

IoT Solution for Silk Production

- Improvement of Silkworm Lifestyle and Quantity of Silk Production

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Topics

- Sericulture and Silk Production
- Internet of Things(IoT)
- Need of IoT in Sericulture
- Application of IoT in Sericulture

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□ What Does Sericulture Mean?

- Sericulture, or silk farming, is the cultivation of silkworms to produce raw silk.
- The production of silk products depend on the quality and quantity of raw silk.
- Ultimately, the more advanced technique, the more one will get raw silk.

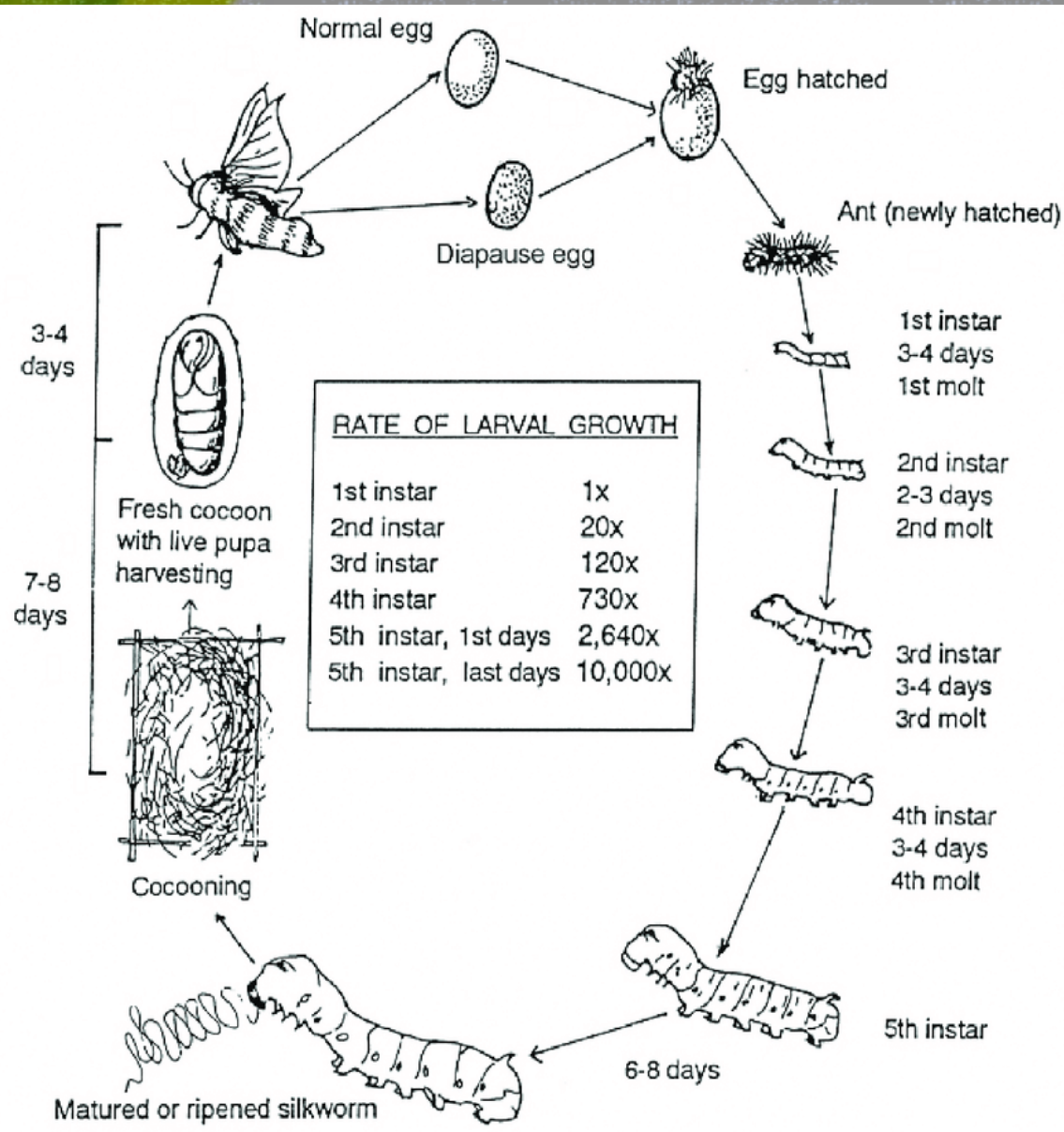
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❑ Process Followed in Sericulture:

- **Moriculture** – The cultivation of mulberry leaves.
- **Silkworm rearing** – Promoting the growth of the silkworm.
- **Silk reeling** – The extraction of silk filaments from the silkworm cocoons.

✓ We will mainly deal with the second process
Silkworm rearing.

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□ A brief description of Silkworm Rearing

In sericulture, the silkworm rearing process begins with the laying of eggs by the female silk moth. Typically, 400-500 eggs are obtained from one female silk moth. These eggs (laid on a paper/cardboard sheet) are then disinfected with the help of a 2% formalin solution.

A feeding bed is prepared on a rearing tray by sprinkling chopped mulberry leaves onto it. The hatched larvae are transferred into this tray via a process known as brushing. In order to maintain humidity, foam strips are soaked in water and placed on the tray. The silkworm larvae initially have a good appetite. As they grow, their appetite slowly diminishes until their active stage. At this stage, the silkworm eats enthusiastically until its final feeding stage.

After reaching maturity, the larvae begin searching for hospitable places to begin their pupation. At this stage, the body of the silkworm shrinks and becomes translucent. These mature larvae now wrap themselves in a cocoon by secreting saliva from the two salivary glands on their heads. This saliva solidifies and becomes silk when it comes in contact with air.

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- ✓ A cocoon is a natural silk composite with a non-woven structure made of continuous silk fibers conglomerated by sericin bonding matrix.



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❑ Silk Reeling

- ✓ Inside the cocoons, the larvae undergo metamorphosis and turn into pupae. The harvesting of silk from these cocoons is the final stage of sericulture. First, the pupae inside the cocoon are killed by boiling the cocoon and exposing it to steam and dry heat. This process is called stifling. Now, the silk filaments are removed from the dead cocoon via a process called reeling. When the cocoons are placed in boiling water for approximately 15 minutes, the adhesion of the silk threads reduces, enabling the separation of individual filaments. These filaments are twisted into a thread with the help of a series of guides and pulleys. This silk is then re-boiled in order to improve its luster. One thread of silk contains approximately 50 silk filaments. However, over 900 meters of filament can be obtained from a single cocoon. Thus, raw silk is obtained from the silkworm and the sericulture process is completed.



Fig: Machine for Processing Silk from Cocoon

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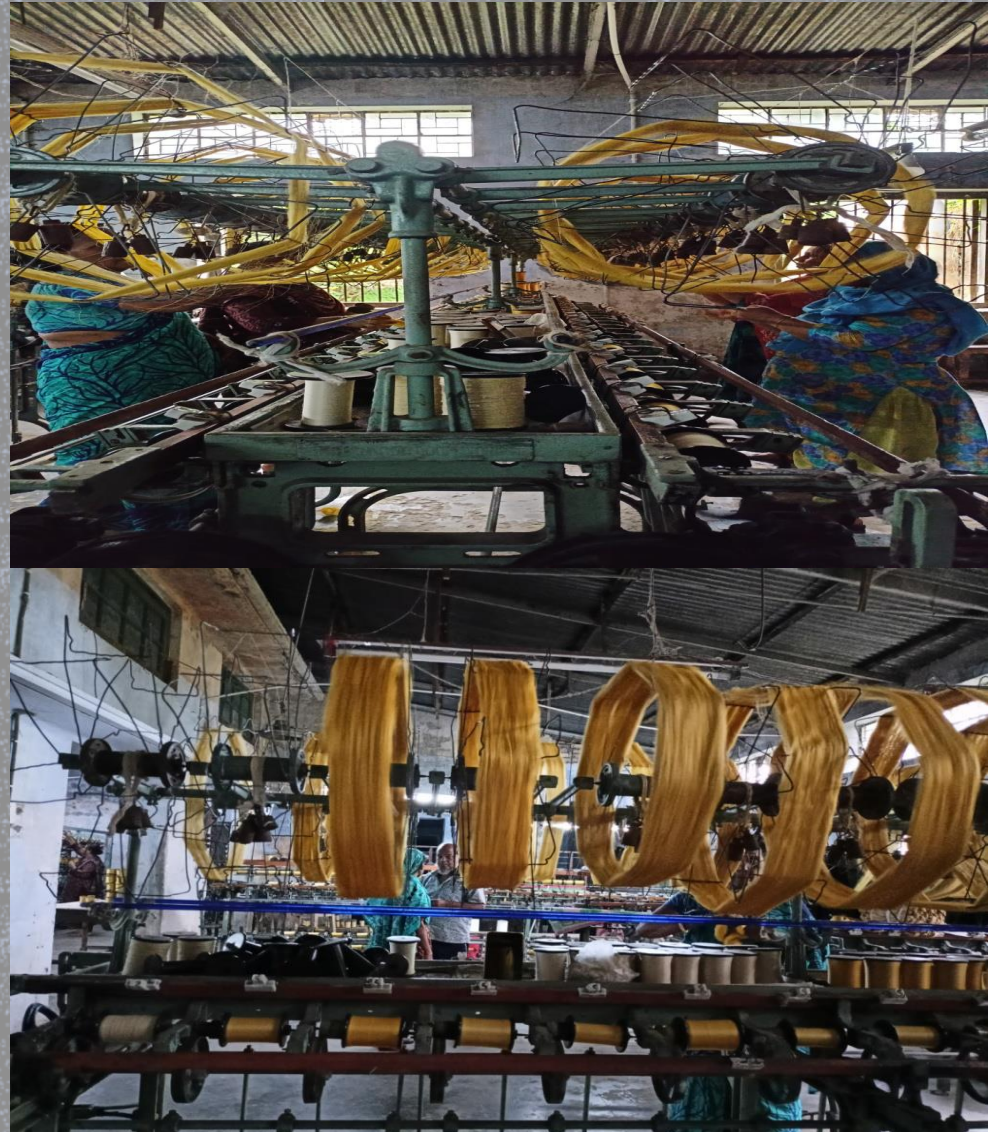


Fig: Silk Reeling

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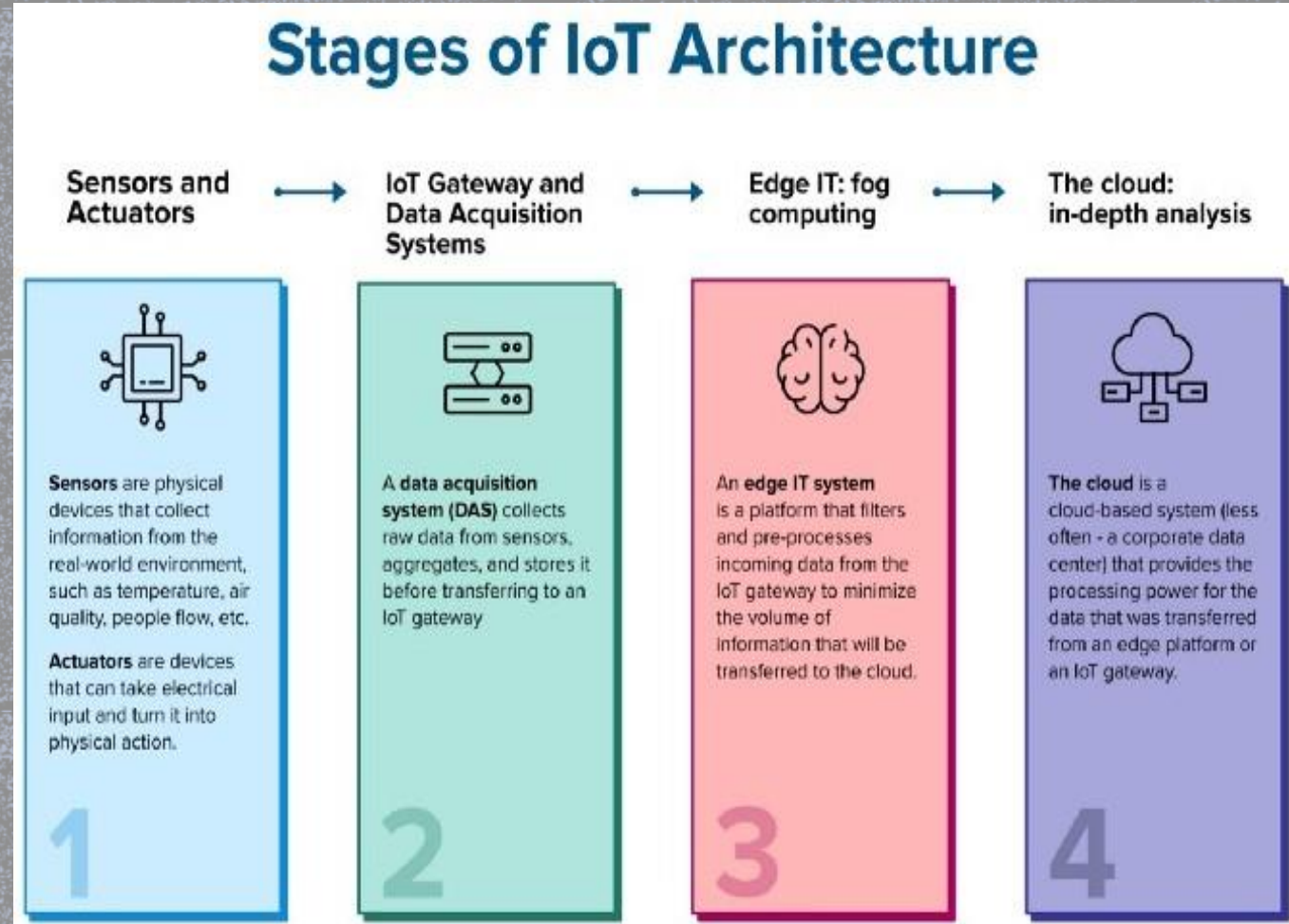


Fig: Process of Sharee creation

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❑ What is Internet of Things(Iot)?

- The Internet of things describes physical objects with sensors, processing ability, software, and other technologies that connect and exchange data with other devices and systems over the Internet or other communications networks.



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□ Why we need IoT in Sericulture?

- ✓ Better monitoring system.
- ✓ Better data collecting method.
- ✓ Best suitable environment creation.
- ✓ Low cost, high output.
- ✓ Quality assurance.

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□ Stages of IoT implementation process

- i. Installation stage
- ii. Testing and Observation stage
- iii. Analysis stage
- iv. Adjustment stage
- v. Commercial stage

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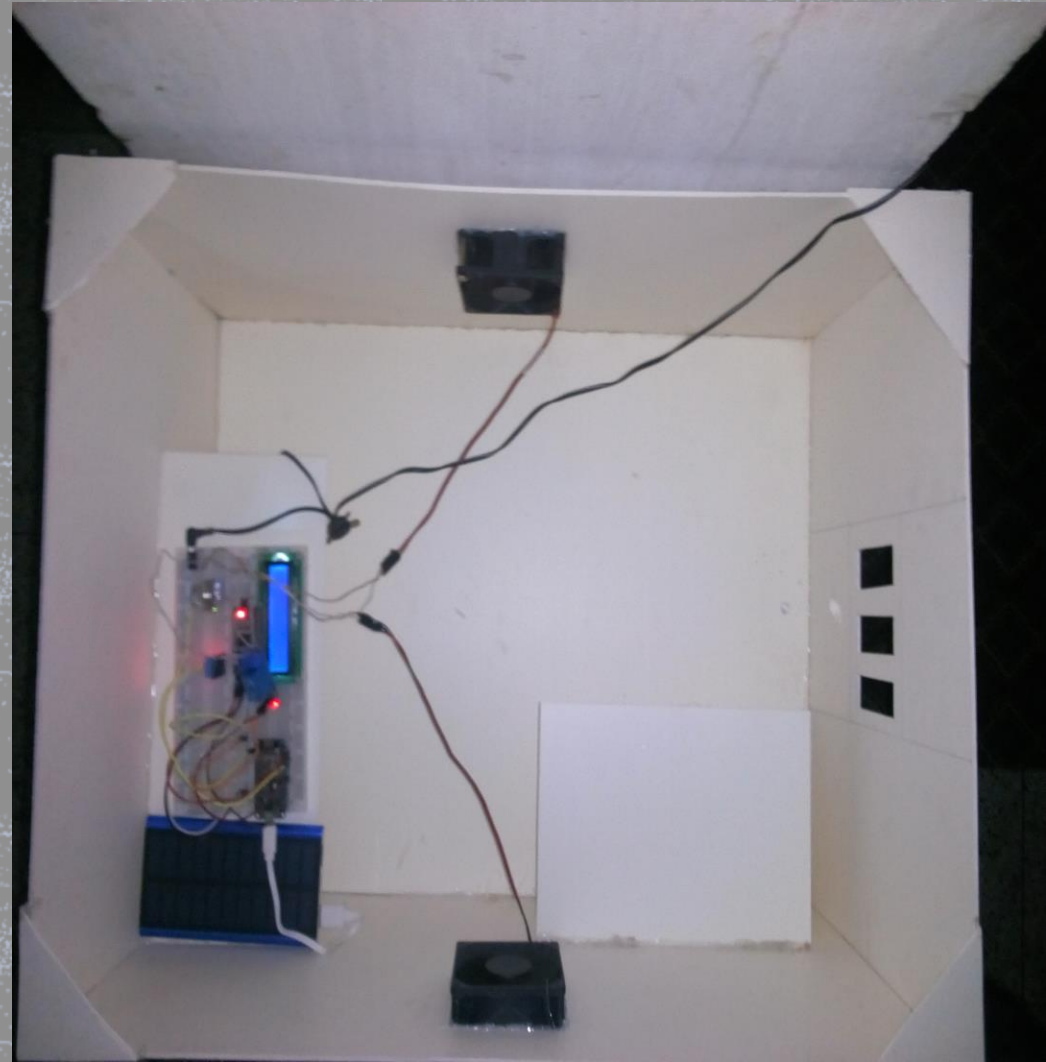
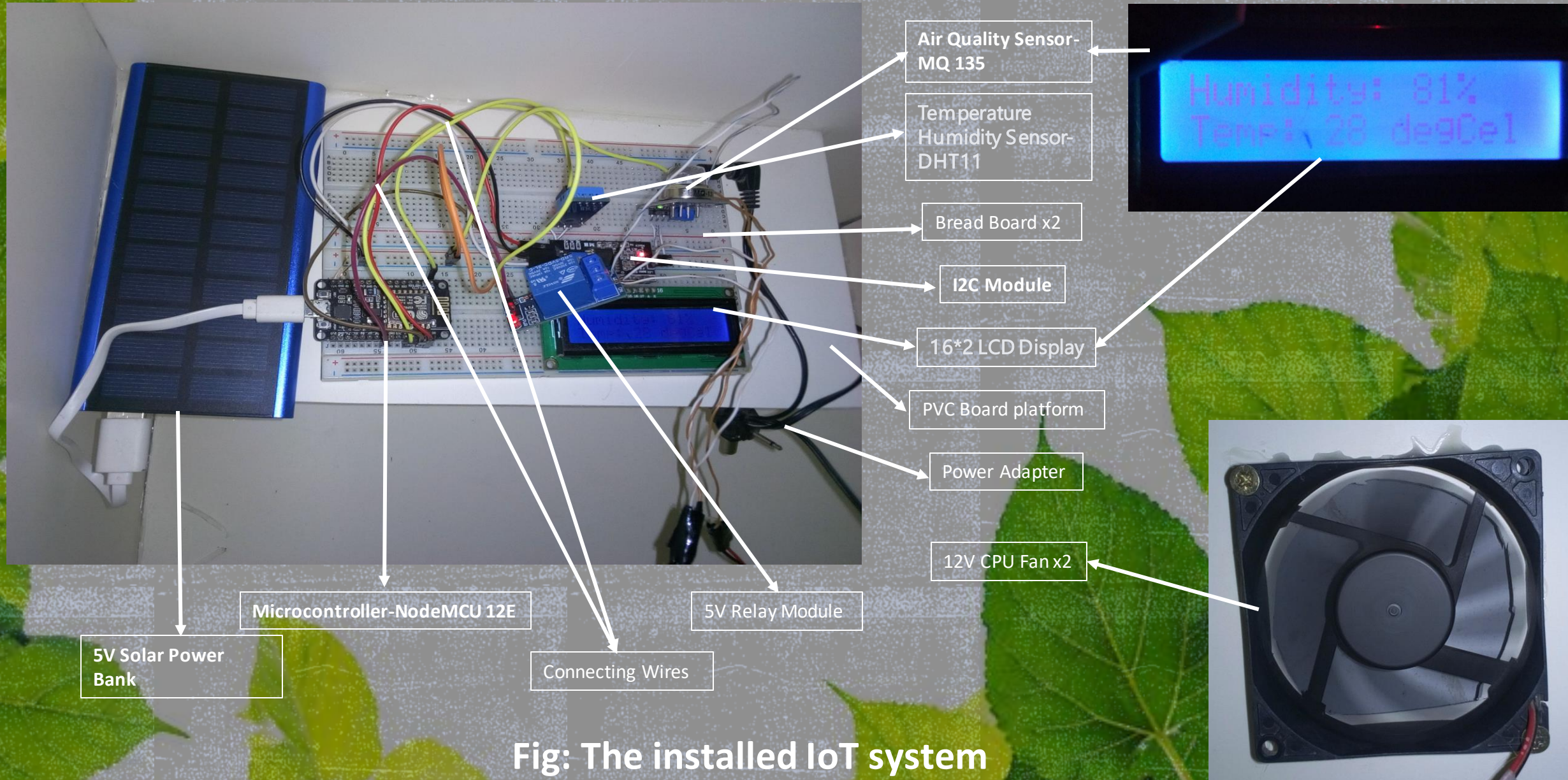
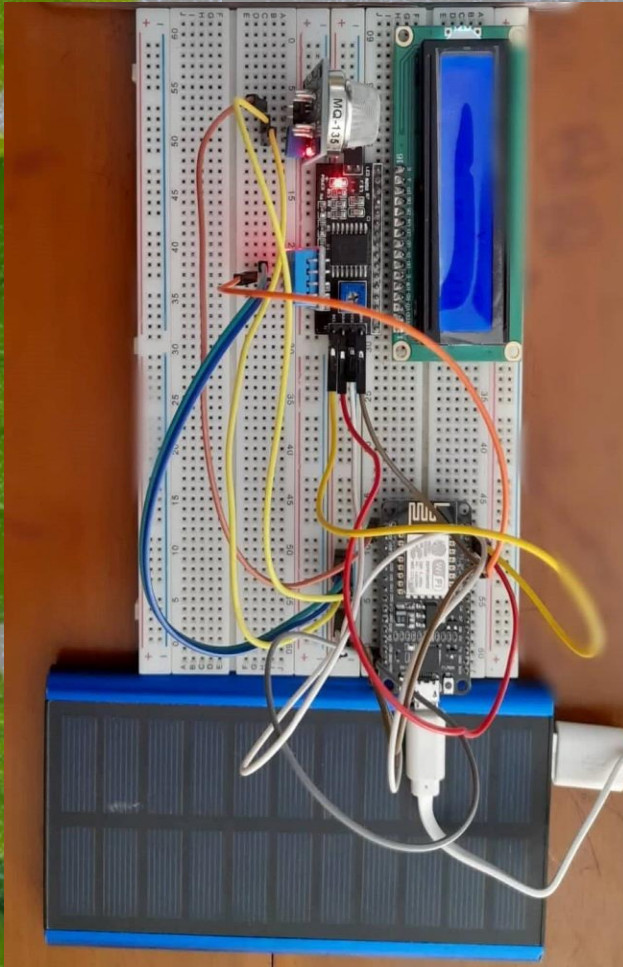


Fig: An artificial environment created for silkworm rearing using IoT

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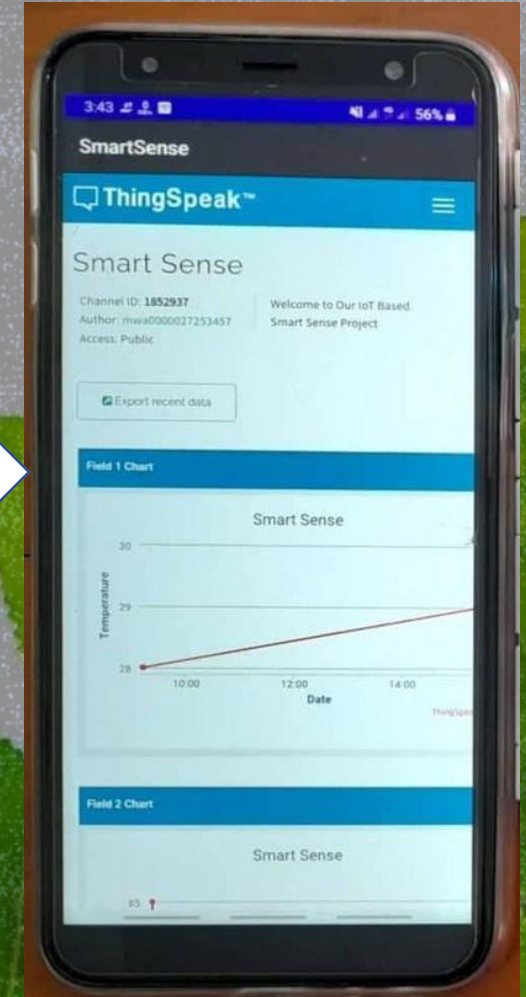


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- ☐ Data Collection using Things Peak web Redirecting App
 - i. Temperature
 - ii. Humidity
 - iii. Air quality

- ☐ Mechanism of air circulation
 - If temp > optimal temp:
Start the fan;
 - If air quality != normal:
Start the fan;



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- ❑ Next Step
- ✓ Testing the setup by co-operating with experienced farmers.
- ✓ Observation and Collecting data
- ✓ Possible improvement

Table 1: Ambient temperature requirements of silkworm during various stages

Stages	Incubation	1 st	2 nd	3 rd	4 th	5 th
Temp(°C)	25	28	27	26	25	24

Table 2: Optimum humidity requirements of silkworm during various stages

Stages	Relative Humidity
Incubation	75-80 %
1 st instar	85-90 %
2 nd instar	85 %
3 rd instar	80 %
4 th instar	70-75 %
5 th instar	65-70 %
Spinning	70 %
Cocoon Preservation	80 %

Fig: Suitable temp and relative humidity for each stage in silkworm lifecycle

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❑ Conclusions

- It was a great joy and fun to work with each other to complete the installation stage. It is true that we still have to do lots to do. But, we are ready to take the challenge and continue till the end. It will be a huge achievement to play a role for modernizing and advancing of Bangladesh sericulture.

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