



Arimac FutureCast 2021

(Team) Name	Team SiRi
Track	IoT
Product Name	Haritha Net (An Agricultural Land monitoring & fertilizer supply system)

1.0 Problem Identification

Sri Lanka is a country where chronic kidney diseases are very abundant among the farmers and people living in agricultural areas. One of the main reasons for this issue are the chemicals in the fertilizers used to cultivate their farms. Furthermore, these harmful chemicals can affect many parts of the body and there are many critiques against these chemical manures.

The previous government banned some of the products and stopped the subsidies given by the government for chemical fertilizers. Although the government encouraged to transform the farmers towards organic fertilizers, their effort was in vain since organic fertilizers are not yet a practical solution due to following reasons;

1. Required composition of fertilizers cannot be obtained from organic fertilizers.
2. Due to the prolonged use of chemical fertilizers soil has changed and farmers claim the organic fertilizers can't produce the same harvest.
3. Organic Fertilizers are not abundant.

Since chemical fertilizers cannot be denied due to above mentioned reasons, it is still necessary to decrease the use of chemical fertilizers and increase the use of organic fertilizers.

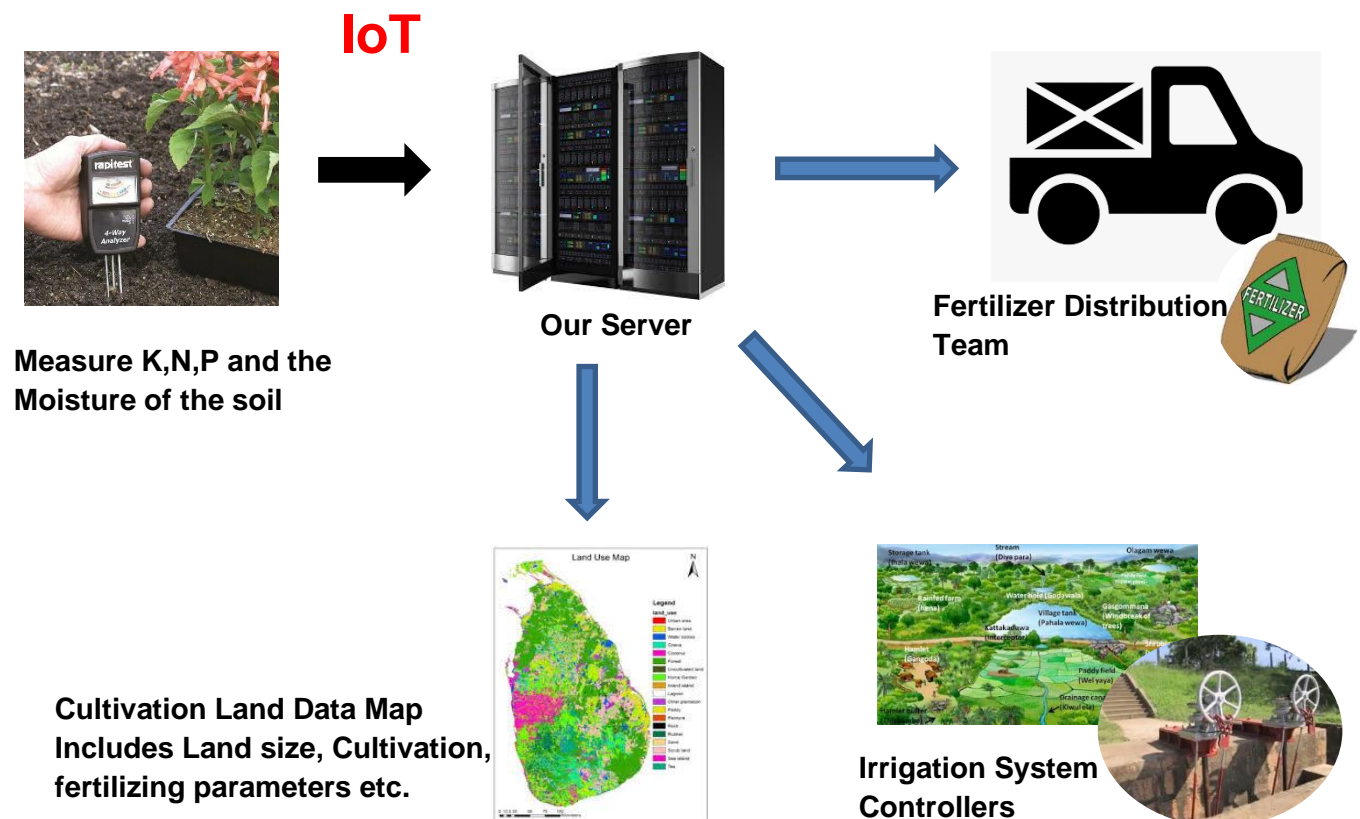
In Sri Lanka farmers use fertilizers without analyzing the nature of the soil. In some fields soil is spoiled by using fertilizers in overdoses. There is a requirement to analyze the composition of the soil and decide the most suitable fertilizer. Then we should add to the soil the amount doing the least damage.

In addition, to encourage organic fertilizers it is important to make them with different compositions. There are many types of chemical fertilizers and similar alternatives should be found as organic manure. In order to do so it is a must to measure the composition of the soil and collect the data. Moreover there should be an efficient connection between farmers and fertilizer producers to supply the specialized fertilizer.

There is another need to transport agricultural products to the market. In the current market customers are buying products for high prices while farmers are selling them at a lower price. There is a significant margin going to the hands of intermediaries. If there is a stronger network between all the farmers in the country and all the markets there is a possibility to reduce this margin helping both customers and farmers.

Furthermore, there is a requirement to collect big data to make predictions and optimise supply chain and other related processes. But the lack of data to feed to a system is a major challenge in the development of the agricultural sector.

2.0 Product Overview



We give a Digital Soil Nutrition meter to our customers (farmers) and its MAC id is linked with the land's id given by our Cultivation Lands Data Map. We get the Google map services for map maintaining and a new land is registered with its location, area, cultivation and the age of the plants. User is allowed to use the same meter for different lands after registering (linking) those lands with the device, in our database. He should choose the correct Land ID before using. This

device has the IoT facility and can be connected to a hotspot or any other WiFi, and send the raw data of the soil (K,N,P content and moisture) to our server. We process that data and update "Fertilizer distribution database" and the Cultivation Land data map essentially. If that land regards to the Irrigation system (like in Anuradhapura, Polonnaruwa etc), we update our "Irrigation System-Lands" database also. We are planning to get into a contract with the Irrigation Department to provide information (advices) to monitor the Irrigation system.

When our "Fertilizer Distribution" database gets an update, we contact the customer and take the confirmation of the fertilizer order and make the distribution within a week. In the initial stage, we plan to do this through existing communication methods and later we plan to launch a Mobile app with features regarding to agriculture. Distribution is like a courier service and larger the customer base more the profit. After that, according to the data, we suite the best percentages of nutrition (K,N,P) and make a custom made fertilizer. By this way, we can avoid the excess usage of fertilizer and water pollution in considerable rates. Additionally, we can give advice to farmers how frequently the fertilization should be done. It is beneficial and cost effective for farmers. Another advantage we have at this point is, lack of fertilizer for different type of cultivation. Our aim is to provide fertilizer within a week so we can earn the trust of customers.

When the Irrigation department has an updated map of moisture in soil of different areas, they can manipulate the water distribution more effectively. This will reduce the water wastage and give solutions for the water problem of the farmers.

This system creates an updated Cultivation Land map in Sri Lanka, and it can be used many other secondary applications like Harvest storing and management, Harvest predictions, Supply chain managements. This will provide better solution for the lack of data in agriculture and other we can earn profits by providing data to other applications as well. We should do an additional data collection annually (Confirm the cultivation on the land, Average Harvest) for a complete database.

After the stabilization, we will promote the organic manure by collecting compost from households and sell them to farmers and urban residences. After checking the success, we will move towards mass production of compost by stablishing a plant. Exporting Compost is also profitable according to the figure in e-markets.

2.1 Innovation and Uniqueness

In Sri Lanka there are no products similar to the product we have introduced. But there are countries where large scale farmers use instruments to measure the composition of the soil and apply fertilizers based on that. But this data is not shared through the internet. The fertilizer manufacturers do not get enough information to plan their production and policy makers don't get enough information about the nature of the soil in the fields. The system connecting every land in the country, every fertilizer manufacturer in the country and every market can drive the agricultural

sector of Sri Lanka to a new era. There are no similar interconnected systems in most of the Asian countries and therefore our product is innovative and unique.

2.2 Sustainability

Sri Lanka has a history of farming for more than 2000 years and for the convenience of the farmers there are tanks and other irrigation systems have been built as well. But due to the misusing of the fertilizers and also not receiving quality fertilizers there are major chronic kidney diseases that have been emerging in many farming areas. Thus, this system is built up to supply quality fertilizers to the farmers, stop the misusing of fertilizers and water and to adapt farmers towards the organic fertilizers as a development state.

As a usage of our system, it helps to reduce the effect of fertilizers for kidney diseases. In many occasions mixing those low-quality chemical fertilizers with the sources of the water leads to this situation and in order to prevent that we can use quality fertilizers for the cultivation which is made specifically for the certain soil by evaluating the composition of Nitrogen, Phosphorus and Potassium percentages of the soil. Furthermore, that is a good opportunity for the farmers to get a better harvest including low fertilizer usage with the low hazard of getting kidney diseases. Moreover, the fertilizer can be manufactured within Sri Lanka with the growth of the system which can be provided with a low cost to the farmers if this system is popular among the farmers in many areas. It is certainly another benefit for the farmers that they can sell their product with a better profit. Thus, it is obvious that the necessity of our system to prevent the biological hazards of Sri Lankan farmers as well as to get a better harvest with low cost. Therefore, the feasibility and the sustainability of our system is good in Sri Lanka.

Apart from the biological hazard of the farmers this system helps for the management of water for the cultivation. Since the water is a limited resource, the farmers do not have the ability to use the water stubbornly. Therefore, the farmers need to know about how to manage the water of the cultivation without misusing it. In the past we have many occasions of protesting farmers demanding the water for their cultivation and it occurred due to the unguided release of water from the irrigation system in Sri Lanka. In our system we closely monitor the farming lands and using these data it is possible to calculate the quantity of the water for the cultivation. Therefore, the water can be released with a guided system which reduces the wastage of the water and provides it to the cultivations according to the necessity of the farmers. With the collaboration of the Irrigation and Agricultural Departments it is possible to implement such a system to manage the water among the farmers. Furthermore, it affects to reduce the water pollution among the cultivational areas in Sri Lanka which indirectly leads to reduce the kidney diseases as well. So, it is manifested that the sustainability of our system in Sri Lanka.

This system can be extended not only for the cultivational management of the farmers but also the cultivational selling purpose of the farmers. As we know most of the economic centers in Sri Lanka the farmers have troubles of selling their product due to the low price and on some occasions, they were unable to sell their products as well. But in some areas the same crops are selling to the people with high prices due to the lack of supply of the crops. Through this system it can be eliminated by registering all the farmers, intermediary salesmen as well as retail shops and giving them the opportunity to order the crops themselves before their stocks went out. It will be helpful for the people and farmers since they have a better entrepot for the marketing as well as it helps to indirectly forecast the products which will be deficient in the natural disasters as well.

Thus, our system has a good opportunity to be sustainable in Sri Lanka and the above facts are clearly supporting that.

3.0 Business Model

Our main source of revenue will be the sales from our device of measuring soil quality. The target market will be the agricultural farms, and the larger conglomerates that have their own affiliated farms and crops. (Eg: Cargills and their source fields.)

The next key aspect of our solution is the IOT based integration of field and soil data, and incorporating that with the fertilizer availability and information to build an updating system that provides valuable information for farmers on the optimum amounts of fertilizer needed. This information, being updated and value added, will be vital for companies in the agricultural sector, and for the farmers themselves.

Therefore we plan to provide recommendation based services which can also be a source of income. The private companies in this sector, as well as the local and national government bodies that require such information are targeted for this information based services.

In addition to integrating the farmers better with the companies that handle the logistics, we can use the updating information to provide the fertilizer importers and manufacturers valuable information on the current trends and future needs of the farm lands in Sri Lanka. Thereby, the integrated and updated information on the land quality can be provided at a price for fertilizer importers and manufacturers, generating another source of income.

Our key supplier will be the device manufacturer, until a favourable situation for mass scale local manufacture is possible. Until then, it will be our only supply link. The IOT system and the data analysis part will be done entirely with the available resources locally by us.

When incorporating fertilizer importers and manufacturers to our business, we can expand it to the level of effectively “Uber- for fertilizers”, where farms can have access to the available fertilizers , and recommended doses, and delivery times, so that they can directly place orders through our system. This requires our system having a delivery system joined with our service, and that would also be a key link in our product distribution.

4.0 Marketing Plan

Our marketing plan would follow that of an innovation that combines many aspects of daily lives, and that benefits the fundamental source of agriculture in our country. We can offer our product as a viable benefit for farmers and agricultural businesses that want to save and preserve the quality of their lands.

We further plan to show our product as an optimization for the current way of doing things in the agricultural sector. By removing the many middle men and the delays we are “saving time, money, crops, and the kidneys of our farmers”.

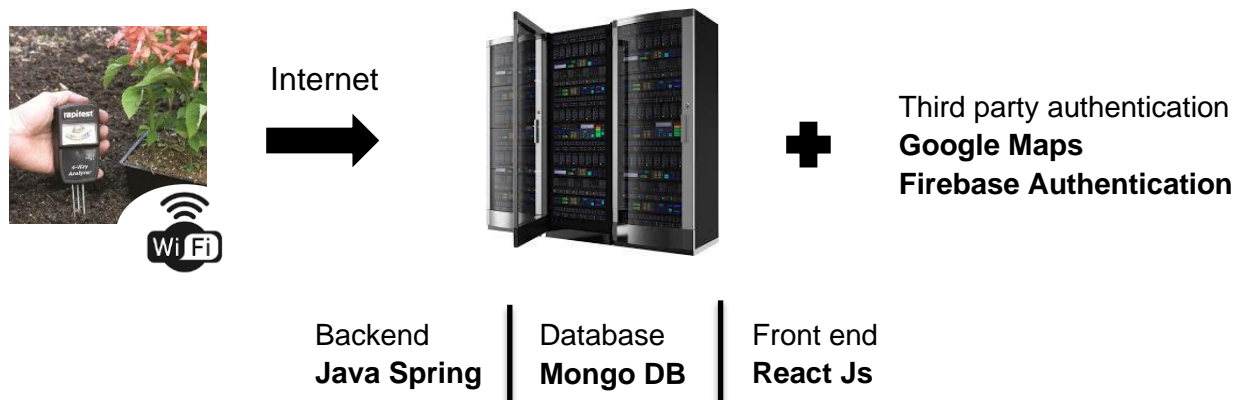
Also, we are integrating three worlds that would have otherwise been blind to each other. The necessities of the farmer and the land, the availability of the fertilizers in the market, and the

delivering companies that are capable of supplying certain loads to certain areas of the country- can be interconnected. Thereby, we can “ Connect the people and empower them”.

Our initial strategy is to have a review of the product by offering it free to a farm and get feedback from the farmers, the supermarket that sells the products, and the local authorities. Then we can provide the device as trials for several farms around the island and boost the confidence in the efficacy of our product for one agricultural cycle. Only after success and quality has been witnessed by farmers, companies and other investors, we plan to charge for our device and service.

5.0 Technology Overview

We plan to import Soil Nutrition Meter with IoT facilities (using esp8266) for our first phase because there are no bulk production factories in Sri Lanka for such applications. Then the connection between the server and the device can be made through a WiFi access point. This will most probably a Hotspot. Then the data will be transferred to COAP server. After the processing the databases are updated according to the information as mentioned in the solution. The technology overview can be present in brief as follows.



Hosting platform – **AWS**

6.0 User Story

In the first phase product users will be the large cultivation firms like CIC, Lipton tea, Dilma tea etc and the Irrigation department of Sri Lanka. In the second phase, we will move towards the medium size (50 hectares or above) cultivation lands as well. When we start the organic manure production, we will try to grab the market of small scale farmers and the urban households.

Meanwhile we can sell our data to other systems as we mentioned previously. Otherwise, we can make those platforms ourselves, grabbing the Sri Lankan e-Agricultural opportunities without giving any chance to a new competitor. Farmer- Buyer interconnection platform will be a good opportunity since we hear problems all the time regarding to that.