

# AgroNet: A Decentralized Platform for Collaborative Community-Driven Consultancy for Farmers and Agro Vendors

Sayanton Mondal<sup>1</sup>, Zack Agar<sup>2</sup>, Raj Ray<sup>3</sup>, Sreetam Ganguly<sup>4</sup>,  
Rubi Bhowmick<sup>5</sup> and Rithwick Sethi<sup>6</sup>

## Abstract

*Indian farmers are consistently plagued by age-old practices, which often prove non-productive, counter-productive, and harmful to the environment. In this modern technological era, farmers need to remain updated about technological advancements and government benefits. Timely, accurate consultancy and instant troubleshooting are non-existent in the Indian agricultural landscape. Farmers are forced to turn up to their peers' advice which can be inaccurate or wait for expert advice from domains in KVKs and Extension Departments in Agro-institutions. This article describes a novel decentralized system that combines the low latency of peer-to-peer consulting and the accuracy of expert-based systems and consulting from domain experts as an Android portal. AgroNet harnesses some of the tried-and-tested technologies to effectively provide consultancy and quick assistance to small and mid-level farmers quickly, with an estimated response time between 24 and 48 hours.*

**Keywords:** AgroNet, Agro Vendors, Private Extension, e-Extension, e- Agriculture

## Introduction

Agriculture is a crucial part of India's economy, and India is among the highest two farm producers in the world. Agriculture is the only means of living for nearly two-thirds of the employed class in India. There are more than 100-150 million farmers in India, according to the National Statistical

---

<sup>1,2,3</sup> SystemOnSilicon Corporation, TX, USA

<sup>4</sup> Indian Institute of Engineering Science and Technology (IIEST), India

<sup>5</sup> Shri Shikshayatan College, India

<sup>6</sup> Delhi Technological University (DTU), India

Office's Situation Assessment of Agricultural Households (SAAH) report for 2018-19.

With this vast number of farmers, only a few government organizations are available as their aid. Every year the government rolls out numerous schemes to benefit the farmers to improve their socio-economic condition. Various farm inputs are being provided at subsidized rates to help them generate a good return. The government uses its machinery like Krishi Vigyan Kendra (KVKs), Agricultural Technology Management Agency (ATMA), and other agricultural extension centers. AgroNet is a friendly platform for users to exchange information and discuss issues concerning agriculture based on experience and knowledge. Sharing accurate information, forming communities, getting feedback from verified domain experts, and the latest news articles are a few features of AgroNet.

The information available on this platform can profit the community of researchers, students, farmers, and many more who ought to access and integrate knowledge on agriculture, governmental agricultural policies, soil testing centers, credit facilities, officers nearby, and other variables associated with it. They can get advice from verified experts and climate model experiments to grasp the ability of agricultural systems to deal with global climate change ever-changing food demands, which can create awareness and motivation for the farmers. Farmers often turn to their peers for help and get inaccurate information. Even the domain experts of KVK's and Extension Departments in agro-institutions failed to give the right advice in time. Here farmers can directly ask questions and query the agriculture experts, getting responses in no time estimated between 24 to 48 hours.

AgroNet will significantly enhance the interaction and information flow from different agricultural sectors involving agriculture domains and people associated with them. We can use the service to increase formal education and improve agricultural knowledge. AgroNet is available in different languages. It will help people from different parts of India converse with each other in their native language.

## **Previous Works**

Xuanli Liu, Mack Nelson, Mohammed Ibrahim (2008) present precision farming, a site-specific farming system that confronts farmers with both opportunity and challenge. It is a successful alternative to traditional agricultural production systems since it allows for more efficient use of natural resources and represents agricultural industrialization. There is a broad method for valuing information, which applies the concept of information evaluation to two types of precision agricultural systems: input-oriented systems and output-oriented systems. The former plant a single crop variety in the field and uses variable fertilizer delivery rates based on site-specific information. The second system cultivates crop types and collects data from crop-based experimental designs. The two precision farming systems acquire information from various sources using distinct methods despite certain similarities.

P.Krishna Reddy (2005) offers a framework for a cost-effective agricultural information dissemination system (AgrIDS) to transmit expert agricultural knowledge to the farming community to boost crop yield via the integration of both agriculture and information technology. It enables the farmer to develop a crop with experience, such as an agricultural specialist's, by spreading individualized and timely expert advice cost-effectively. The lag time between research effort and practice can significantly decrease using AgrIDS. In AgrIDS, agricultural professionals create advice by utilizing both available crop-related agricultural technology and the most recent crop-related information obtained over the Internet in the form of both text and images. AgrIDS contains four parts: Farmers, Coordinators, Agricultural experts, and Agricultural Information System (AIS). All parts are connected through the Internet.

Dishant Jojit James et al. (2020), says that scientists from Krishi Vigyan Kendras take the lead in India in transmitting cutting-edge technology with positive consequences to farmers at the grassroots level. Social media allows people to exchange information and participate in agricultural conversations

and debates. It also allows them to be informed of current agricultural innovations and keep up to date.

While precision farming undoubtedly benefits farmers in many ways, farmers are also required to have site-specific information about the land, sophisticated knowledge and skills for handling an extensive body of information, and complex equipment that they may have never used before. Furthermore, gathering information is costly, and no matter how much a farm spends on it, it has no resale value in the market. Obviously, before deciding to use precision farming, farmers must weigh the benefits of information against the expenses. Precision farming begins with information evaluation. This type of information is outside the scope of experience, and collecting it generally incurs substantial costs. A valid issue is whether it is worthwhile to get the knowledge. What is the value of the information? This proves to be a difficult challenge for farmers and academics.

Social Media is not devoid of disadvantages, as mentioned by Aliyu Akilu Barau, Safiul Islam Afrad (2017). For example, social media gave new meaning to communication, interaction, and culture and led to several social movements and revolutions. It can also detach a farmer, extension worker, or any other professional in the line rather than facilitate salient physical interactions, which are indispensable for proper networking and ultimate development. Many farmers are subsistence with little to incur data cost for accessing social media. In addition, there is a high internet cost at internet cafés. This ultimately presents a challenge to social media uses in agricultural extension services. Poor electricity supply and internet connectivity infrastructures are vital challenges to social media use in agricultural extension service delivery, the most affected are rural communities in developing countries. Stakeholders in agricultural extension service delivery, especially farmers and extension workers, are less educated, and using social media requires both educational and technical literacy. The accessible nature of social media in terms of comments and content creation is something that extension services cannot compromise.

Irrelevant posts, privacy concerns, stakeholders' conflicting perceptions, and lack of capacity in using social media act as deterrents to using social media in extension service program delivery. Currently, monitoring and assessing the quality and worth of information shared on social media are unsatisfactory for extension service delivery. As a result of cultural and societal limitations on women, the integration of social media into agricultural extension service delivery needs to take into account a gender-sensitive approach to cater to all regardless of advantage or otherwise.

Even though India has a large pool of agricultural scientists with appropriate expertise, it is not easy to cover all the farmers on a weekly/daily basis due to the cost and time factors. Also, such a system will be expensive to build and maintain. Further, drawbacks of the traditional system exist, such as the irrelevance of the delivered information, the inability of the system to cover all the farmers, the lack of avenues to improve performance, and the unaccountability for the advice given by the system.

### **Proposed Solution and Technology Stack**

To tackle the scenario as mentioned above, we propose a role-based personalized system where each role will be shown personalized feeds. The "actor" i.e. user primarily belongs to one of the four categories defined by the system i.e. Farmer, Business, Govt and Expert. The user can start using the platform by simply providing his phone number and verifying the authenticity of the number.

To help the user get started with the platform, the user will be asked a certain set of questions to create a basic profile that will enable the platform to personalize the feed according to the user's category along with their field of specialization (Farming, Harvesting, Waste Management) and other geographical features (state, Pincode, etc).

Depending on the category, the feeds will have four options, i.e., Farmer, Business, Government, and Expert. Based on the category, post priority shall be decided. If the category is Business or Government, the posts seen

will be general, or fellow farmers post from the same area. As per the pre-defined priority order, posts from fellow farmers from the same area will be shown more than the general posts. However, suppose the category is Farmer or Expert. In that case, the posts will be seen in different priority order, in which the posts based on the specialization from the same area will be most frequent in the feed followed by posts from fellow farmers from the same area and then posts based on just the specialization.

The second part of the architecture involves the user who will create posts. The user clicks on it to create a post. The post will require a Post Title, Description, Category (Harvesting, Cultivation, Waste Management), and an image option. If the user wants to upload an image, he/she can upload using the system camera/the file system. If the fields are not valid for the post creation, it will go back to the post menu. Else, the post will be created and sent to the feed.

To keep it scalable and maintainable owing to the traffic the platform may have to withstand, we opted for a non-monolithic approach where each feature can be independently maintained and scaled (as per traffic) such that the entire system does not go down for a fault in any of the modules such as authentication, profile creation, image upload, feed and post modules, thereby, having a loosely coupled relationship among them. This enables the user to experience an almost zero downtime scenario from his perspective.

These modules will have separate images to be run in a containerized manner. Containerisation enables capturing logs and error handling for each module separately such that each module can be scaled accordingly as and when need be in an almost independent manner.

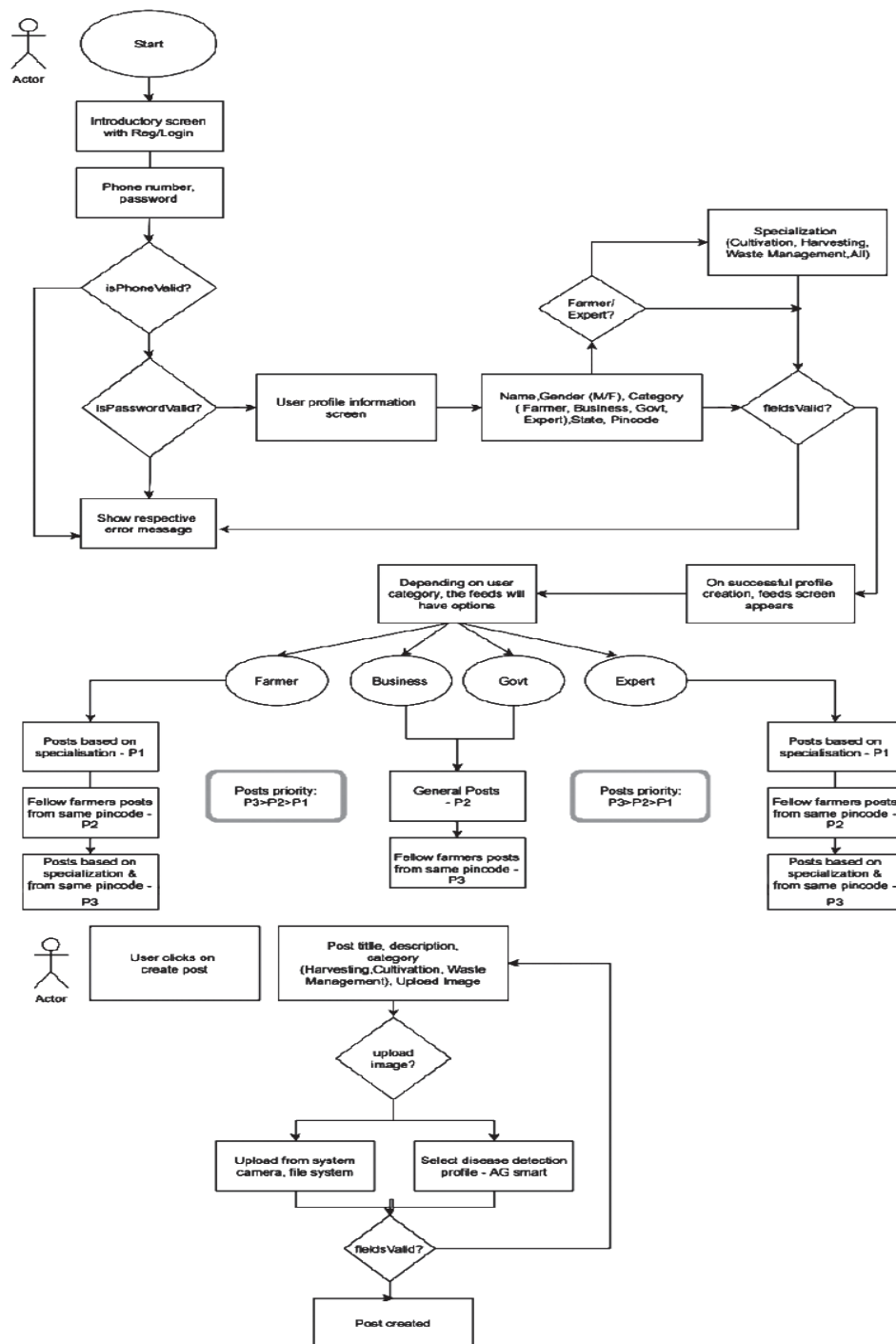


Fig-1: AgroNet Architecture



## Possible Socio-Economic Impact

AgroNet is designed to be a platform that would interconnect the people associated with the agriculture and allied services fraternity along with the ones associated with indecision and policymaking. It will link the farmers with different government officials like ADAs, resource persons, subject matter specialists from KVKs, agriculture institutions, researchers, agricultural colleges and universities, agriculture science experts, and fellow progressive farmers. They will remain well informed about the new, modern, and state of the art technologies, methodologies, and facilities. Without going anywhere, they can witness how their fellow farmer is doing wonders with similar kinds of resources. The concept of result demonstration and method demonstration could be readily available for the farmers anywhere. The farmer would remain informed about the current government schemes and subsidies made available to them by the government. AgroNet creates a whole agriculture ecosystem that would generate a colossal agriculture knowledge pool with every sector of the agriculture fraternity. This would make a direct impact on the socio-economic condition of the farmer. It will be like a social media platform for them. With the efficient use of artificial intelligence and machine learning, we can also customize the feed of each farmer according to their needs.

## Conclusion

The scenario of Indian agriculture is changing. With the inclusion of new-age startups, the concept of smart and precision agriculture is flourishing. It is becoming more and more technology-driven. After the Covid-19 pandemic, combining agriculture with state-of-the-art technology has become more evident. Indian small and marginal farmers being poor and with little education, will find it challenging to indulge themselves and cope with the present changes. AgroNet, with a user-friendly and straightforward interface clubbed with several regional languages, can become an introductory model for facilitating modern technology into the lives of millions of farmers. AgroNet utilizes tried and tested methods in



social engineering and crowd-sourced expert systems to provide quasi-autonomous consultancy to the regular farmer. Ease of integration with current extension infrastructure, scalability due to its modular build, and low maintenance costs make it a sustainable, simple, and elegant solution to enable expert outreach for the modern farmer.

## **References**

- Arjun, K. M. (2013). Indian agriculture-status, importance and role in Indian economy. *International Journal of Agriculture and Food Science Technology*, 4(4), 343-346.
- Barau, A. A., & Afrad, S. I. (2017). An overview of social media use in agricultural extension service delivery. *Journal of Agricultural Informatics*, 8(3), 50-61.
- Harish Damodaran. (2021, April 19). The Indian Express. <https://indianexpress.com/profile/author/harish-damodaran/>
- James, D. J., Shivamurthy, M., Lakshminarayan, M. T., & Ganesamoorthi, S. (2020). Social Media Used by Krishi Vigyan Kendra Scientists. *Int. J. Curr. Microbiol. App. Sci*, 9(6), 2609-2617.
- Lerche, J. (2014). Regional patterns of agrarian accumulation in India. *Indian capitalism in development*, 46-65.
- Liu, X., Nelson, M., & Ibrahim, M. (2008). The Value of Information in Precision Farming.
- Reddy, P. K., & Ankaiah, R. (2005). A framework of information technology-based agriculture information dissemination system to improve crop productivity. *Current Science*, 88(12),1905-1913.