Sustainable Digital Agriculture

with the help of Robotics,IoT and Open Data

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Agriculture in the Indian context

- Three fourths of the India population workforce is related with agriculture and its allied fields.
- Most farmers in the country still practice traditional methods for agriculture.
- These practices have not yet been attuned to the recent climate change phenomenon.
- As a result the gross yield produced is getting reduced year after year.

Paddy Cultivation Kerala

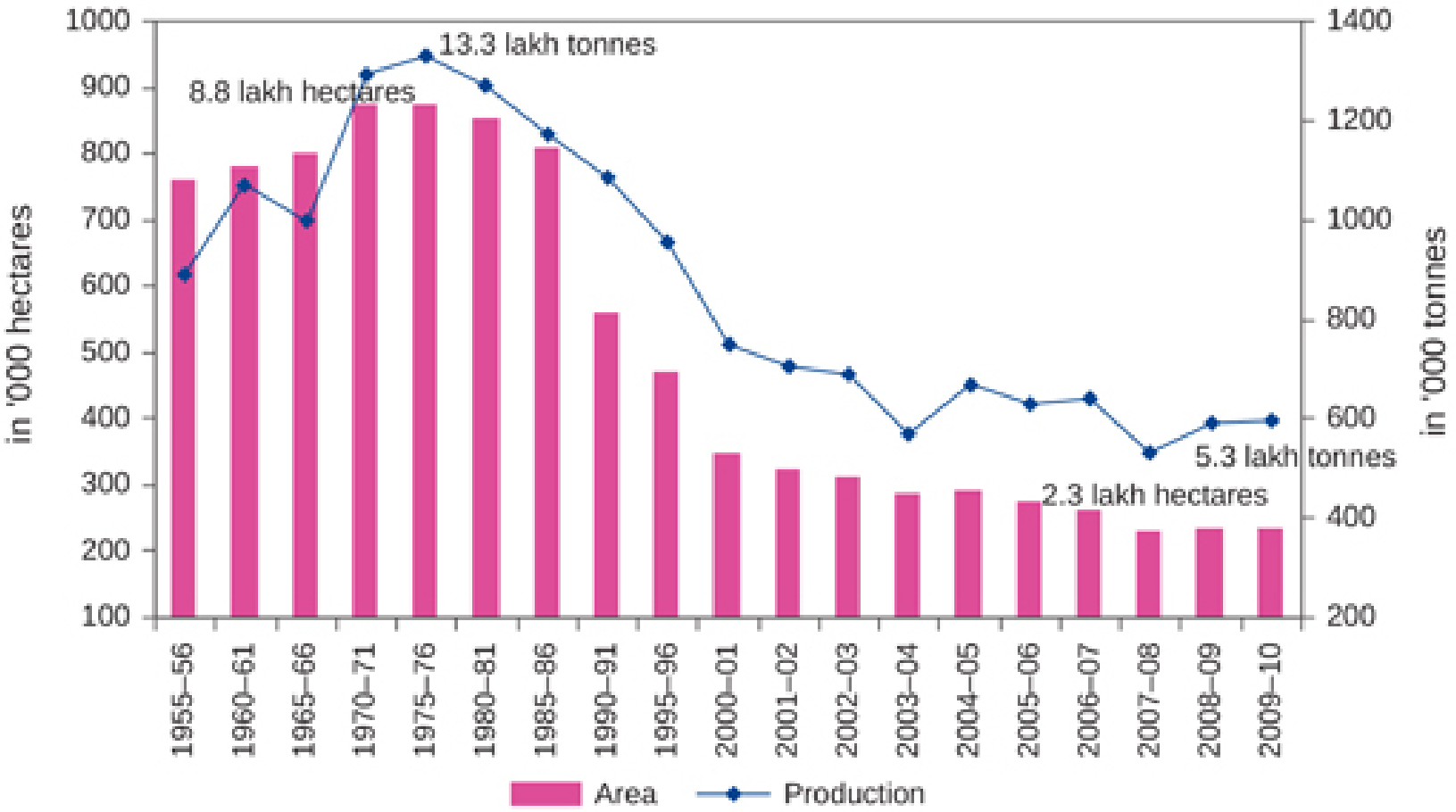

Figure: Paddy Cultivation in Kerala, Jayan Jose Thomas, Department of Humanities and Social Sciences, Indian Institute of Technology, New Delhi

Difficulties faced by farmers

- The agriculture concern on three major areas that is inadequate water supply (irrigation), attack of crops by pests and insects and thirdly failure in properly storing the produce which in turn might be attacked by pests and rodent. [1]
- We have reached a point in human history where we are able to carry computers in our pockets and have expored possibilities we've nerver been able to do so before. It is about time that we now implement out technological prowess as a race to improve basic necessities such as food.

[1] Sudhir Rao Rupanagudi, Ranjani B. S., Prathik Nagaraj, Varsha G Bhat, and Thippeswamy G, A Novel Cloud Computing based Smart Farming System for Early Detection of Borer Insects in Tomatoes, ICCICT, pp.1-6, 2015.

Difficulties faced by farmers

- The concept of IOT can be used in agriculture field. In this, smart node involves the use of sensors, RFID, GSM/GPS, ZigBee and other wireless device with internet stack in built into the device for sensing the agriculture parameter and send to the base station or internet.[2]

[2]Duan Yan-e, Design of Intelligent Agriculture Management Information System Based on IoT, Fourth International Conference on Intelligent Computation Technology and Automation, Volume-1, pp. 1045-1049, 2011

Robotics in Farming

- Aided by computer vision and machine learning
- Immense space for startups.
- Grobomac and cotton in India
- Limited by lack of available data

Figure: Grobomac Cotton Machine

The Internet of Things in farming

- IoT and wireless sensor node can reduce time and efforts required for monitoring the agriculture environment.
- Different organizations, government departments etc., are taking interest in implementing the technology for agriculture parameters measurement.

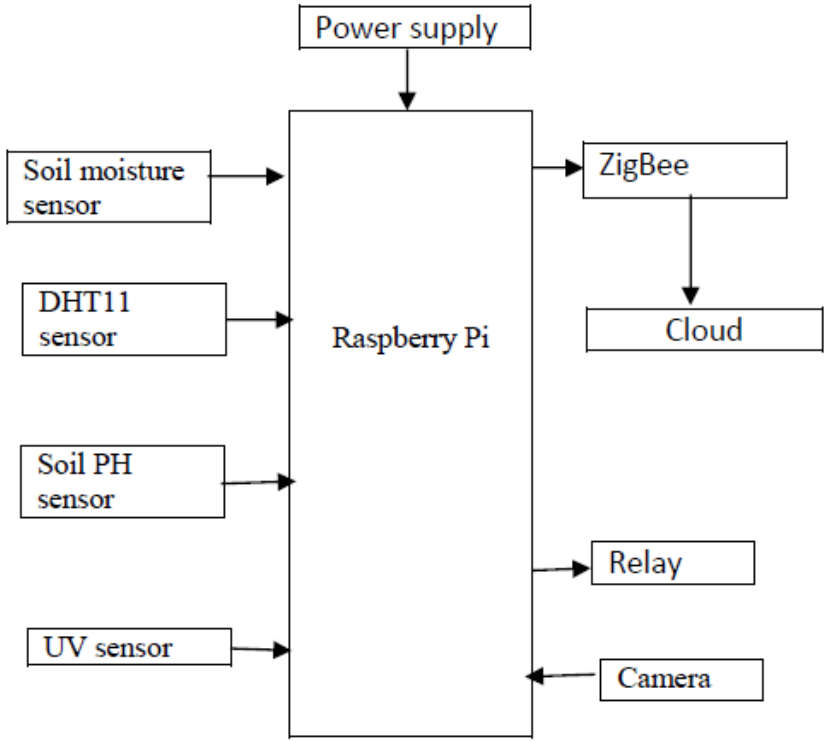

Figure: Raspberry Pie Example Configuration

Data: Acquisition

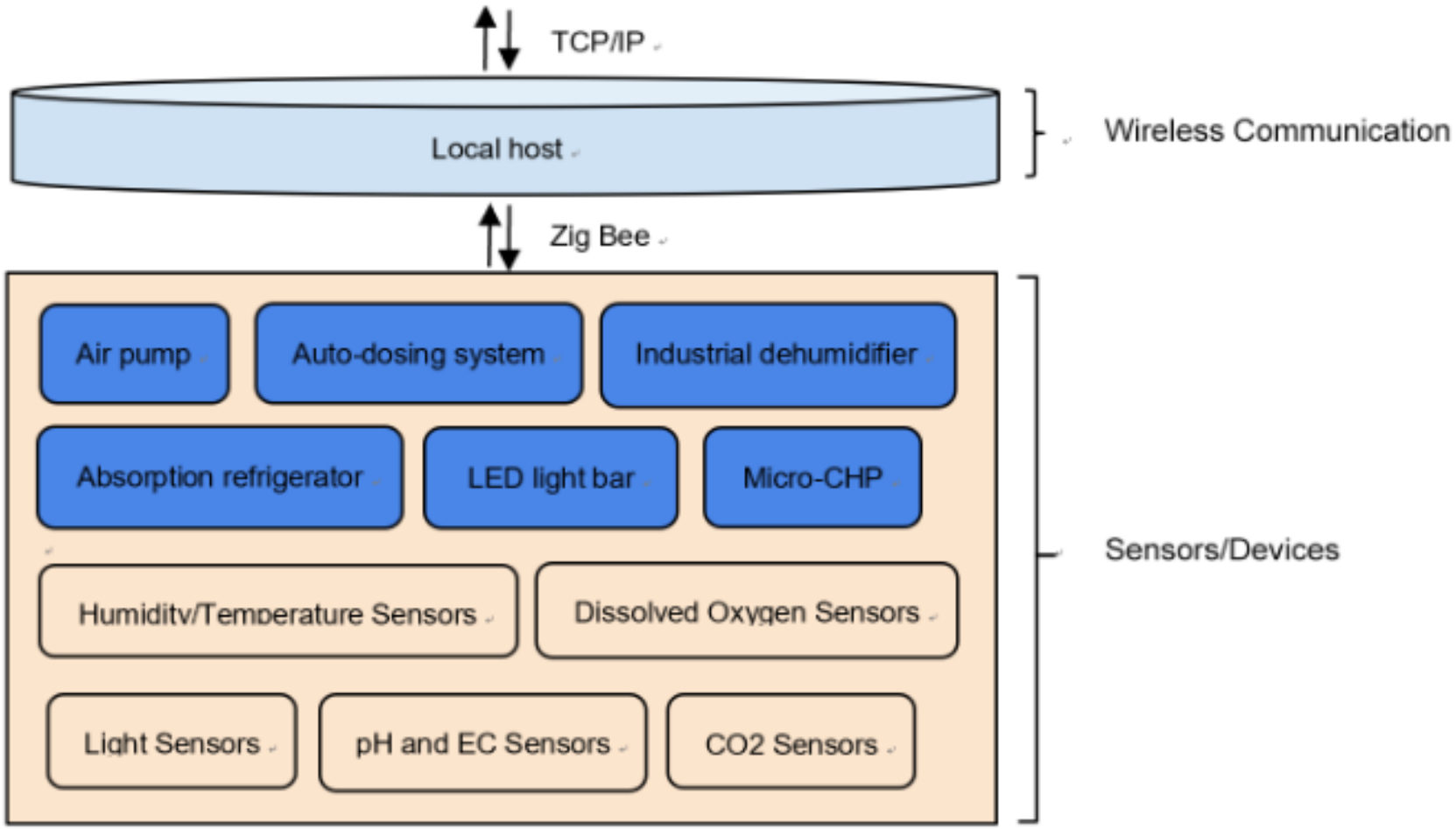

Figure: Data Acquisition Architecture

Data: Processing

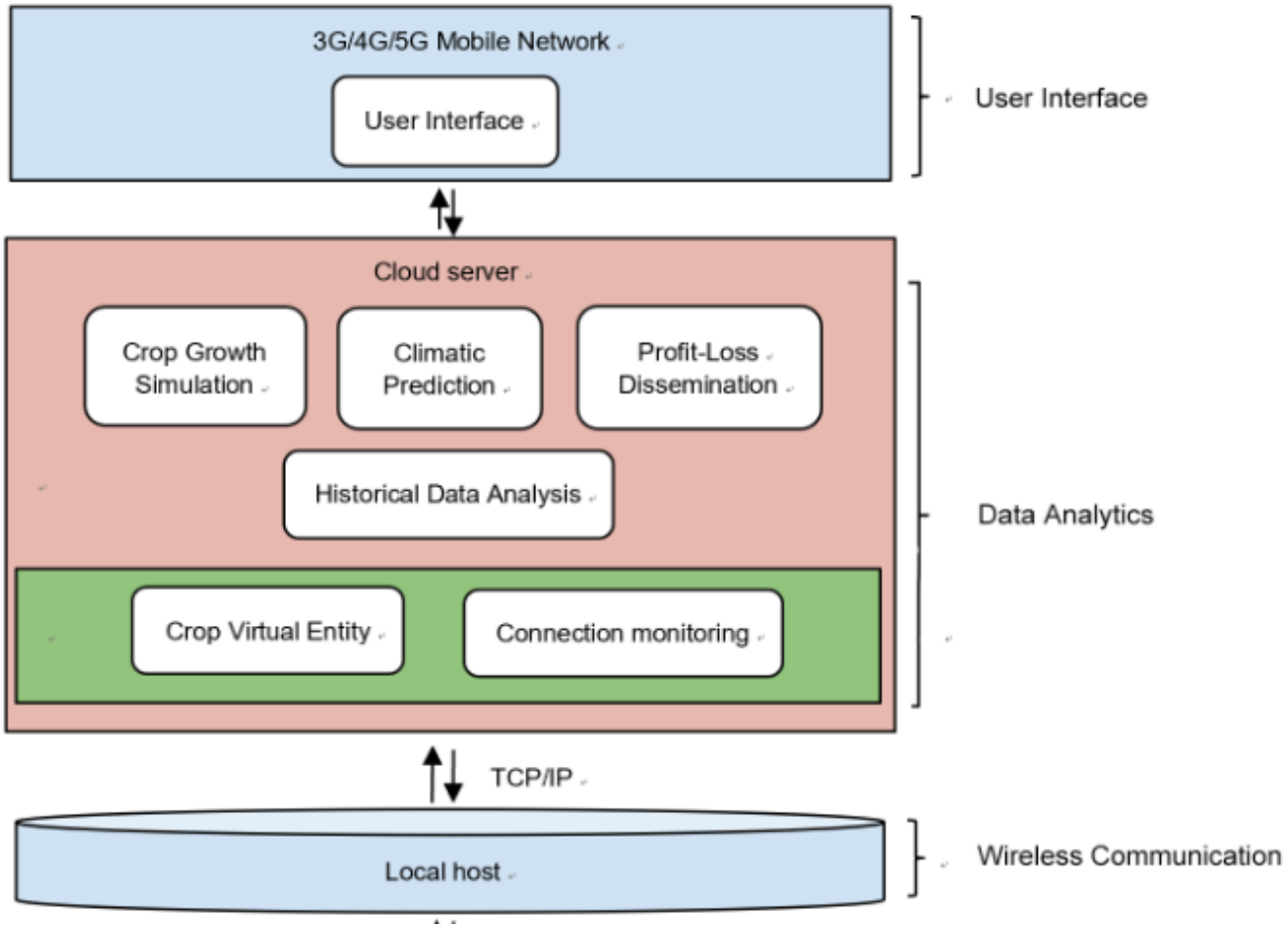

Figure: Data Processing using Virtual Machines

Way Forward: An integrated system

- IoT's monitoring systems, Data processing and analytics using a centralized server and finally ground work using robotics is the future.
- Challenges faced:
  - Scale of the project
  - Initial development and prototyping cost
  - Lack of Open Research and Data.
- If implemented the farming will be a much more viable career choice for a lot of people.
- Losses due to unpredictable climatic conditions which forces a large number of farmers to suicide can be avoided.

Conclusion

- An integrated system that leverages IoT, Open Data and Robotics is going to be future of agriculture.
- Even though the technology in itself has reached enough maturity, adoption rates of similar systems in mainstream agriculture by independent farmers is rare.
- Startups are venturing into agri-tech is increasing constantly.

References

- Li, N.P., Xiao, Y.M., Shen, L., Xu, Z.Y., Li, B.T. and Yin, C.X. (2019) *Smart Agriculture with an Automated IoT-Based Greenhouse System for Local Communities. Advances in In-ternet of Things* , 9, 15-31. https://doi.org/10.4236/ait.2019.92002
- Sudhir Rao Rupanagudi, Ranjani B. S., Prathik Nagaraj, Varsha G Bhat, and Thippeswamy G, *A Noveli Cloud Computing based Smart Farming System for Early Detection of Borer Insects in Tomatoes* , ICCICT, pp.1-6, 2015.
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