shoe polish, furniture etc. for water proofing.
   vi. Used in adhesives, chewing gums and inks etc.
4. **Uses of Bee Venom:**
   i. Rheumatism can be cured by *apitherapy where* bees are made to sting the patient.
   ii. Venom can be used as sub-cutaneous injection for treating rheumatism.
   iii. Ointment made by mixing apitoxin, vasaline and salicylicacid (1:10:1) can be applied on affected areas.
   iv. It has stimulating effect on heart muscles and decreases cholesterol level and lowers blood pressure.
   v. It can cure neurosis, endoarteriosis, endoarthritis and neuraglia.
   vi. Antihistamine creams or injections are used as anti-allergents.
5. **Uses of Pollen:**

It is collected by pollen trap from ingoing pollen foragers. Pollen is a rich protein source for human diet.

6. **Uses of Propolis:**

Propolis gathered by bees from resinous exudes of tree. In the bee colony propolis is used for sticking frames, sealing cracks and crevices but it is a contaminant of comb wax. Propolis is obtained by scrapping it from the frames.

Properties: It contains resins and balsams 55 per cent, ethanol and scented oils 10 per cent and pollen 5 per cent.

i. Used in preparing ointments for treating cuts, wounds and abscesses in cattle.
ii. Mixed with vasallne to soothen burns.

7. **Uses of Royal Jelly:**

Royal jelly is secreted by gland of nurse bees of the age of 6 to 12 days when the glands are fully active. It is very nutritious food and is fed to the young worker larvae and the queen larva and adult. Royal jelly is milky or light pale in colour.

Properties: It contains proteins 15 to 18 per cent. Proteins are mainly amino acids (alanine, arginine, aspartic acid, gultonic acid, glycine, isoleucine, lysine, methionine, phenyl alanine, tryptophane, tyrosine and serine). It also contains lipids 2 to 6 per cent, carbohydrates 9 to 18 per cent (glucose, fructose)

i. Responsible for queen determination
ii. Very nutritious food for human beings

Problem Formulation:

Magnitude: There are certain challenges for beekeeping farmers to produce sustainable yields due to unpredictable weather conditions in India and globally as well.

Time Frame: This problem prevails throughout the year due to temperature and humidity changes.

Geographic area:

Various species of bees get adapted to their surrounding temperature. They get adapted to climate and their brood nests are made according to season.
In actuality, the response to lack of pollen and the response to cold temperature are independent of each other but happen to overlap in cold-winter regions.
Whereas in hot regions, bees get adapted to surroundings by constantly working and maintaining minimum temperature by refilling the food/resources that was consumed during winter.

Population: Beekeeping Farmers.

Existing Solution: Temperature and Humidity inside the beehives play very important role in the process of getting best yield. In developing nations like India, traditional farmers put wet gunny bags to maintain desired temperature and humidity using their own intuition which may lead to low yield due to human errors. Whereas in developed nations like Europe and America, the farmers are tech-savvy to adopt modern methods of data collection with the help of IoT devices in order to make smart decisions with predictive analytics.

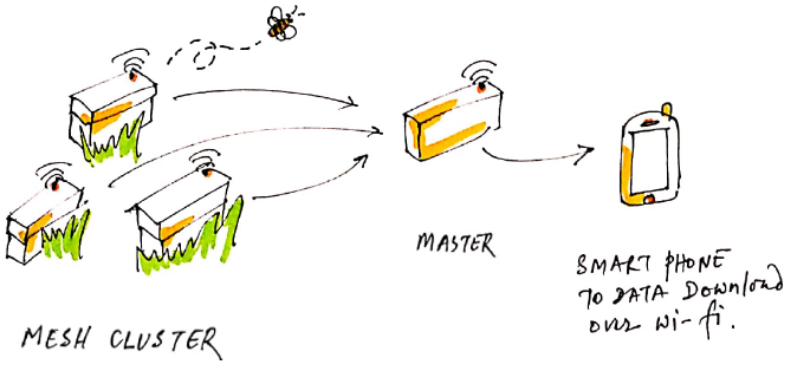
Unanswered questions: How can we manage to keep beehive weather condition to be perfect for bees?
How can we check the weight of beehives without disturbing bees?

How can the beekeeping farmers get statistics in simplified way?

Problem Statement:

Can we develop an IoT based smart solution which can monitor weather conditions in beehive and its weight and can tell farmers, how to control weather conditions in the beehive and take necessary steps in order to get best yield through a simple app?

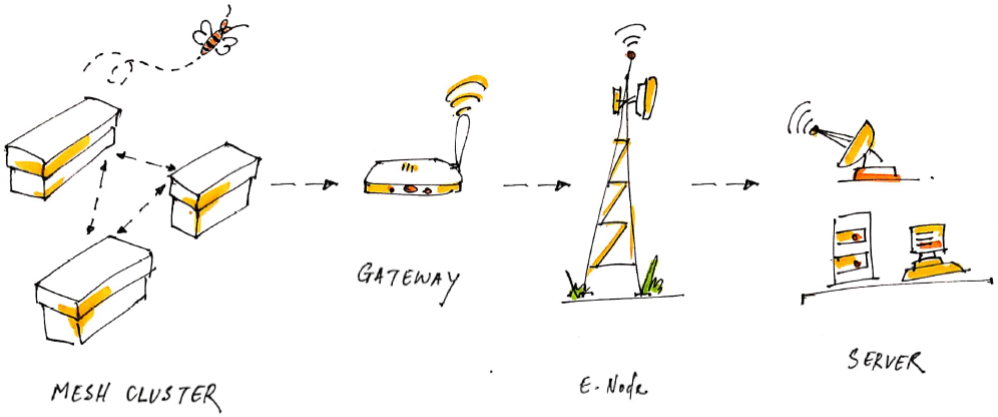
Site with no network connectivity



Work-flow steps

1. Temp., humidity and weight collected from boxes and sent to master each hour.
2. Master saves the records in its memory
3. User can take a smart-phone to site, and download data from Master

Site with GSM network available



Work-flow steps

1. Temp, humidity and weight will be collected from field boxes, and sent to the Gateway/Master per hour
2. Master collects data and through mobile network send to server
3. Dashboard and records are updated in real-time, and visible in desktop/mobile interface
4. Data can also be directly downloaded in mobile phone at site

Our role in project:

- We will do analysis on how temperature and humidity are affecting the beehive and how the weight is increasing and decreasing.
- Develop a user-friendly app which is easy to use and has a UI which is understand for farmers. Basically, design of our app will be farmers centric design.