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I. Introduction.

1. Problem review.

   Today, agriculture is developing more and more, with a rapid increase in the demand for food production. However, farming is still limited in terms of human resources as well as many aspects. With growing technology like the present, there has been a huge positive support for agriculture. With the agriculture industry on a large scale, it is difficult to monitor product quality, accurately monitor weather conditions as well as the essentials for growing crops.

   There needs to be a solution for reducing labor but still having high efficiency in agriculture, capturing the factors that help farmers, so the solution is to build a support system in farming and process automation.

2. Proposed project research.

   Based on the situations, I decided to research the application of IoT in smart farming.

   Title: Research about advantage and disadvantage of application of IoT in Smart Fmarming.

   Objective: The overall objectives of the research are:

   - ✓ What is IoT?
   - ✓ Why IoT is important?
   - ✓ What is Smart Farm?
   - ✓ What are Smart Farm's features?
   - ✓ Is IoT used popular in farm nowadays?
   - ✓ What companies are using IoT in smart farm?
   - ✓ Define what is Smart Farming.
   - ✓ Their props and cons.
   - ✓ Application of IoT in Smart Farming.

II. Literal review.

1. Reseach methodology.

   Research is a careful and detailed study into a specific problem, concern, or issue using the scientific method. It's the adult form of the science fair projects back in elementary school,

where you try and learn something by performing an experiment. This is best accomplished by turning the issue into a question, with the intent of the research to answer the question.

There are serveral research methods:

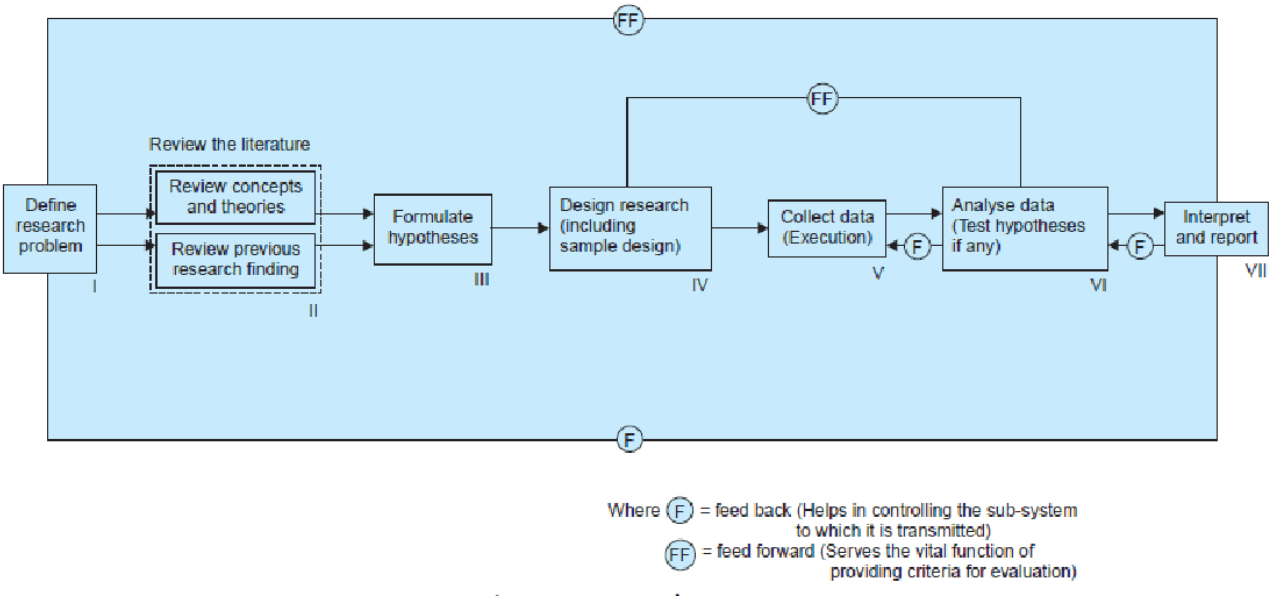
- Primary Research
- Secondary Research
- Scientific research
- Quantitative, quanlitative.

In this research, I use primary research and secondary research, specifically online survey, and online data. And the research methods are qualitative and quantitative methods.

2. Research process.

The Research Process is a process of multiple scientific steps in conducting the research work. Each step is interlinked with other steps. The process starts with the research problem at first. Then it advances in the next steps sequentially. Generally, a researcher conducts research work within seven steps. In research work, primarily, research require a Research Proposal. It is because the proposal approves the research project whether you achieve the ability to conduct research or not. So, when write a research proposal, present the detailed plans and specific objectives of the research correctly.

Steps of the research process: Research process consists of series of actions or steps necessary to effectively carry out research and the desired sequencing of these steps. The chart shown in Figure well illustrates a research process. The chart indicates that the research process consists of several closely related activities.



a. Step 1: Identify and defining the Research Problem.
The first step in the process is to identify a problem or develop a research question. The research problem may be something the agency identifies as a problem, some knowledge or information that is needed by the agency or the desire to identify a recreation trend nationally.

b. Step 2: Review the Literature.
The researcher must learn more about the topic under investigation. To do this, the researcher must review the literature related to the research problem. This step provides foundational knowledge about the problem area.

c. Step 3: Formulating a Hypothesis.
In this step, the researcher makes the problem precise.
- ✓ The research work is topic focused and refined.
- ✓ Then the researcher steps forward to how the problem would be approached. The nature of the research problem can decide to formulate a definite hypothesis.
- ✓ A hypothesis is tested. Effective research work formulates a hypothesis in such a way that collected factual data will provide evidence that either supports or disproves them.
- ✓ In the end, the hypothesis turns into a practical theory.

d. Step 4: Research Design.
Research design decides how the research materials will be collected. One or more research methods, for example, experiment, survey, interview, etc are chosen depending on the research objectives.

e. Step 5: Carry out the Research Process.
   While the research design is decided, then the researcher collects data, records information. The researcher proceeds with the research. Practical difficulties may arise in this stage.

f. Step 6: Preparing Research Results.
   Need to prepare research results for reporting as well as evaluating research results

g. Step 7: Reporting Research Findings.
   The final step of the research process outline is to report the research findings. Describe the significance of the research study.

3. Scientific research.
   Definition: Research conducted for the purpose of contributing towards science by the systematic collection, interpretation, and evaluation of data and that, too, in a planned manner is called scientific research: a researcher is the one who conducts this research. The results obtained from a small group through scientific studies are socialised, and new information is revealed with respect to diagnosis, treatment, and reliability of applications. The purpose of this review is to provide information about the definition, classification, and methodology of scientific research.

   Before beginning the scientific research, the researcher should determine the subject, do planning and specify the methodology. In the Declaration of Helsinki, it is stated that 'the primary purpose of medical research on volunteers is to understand the reasons, development and effects of diseases and develop protective, diagnostic, and therapeutic interventions (method, operation and therapies). Even the best proven interventions should be evaluated continuously by investigations about reliability, effectiveness, efficiency, accessibility and quality'..

4. Primary research.
   Definition: Primary research is defined as a methodology used by researchers to collect data directly, rather than depending on data collected from previously done research. Technically, they "own" the data. Primary research is solely carried out to address a certain problem, which requires in-depth analysis.

   Methods: Depending on the setting of the study and the research aims, researchers use a variety of primary research methodologies to get first-hand data from research subjects. Interviews, surveys, focus groups, and observation methods are examples of these approaches, which will be detailed in the subheadings below.

a. Interviews:

An interview is a sort of qualitative data gathering approach that entails having a virtual or face-to-face talk with the research subject(s) to obtain accurate data. In most cases, interviews consist of open-ended questions that allow the responder to express himself or herself freely.

Structured, unstructured, and semi-structured interviews are all possible. A structured interview, unlike a semi-structured interview, has a pre-planned interrogation process, whereas a semi-structured interview contains a question sequence from which the interviewer can freely stray to gain extra information.

b. Surveys:

A survey is a typical data gathering strategy that is used to obtain useful information from certain groups or persons in accordance with the research's context. In order to get insight into the study subjects, it typically entails delivering a questionnaire including standardized close-ended and open-ended questions.

Because it entails obtaining varied viewpoints in the form of replies to research questions, a survey may be thought of as a sort of opinion sampling in certain ways. This technique of data collection also allows for data aggregation, which can help researchers make better decisions.

We offer online and offline surveys, longitudinal and cross-sectional surveys, and diverse industry-specific surveys including employee surveys. Survey types are grouped based on data collection techniques, frequency, and industry. Based on the question kinds, surveys can be characterized as biased or impartial.

c. Focus groups:

A focus group is a qualitative research method in which the researcher poses several open-ended questions to a group of research subjects consisting of 6-10 participants. This method is more cost-efficient when compared to other data-gathering methods such as face-to-face interviews.

Usually, this method is employed for marketing research to gain diverse user feedback about a product. Since it makes use of open-ended questions, focus groups allow respondents to freely communicate their opinions without the restrictions posed by close-ended questions.

d. Observation:

Observation is a type of qualitative research method in which the researcher closely examines the research subjects as they interact with their environment for a stipulated

period. The primary aim of this method is to allow the researcher to gather useful information about their features and behaviors in line with the research context.

e. Data analysis.

The act of sorting through vast samples of data, selecting legitimate data, and assessing these data groups to arrive at objective study conclusions is known as research data analysis. In this case, the researcher analyzes data samples to find a logical pattern that supports or refutes the hypothesis.

Data analysis is significant since it helps the researcher to choose the most important data that will provide beneficial insights during the investigation. While this is a time-consuming procedure, it is vital to give the study data shape, sequence, and significance.

Advantages of Primary Research:

- The information gathered is firsthand and accurate. To put it another way, there is no data dilution. This research approach may also be tailored to meet individual needs as well as the demands of organizations or corporations.
- Primary research focuses primarily on the topic at hand, implying that all emphasis is focused on determining a likely solution to a certain subject area. Primary research helps scholars to go deeper into a subject and consider all possible outcomes.
- Controlling the data obtained is possible. Primary research allows you to have more control over how data is gathered and used. Businesses or organizations gathering data are free to utilize their judgment in determining how to best use data to obtain valuable research results.
- Because primary research is a time-tested approach, the results acquired from completing this sort of study may be trusted.

Disadvantages of Primary Research:

- One of the most significant drawbacks of primary research is that it may be rather costly to undertake. Depending on the setting or primary research method chosen, many monies may be necessary. Not every company or organization can afford to invest a large sum of money.
- This sort of study might take a long time. Conducting interviews, sending, and receiving online surveys may be a time-consuming procedure that requires time and patience to succeed. Furthermore, assessing the results and using the information to enhance the product or service will take time.
- Using only one primary research approach isn't always adequate. In such circumstances, the employment of more than one approach is essential, which may lengthen the time it takes to conduct research as well as the expense.

- In this research, I decided to use **online survey method** to conduct primary research.

5. Secondary research.

Definition: Secondary research or desk research is a research method that involves using already existing data. Existing data is summarized and collated to increase the overall effectiveness of research.

Secondary research includes research material published in research reports and similar documents. These documents can be made available by public libraries, websites, data obtained from already filled in surveys etc. Some government and non-government agencies also store data, that can be used for research purposes and can be retrieved from them.

Methods: Secondary research involves data assimilation from different sources, that is, using available research materials instead of creating a new pool of data using primary research methods. Common secondary research methods include data collection through the internet, libraries, archives, schools, and organizational reports.

a. Online Data:

The term "online data" refers to information obtained via the use of the internet. Because the internet provides a wide pool of both free and paid research materials that can be instantly accessed with the press of a button, this approach has recently gained popularity.

While this strategy makes data collection easier, the researcher must be careful to only acquire material from reliable sources. The internet serves as a virtual aggregator for all other secondary research data sources.

b. Data from Government and Non-government Archives:

Data can also be gathered from official and non-government archives, which generally include reliable information that gives helpful insights into a variety of study situations. In many circumstances, you'll have to pay a fee to have access to this information.

The problem is that, for a variety of reasons, such data is not always readily available. Some of these resources, for example, contain classified information, making it difficult for academics to gain access to them.

c. Data from Libraries:

Public and private libraries can also provide access to research resources. Consider a library as an information warehouse that houses a collection of essential data that may be used as legitimate data in a variety of research situations.

In most situations, scholars contribute many copies of their dissertations to public and private libraries, particularly in academic research. In addition, libraries collect and

maintain company directories, bulletins, annual reports, and other comparable papers that may be used as research data in both soft and physical versions.

d. Data from Institutions of Learning:

Secondary data may also be found at educational facilities such as schools, universities, and colleges, which is very useful in academic research. This is since educational institutions conduct more research than other industries.

Because educational institutions are dedicated to solving issues and extending the body of knowledge, it is comparatively easy to get research data from them.

Advantages of Secondary Research:

- Most of the data for this study is easily accessible. Unlike primary research, where data must be gathered from scratch, there are a variety of sources from which relevant data may be gathered and used.

- This is a less expensive and time-consuming approach since the data necessary is readily available and inexpensive when obtained from reliable sources. The cost of obtaining data has a minimum cost.

- Secondary research data provides organizations and enterprises with information regarding the success of primary research. As a result, organizations or corporations can develop hypotheses and assess the cost of performing primary research.

- Because data is readily available, secondary research takes less time. It may be finished in a matter of weeks, depending on the business's goals and the amount of data required.

Disadvantages of Secondary Research:

- Although data is easily available, it is necessary to conduct a credibility assessment to determine the accuracy of the information.

- Not all secondary data sources have the most up-to-date reports and figures. Even if the information is correct, it may not be up to date enough to accommodate recent events.

- The conclusion of secondary research is derived from a collection of primary research material. The quality of primary research that has previously been completed will have a stronger impact on the success of your research.

➢ In this research I decided to use **Online Data to conduct Secondary research.**

6. Comparition in the characteristics of two kind of research.

Primary Research	**Secondary Research**
To acquire data, personal research is undertaken. The data collected belongs to the researcher..	To collect data, research is done on the ground. The data that is gathered belongs to the researcher.
Raw data is used in primary research.	Secondary research is based on previously evaluated and filtered data that has been tried and true.
The information gathered is tailored to the needs of the researcher. Data is gathered depending on an organization's or business's specific requirements.	Data may or may not be according to a researcher's specifications.
A researcher is heavily immersed in primary research to obtain data.	Secondary research, as opposed to primary research, is quick and simple. Its goal is to get a more comprehensive comprehension of the topic matter.
Primary research is a costly technique that takes a long time to gather and analyze data.	Because data is already available, secondary research is a rapid procedure. The researcher must know where to look for the most relevant facts.

7. Quantiative data collect method.
   Quantitative data is a group of quantifiable information that can be used for mathematical computations and statistical analysis which informs real-life decisions while qualitative data is a group of data that describes information.

   Quantitative data is a combination of numeric values which depict relevant information. Qualitative data, on the other hand, uses descriptive approach towards expressing information.

8. Quanlitative data collect method.
   Qualitative data is the type of data that describes information. Its is a descriptive statistical data type, making it a data that is expressed with groups and categories rather than numbers.

   It is also known as categorical data. This data type is relevant to a large extent in research with limited use in statistics due to its incompatibility with most statistical methods.

Qualitative data is divided into two categories, namely, nominal data and ordinal data. Nominal data names or define variables while ordinal data scales them.

9. Select and explain the reasons for choosing the research method.
   In this research, we use primary research and secondary research, specifically survey and at the same time collect data from permissible sources, mainly from the internet. The reason I use surveys to collect data is because it's a quick and accessible method to everyone. Deploying the survey is also very fast, and in the survey, I can collect an unlimited amount of data because it has good coverage through the internet. Along with that is the survey-based part, I can easily receive data and model and analyze it and one point is that this is the most optimal method until now, in the situation of the Covid epidemic. -19 is spreading. Collecting data from other methods such as interviews is very difficult and risky, and the interview will not be able to accept large amounts of data through survey collection. The second part is about secondary research, which uses methods of collecting and analyzing data from internet sources. Its benefit is that it helps to reduce the effort of collecting thanks to the support of technology, the speed of accessing information is very fast, so this is a source not to be missed for this research if There is an accurate analysis and evaluation of the received data because in the internet, the data bias is also very large, so the research process needs to be carefully planned and implemented.

III. Secondary research.

1. About Smart Farming.

   1.1 What is IoT?

   The Internet of Things, or IoT, refers to the billions of physical devices around the world that are now connected to the internet, all collecting and sharing data. Thanks to the arrival of super-cheap computer chips and the ubiquity of wireless networks, it's possible to turn anything, from something as small as a pill to something as big as an aeroplane, into a part of the IoT. Connecting all these different objects and adding sensors to them adds a level of digital intelligence to devices that would be otherwise dumb, enabling them to communicate real-time data without involving a human being. The Internet of Things is making the fabric of the world around us smarter and more responsive, merging the digital and physical universes. **According to (Bahga, A., & Madisetti, V. -2014)**

   1.2 What is IoT in Smart Farming?

   - IoT-based smart farming, a system is built for monitoring the crop field with the help of sensors (light, humidity, temperature, soil moisture, etc.) and automating the irrigation system. The farmers can monitor the field conditions from anywhere. IoT-based smart farming is highly efficient when compared with the conventional approach.

   - The applications of IoT-based smart farming not only target conventional, large farming operations, but could also be new levers to uplift other growing or common trends in

agricultural like organic farming, family farming (complex or small spaces, particular cattle and/or cultures, preservation of particular or high-quality varieties, etc.), and enhance highly transparent farming.

- In terms of environmental issues, IoT-based smart farming can provide great benefits including more efficient water usage, or optimization of inputs and treatments. Now, let's discuss the major applications of IoT-based smart farming that are revolutionizing agriculture. **According to (Iera, A., & Morabito, G. - 2010)**

1.3 What is Smart Farming?

Smart farming is a management concept focused on providing the agricultural industry with the infrastructure to leverage advanced technology – including big data, the cloud, and the internet of things (IoT) – for tracking, monitoring, automating, and analyzing operations. Also known as precision agriculture, smart farming is software-managed and sensor-monitored.

Smart farming is growing in importance due to the combination of the expanding global population, the increasing demand for higher crop yield, the need to use natural resources efficiently, the rising use and sophistication of information and communication technology and the increasing need for climate-smart agriculture**. According to (RFiD Journal, 22(7), 97-114)**

1.4 Future trending.

- Smart farming market will reach at an estimated value of USD 25.02 million and grow at a CAGR of 12.76% in the forecast period of 2021 to 2028. Rising pressure on food supply

system owing to rapidly growing population is an essential factor driving the smart farming market.

- Smart faming is defined as application of one or more than one technology in the farming process to gain more efficiency and effectiveness. It is the advanced and innovative way of doing farming to get the maximum output and to reduce the human efforts. Advance technology includes usage of hardware, service, and software to the process of farming. The technology includes irrigation management, scouting of crops, harvesting, seeding and many more.

- Surging use of modern technologies in agriculture farms is a crucial factor accelerating the market growth, also increasing income levels and demand for protein-rich aqua food, rising focus of farmers on livestock monitoring and disease detection, rising emphasis on reducing management cost by adopting advanced livestock monitoring products and surging adoption of advanced technologies such as IoT and AI in aquaculture farms are the major factors among others boosting the smart farming market. Moreover, increasing adoption of livestock monitoring solutions in developing countries, rising use of unmanned aerial vehicles or drones in agricultural farms, rising popularity of land-based recirculating aquaculture systems and rising focus on integration of smartphones with agricultural hardware and software applications will further create new opportunities for smart farming market in the forecast period mentioned above. **According to (iotsworldcongress.com/iot-transforming-the-future-of-agriculture).**

Smart Farming Market Scope and Market Size

- Smart farming market is segmented since agriculture type, software, services, solution, and application. The growth among segments helps you analyse niche pockets of growth and strategies to approach the market and determine your core application areas and the difference in your target markets.

- Based on agriculture type, smart farming market is segmented into precision farming, livestock monitoring, fish farming, smart greenhouse, and others.

- Based on software, the smart farming market is segmented into web based and cloud based.

- Based on services, the smart farming market is segmented into system integration and consulting, support and maintenance, connectivity services, managed services, and professional services.

- Based on solution, the smart farming market is segmented into network management, agriculture asset management, supervisory control and data acquisition, logistics and supply chain management, smart water management, and others.

- The smart farming market is also segmented based on application into yield monitoring, field mapping, crop scouting, weather tracking and forecasting, irrigation management, farm labor management, financial management, feeding management, milk harvesting, breeding management, fish tracking and fleet navigation, water quality management, HVAC management and others. **According to (Aniket Kadam. Alliedmarketresearch)**

1.5 Benefit of IoT in Smart Farming.

- IoT enables easy collection and management of tons of data collected from sensors and with integration of cloud computing services like Agriculture fields maps, cloud storage etc., data can be accessed live from anywhere and everywhere enabling live monitoring and end to end connectivity among all the parties concerned.

- IoT is regarded as key component for Smart Farming as with accurate sensors and smart equipment's, farmers can increase the food production by 70% till year 2050 as depicted by experts.

- With IoT productions costs can be reduced to a remarkable level which will in turn increase profitability and sustainability.

- With IoT, efficiency level would be increased in terms of usage of Soil, Water, Fertilizers, Pesticides etc.

- With IoT, various factors would also lead to the protection of environment.

According to (Digiteum Team iot in agriculture)

1.6 Disadvantage of Smart Farming

One huge disadvantage of smart farming is that it requires an unlimited or continuous internet connection to be successful. This means that in rural communities, especially in the developing countries where we have mass crop production, it is completely impossible to operate this farming method. In places where internet connections are frustratingly slow, smart farming will be an impossibility.

As pointed out earlier, smart farming makes use of high techs that require technical skill and precision to make it a success. It requires an understanding of robotics and ICT. However, many farmers do not have these skills. Even finding someone with this technical ability is difficult or even expensive to come by, at most. And, this can be a discouraging factor hindering a lot of promising farmers from adopting it. **According to (Maanak Gupta - Security and Privacy in Smart Farming: Challenges and Opportunities)**

2. Smart Farming current products.

Below are some products of smart farming in the world

- Monitoring of climate conditions: Some examples of such agriculture IoT devices are allMETEO, Smart Elements, and Pycno.

- Greenhouse automation: For instance, Farmapp and Growlink are also IoT agriculture products offering such capabilities among others.

- Crop management: Arable and Semios can serve as good representations of how this use case can be applied in real life.

- Precision farming: CropX builds IoT soil sensors that measure soil moisture, temperature, and electric conductivity enabling farmers to approach each crop's unique needs individually. Combined with geospatial data, this technology helps create precise soil maps for each field. Mothive offers similar services, helping farmers reduce waste, improve yields, and increase farm sustainability.

- Agricultural drones: DroneSeed, for example, builds drones for planting trees in deforested areas. The use of such drones is 6 times more effective than human labor. A Sense Fly agriculture drone eBee SQ uses multispectral image analyses to estimate the health of crops and comes at an affordable price. **According to (Alexey Chalimov-IoT in Agriculture: 8 Technology Use Cases for Smart Farming)**

3. Conclusion secondary research and hypotheses.
   Based on the knowledge I have gathered from the literature reivew, I can conclude that Smart Farming will increasingly develop according to the current trend because of the urgent need for food as well as environmental issues. attention in recent times. I have also gathered information about IoT, and IoT in farming, highlighting the benefits of applying IoT to farming. Along with that, I also researched on the disadvantages of applying IoT based on that there will be options for improvement to limit the disadvantages on the Internet.

IV. Primary research.

1. Primary research plan.
   To collect primary data most accurately, I created a plan for primary research including 1 set of questions. These questions include qualitative and quantitative questions. Link survey: https://forms.gle/DiCL6J4EY5LKUHcKA

   The questios were planing below:

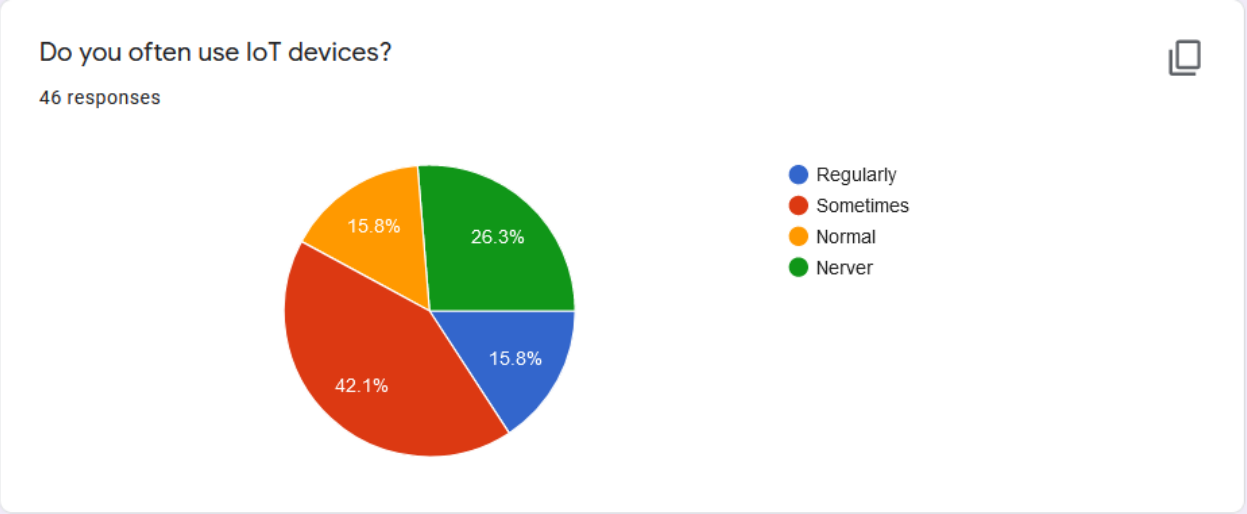
   - Do you often use IoT devices?
   - Are you satisfied when using IoT devices in general?
   - How is your understanding of IoT in agriculture?
   - Do you agree with: "IoT help a lot in farming"?
   - Do you think the application of IoT in farming is promising or not?

- Have you ever participated in a project raleted to IoT farming?
- How do farmers think about the IoT?
- What are the benefits of applying IoT in farming for farmers?
- In your view, what are the possible limitations of applying IoT in farming?

2. Analyze collected data.

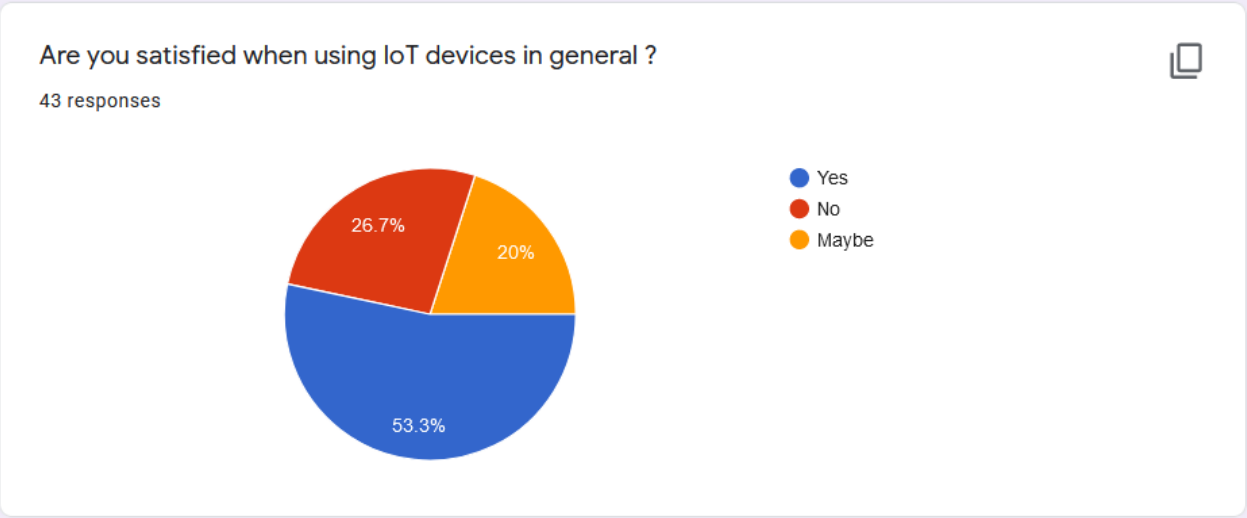
Q.1 . Do you often use IoT devices?

In the first question, survey each person's use of IoT devices. In this question, it is found that the majority of those surveyed have used IoT devices, accounting for more than 40%. However, a fairly large number of people have never used IoT devices, accounting for nearly 30% of those surveyed. The number of people who use IoT devices regularly accounts for 15%.



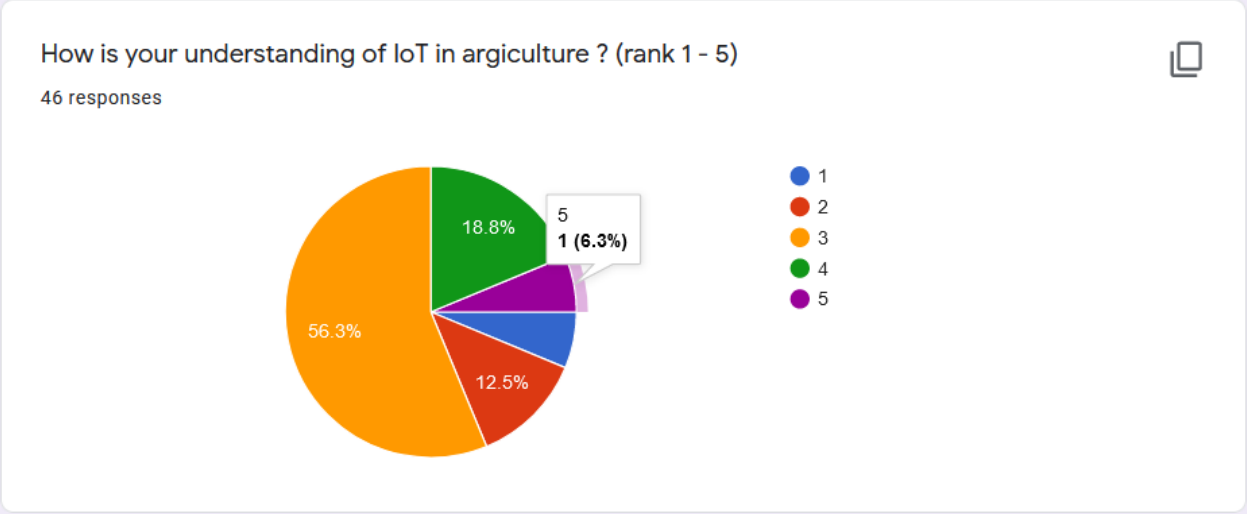
Through the above data, we can see that IoT devices are not popular, but in the current development, the number of people who have access to these devices' accounts for more than 80%. So, conducting an IoT project is a good option.

Q.2 . Are you satisfied when using IoT devices in general?



In the second question, assess the satisfaction of the respondents when using IoT devices. The overview shows that most people are satisfied using IoT devices, more than 50% are satisfied. However, the number of dissatisfactions about the quality is close to the same, some comments are not sure whether they are satisfied using it. It can be realized that satisfaction depends on the development of technology in IoT and on the development ability of each product. In the future when IoT will expand and develop in technology and many fields, the satisfaction in user experience will be increased.

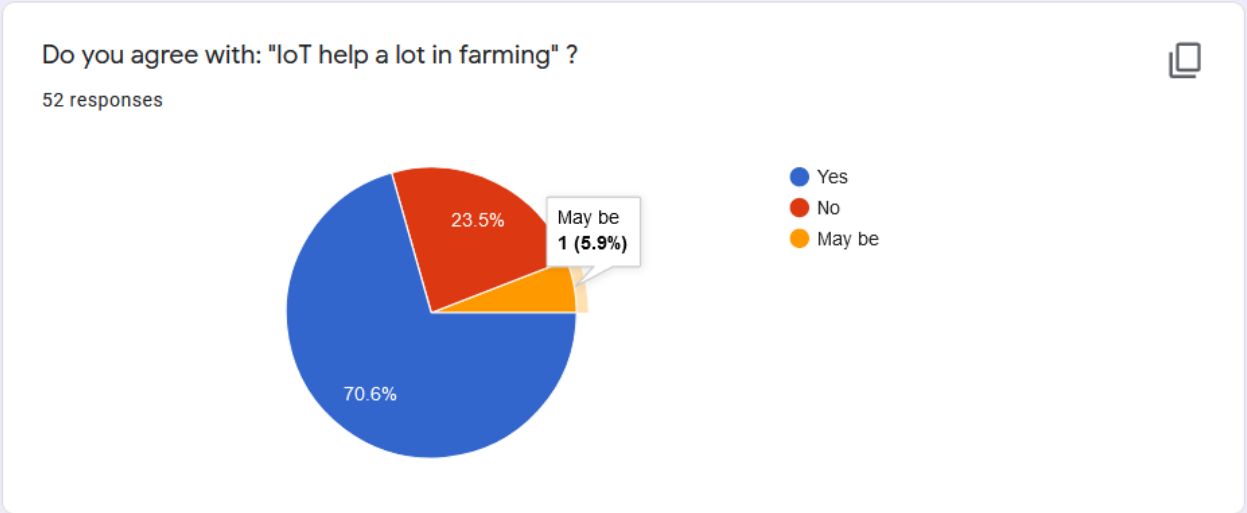
Q.3 . How is your understanding of IoT in agriculture?



In this question assess the understanding of IoT in agriculture of survey participants. Questions are rated on a scale of 1-3. Based on the feedback, it can be seen that the general understanding level of people is at 3 with nearly 60% of the total, this is medium level, showing that IoT in agriculture is not really understood. Because the application of IoT in agriculture in Vietnam is not widespread. Next is about the level of 4, 5, accounting for about 25%, only 1 in 4 of the

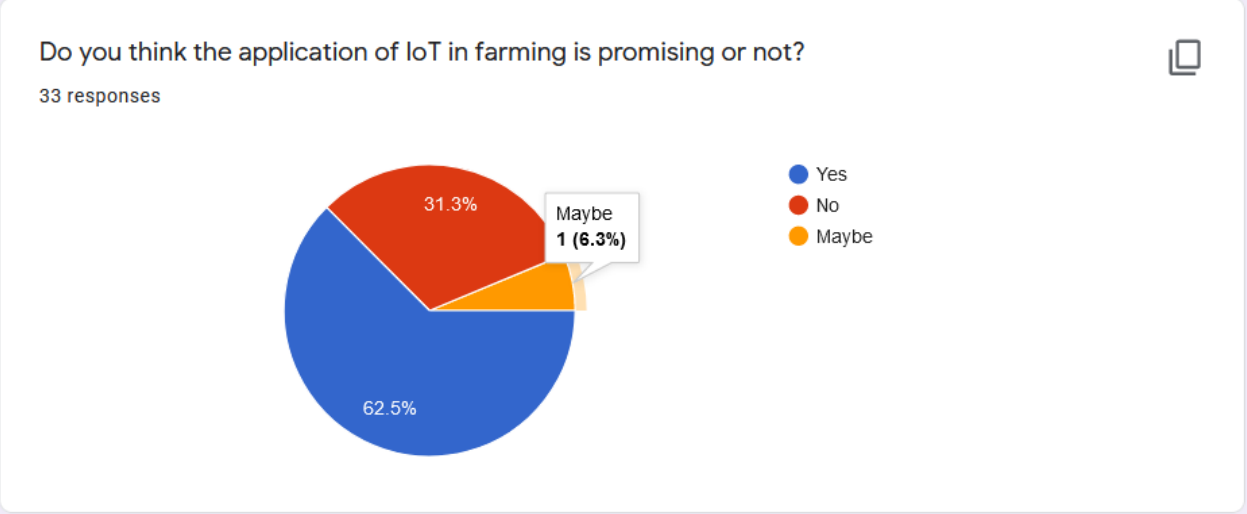
total number of people surveyed have a good understanding of IoT in agriculture. Studying this project will help improve understanding as well as practical application.

Q.4 . Do you agree with: “IoT help a lot in farming”?



Question 4 is to assess whether people agree with the idea that IoT helps a lot in farming. The answer in agreement is a large number, 70% of people agree with the above opinion. The goal of IoT in farming is to grow, support, reduce labor and improve productivity. It is for those reasons that those who agree that adopting IoT will be of great help to agriculture. However, there are still some people who disagree with the above opinion - accounting for 23.5%, the reason for this may be that the application of IoT is not effective, especially in agriculture. From there, there is a need for research investment for IoT to meet the above-mentioned goals.

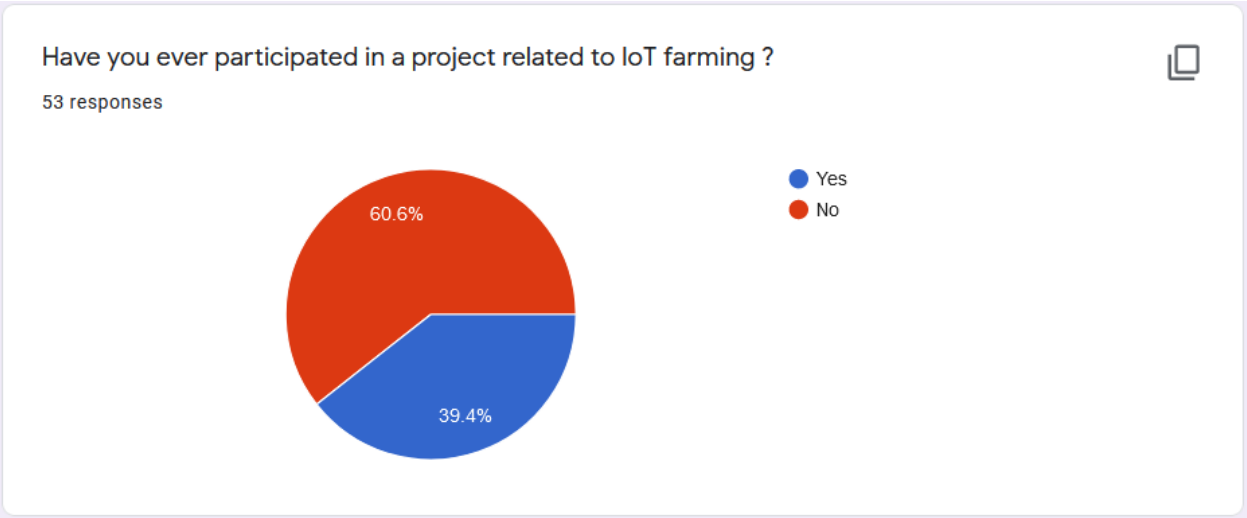
Q.5 . Do you think the application of IoT in farming is promising or not?



This question asks about the vision, taking an assessment of the development prospects of IoT in farming. The purpose of this question is to get an opinion on whether this project is promising

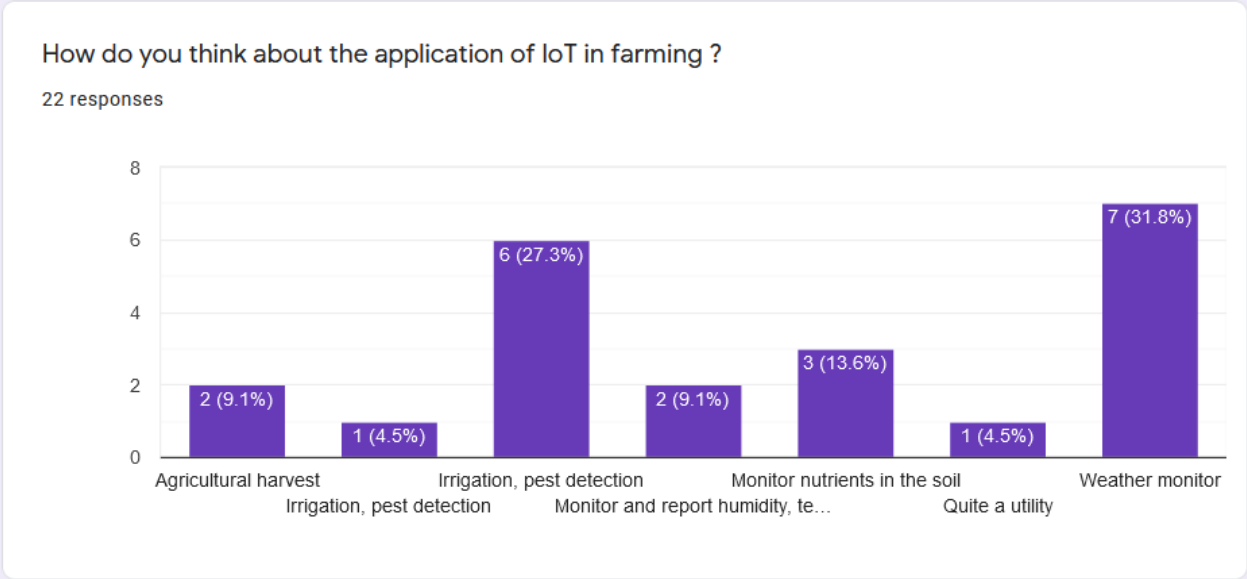
or not. A project needs a future to know whether to put effort into research and development. More than 60% think that the application of IoT in farming is very promising, so choosing a research topic has had a successful first step, applying IoT to an industry that needs to be evaluated for feasibility. However, there are still nearly 30% of people who think that applying IoT to farming has no development prospects. The reason may come from the information that applying IoT to farming is not necessary, but through this study the goal is to demonstrate what IoT can do and bring to farming.

Q.6 . Have you ever participated in a project raleted to IoT farming?



The last quantitative question refers to the number of people who have participated in an IoT project in agriculture. More than 60% of people have never participated in any project. The number shows that IoT projects, especially IoT projects in agriculture. Choosing an IoT project to conduct research in an area with relatively little prior application will have the advantage of being pioneering. However, the downside when few people have ever participated in iot projects is that there are few people around with practical experience, which leads to when needing support, it will be very difficult.

Q.7 . How do you think about the application of IoT in farming?



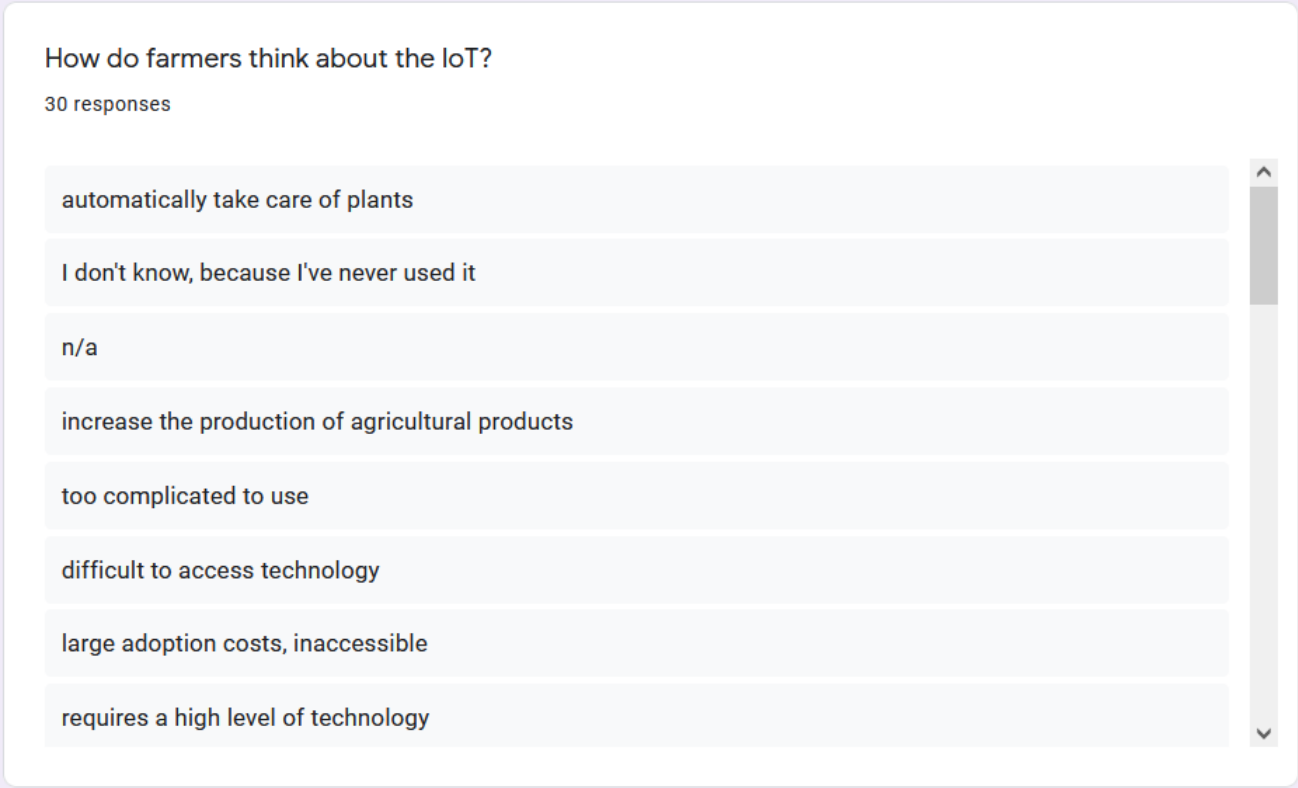
In this question to collect opinions on how IoT will help in agriculture, through 21 responses, there are main responses as follows:

- Weather monitor: is the most answered opinion, accounting for more than 30%
- Irrigation, pest detection
- Monitor nutrients in the soi
- Agricultural harvest
- Monitor and report humidity, temperature, light intensity
- Quite a utility

One thing can be noticed that the application of iodine in agriculture revolves around the problem of automatically monitoring external factors from the environment affecting crops. The reason for these answers comes from the fact that in farming, environmental factors are very important, in the past it was difficult to capture these factors accurately and timely. However, with the application of IoT, these are information that are easily collected, based on this information, the system will respond appropriately for each case. In addition, the response mentioned automation in harvesting, which is an application that helps increase productivity, reduce labor, thereby greatly supporting farmers.

Q.8 . How do farmers think about the IoT?

Below are some of the key responses from the 30 responses collected from this question, which aims to collect real data from people who directly use the smart farming system.

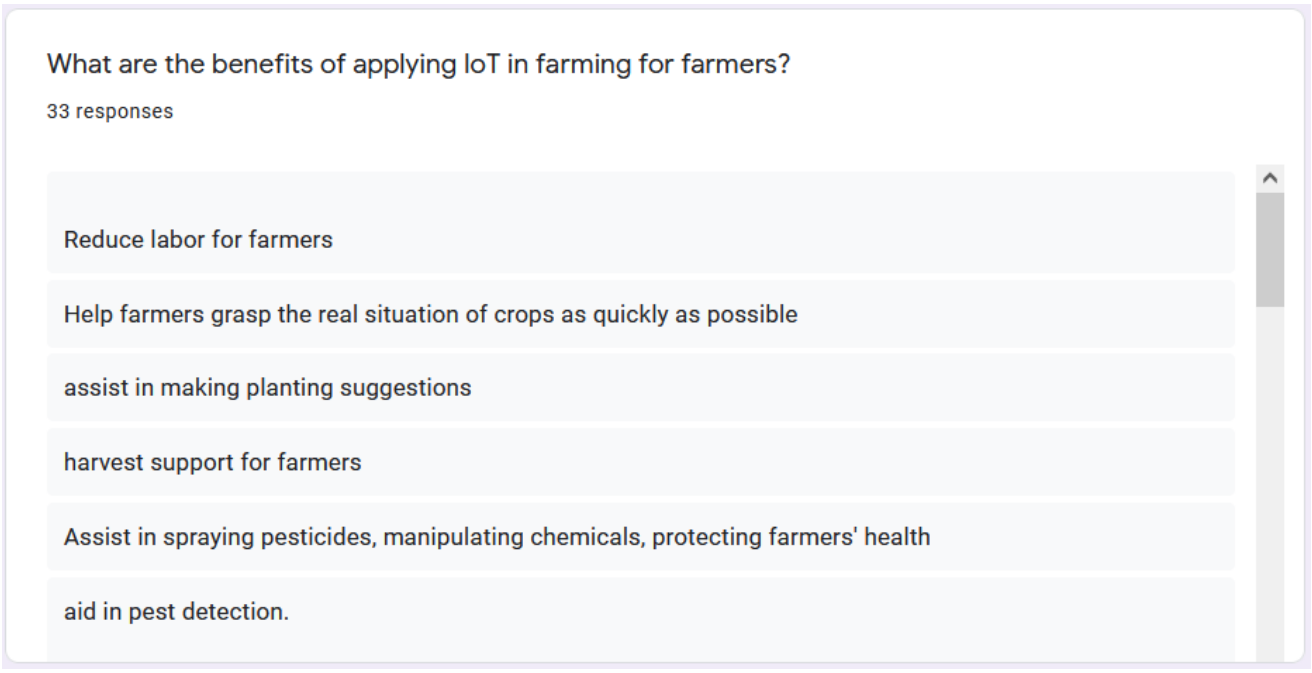


It can be seen that farmers think that IoT can help them in taking care of their crops, which is a boon for farmers, who expect that time-consuming and repetitive tasks will there is an automatic support system. Some people have never used an IoT system, so they do not have any feedback on this question. However, some follow-up questions can be seen as obstacles to IoT being accessible to farmers today.

The first is about the feedback that the application of iot will cost more money to get this technology, in fact, to have an iot system is currently very expensive, but it can still be overcome. mass production, thereby reducing costs.

The next problem that farmers have thought about is technological barriers, requiring high technical skills to be able to use it, but this problem can be overcome from the development process. proceed to develop integrated control modules, from which users will have a system that is as easy to manipulate and manage as possible.

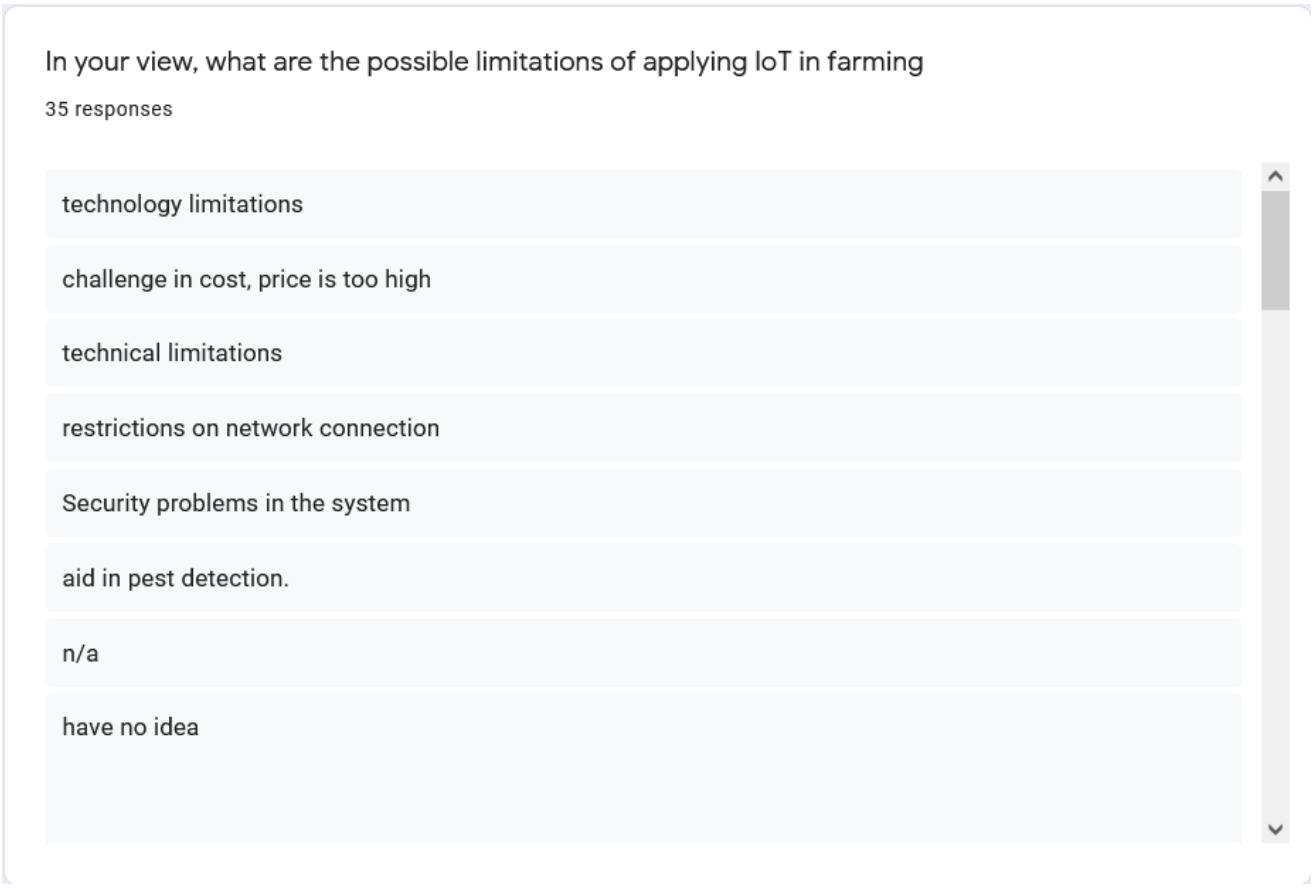
Q.9 . What are the benefits of applying IoT in farming for farmers?



The main goal is to apply IoT in agriculture to help farmers, so I have created this survey question for you. It can be seen that the support in reducing labor for farmers has been recognized, this is also the desire that the project wants to bring. Moreover, from these responses, we can know the actual demand from the user. Ideas about helping farmers get to know the status of cops as quickly as possible so they can give better direction to take care of their crops and improve yields later on. As the answer, it will be expected that the system can support the suggestion of plant care directions based on the analytical data. When applying IoT, it can also assist farmers in harvesting, quickly detecting pests and diseases on a large area, which previously would have been difficult to detect and take a lot of effort.

Q.10 . In your view, what are the possible limitations of applying IoT in farming?

The question consults about the difficulties that will be encountered when applying IoT in farming. The question received an average of 30 evaluable responses. Below is an analysis of the main responses.



First of all, it can be seen that the opinion on technology is limited, the application to farms is often in suburban or rural areas, these areas are difficult to access new technology, people are still farming. farming in the traditional way, so it is difficult to change the way of farming. Another problem is that if IoT is applied, it will cost a lot of money to have an IoT system on a large scale, along with the cost of current technology equipment is very high. The third response said that there will be technical limitations for people, accessing new technology is not easy for people. The fourth problem is that for application in large areas, internet connection is very difficult when the fields are often in remote areas where there is no network connection, and the real-time factor in this system. Also important, connection restrictions lead to erroneous data transmission.

- Summary , in the research I have done above, from applying primary research and secondary research, comparing with the objectives set out initially in the research plan is to understand and answer questions such as:
    - What is IoT?
    - Why IoT is important?
    - What is Smart Farm?
    - What are Smart Farm’s features?
    - Is IoT used popular in farm nowadays?

- What companies are using IoT in smart farm?
- Their props and cons.
- Application of IoT in Smart Farming.

So, I have reached the following problem: given the definition of Iot, since this is a study on the application of IoT in farming so first need to understand what IoT is, then the part that I have covered Given the importance of IoT today, from that importance we will understand what benefits if applying IoT in farming will bring? The third goal that I achieved was understanding IoT in farming, which is the main topic of this research. To research, it is necessary to first have an understanding of a certain field, what is smart farming, from which to give a view of how IoT can be applied in the field of smart farming. What can it do to help? Understanding the concept, it is necessary to know that the features that smart farming has to give an overview. The next objective that I achieved was researching the prevalence of IoT applied in farming today, the answer coming from data analysis is that people today realize the potential of IoT and apply it. Farming is very popular, due to the benefits that IoT brings. Specifically, in terms of productivity improvement, labor reduction, etc., are the decisive factors that bring IoT into popularity today. I also gave real examples of companies that have been applying IoT to farming, to give a realistic view of the IoT farming market today. And I also gave an analysis of the benefits and disadvantages of applying IoT in farming. Finally, based on the knowledge studied and applied in practice. Through this section, it is shown that my studies in this study have fully met the objectives set forth in the beginning, and at the same time ensured the effective research.

V. Conclusion.

Through this report, I have presented the research problem, the solution to that problem, the research methods and applied it in the topic. Through this report, I have presented the research problem, the solution to that problem, the research methods and applied it in the topic.
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VI. References.

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VII. Appendix.

Research Proposal Form

Student Name: Nguyen Tan Anh **Student Number**: BHAF190112

Tutor: Bùi Duy Linh **Date**: 06/11/2021

Unit 13: Computing research project

Propose title: IoT and Smart Agriculture.

Section One: Title, objective, responsibilities
Research question: What are roles of IOT in farming?

Objectives

I want to learn:

- What is IoT?
- Why IoT is important?
- What is Smart Farm?
- What are Smart Farm's features?
- Is IoT used popular in farm nowadays?
- What companies are using IoT in smart farm?

Section Two: Reasons for choosing this research project

Reasons for choosing the project

- I am interested in the potentials of IOT in general and Smart Farm.
- Nowadays IoT is present in many fields as well as in agriculture and animal husbandry. IoT applications help improve productivity and output. Vietnam is a country with a large agricultural industry, so the application of IoT will help a lot
- IOT are a topic which many companies are researching so it would help me to find research material easier.

Section Three: Literature sources searched

The initial sources which could help me to answer those questions:

1. IOT and Argriculture
2. IOT TRANSFORMING THE FUTURE OF AGRICULTURE
3. What To Know About Smart Farming Using IoT

Use of key literature sources to support your research question, objective, or hypothesis:

Section Four: Activities and timescales

1. Collect materials relating to research's question and objectives
2. Complete research proposal
3. **Milestone 1[11-11]**: Get feedback from the Tutor about the research proposal
4. Produce project plan
5. Writing literature review and represent the findings in term of hypothesizes
6. Check project progress: research proposal, plan, literature review
7. Preparation for primary research (to confirm the findings in literature review or clarify the questions might arise after the literature review)
8. **Milestone 2[13-11]**: Get feedback from the Tutor about the plan of primary research.
9. **Milestone 3[16-11]**: Get feedback from the Tutor about the result of literature review
10. Conducting the primary research
11. **Milestone 4[19-11]**: Represent the findings in primary research and get feedback from Tutor
12. Writing assignment 1 which contains LO1, LO2
13. **Milestone 5[26-11]**: Submit assignment 1 -Draft
14. **Milestone 6[30-11]:** Submit assignment 1- Final
15. Writing Assignment 2 which contain LO3, LO4
16. **Milestone 7[8-12]:** Submit assignment 2 -Draft
17. **Milestone 8[12-12]:** Presentation- put everything together.
18. **Milestone 9[15-12]:** Submit assignment 2- Final

Activities to be carried out during the research project (e.g., research, development, analysis of ideas, writing, data collection, numerical analysis, tutor meetings, production of outcome, evaluation, writing the report) and likely durations:

Milestone one:

Target Date (set by tutor)

Milestone two:

Target Date (set by tutor)

Section Five: Research approach and methodologies

- Research process: sequential
- Research classes: quantitative and qualitative
- Research methods: case study, survey

Type of research approach and methodologies you are likely to use, and reasons for your choice:

What your areas of research will cover:

Comments and agreement from tutor

[This part not for student]

Comments (optional):

I confirm that the project is not work which has been or will be submitted for another qualification and is appropriate.

Agreed: ..... (Name) ..... (Date) .....

Comments and agreement from project proposal checker (if applicable)

[This part not for student]

Comments (optional):

Agreed: ..... (Name) ..... (Date) .....

Research Ethics Approval Form

All students conducting research activity that involves human participants or the use of data collected from human participants are required to gain ethical approval before commencing their research. Please answer all relevant questions and note that your form may be returned if incomplete.

For further support and guidance please see your respective Unit Tutor.

Before completing this form, we advise that you discuss your proposed research fully with your Unit Tutor. Please complete this form in good time before your research project is due to commence.

Section One: Basic details

Project title: **Research about advantage and disadvantage of application of IoT in Smart Fmarming.**

Student name: **Nguyen Tan Anh**

Student number: BHAF190112

Programme: **Computing research**

School: **BTEC FPT International College**

Intended research start date: **6/11/2021**

Intended research end date: **8/12/2021**

Section Two: Project summary

Please select all research methods that you plan to use as part of your project:

- Interviews ☐
- Questionnaires ☑
- Observations ☑
- Use of personal records ☑
- Data analysis ☑
- Action research ☑
- Focus groups ☑
- Other (please specify):

Section Three: Participants

Please answer the following questions, giving full details where necessary.

Will your research involve human participants?**: Yes, the research needs the answer of human participants to research about behavior.**

Who are the participants? Tick all that apply:

Children aged 12–16: ☐ Young people aged 17–18: ☐ Adults: ☑

How will participants be recruited (identified and approached)? People with experience in the field of research and those who use equipment

Describe the processes you will use to inform participants about what you are doing:

How will you obtain consent from participants?**:** With consultation and support from the lecturer, the participants agreed.

Will this be written?**:** Ye**s**

How will it be made clear to participants that they may withdraw consent to participate at any time?**:** There will be a commitment before everyone attends, including the condition that the participant can withdraw consent at any time.

Studies involving questionnaires:

Will participants be given the option of omitting questions they do not wish to answer?

Yes: ☑ No: ☐

If No please explain why below and ensure that you cover any ethical issues arising from this:

Studies involving observation:

Confirm whether participants will be asked for their informed consent to be observed.

Yes: ☑ No: ☐

Will you debrief participants at the end of their participation (**i.e.,** give them a brief explanation of the study)? **Y**es, will notify to the participants of the progress and and a brief summary of the research

Yes: ☑ No: ☐

Will participants be given information about the findings of your study? (This could be a brief summary of your findings in general.)

Section Four: Data storage and security

Confirm that all personal data will be stored and processed in compliance with the Data Protection Act (1998):

Yes: ☑ No: ☑

Who will have access to the data and personal information?**:** People involved in the study such as instructors, researchers, and participants

During the research:

Where will the data be stored**?: The data store in Google storage service.**

Will mobile devices (such as USB storage and laptops) be used?

Yes: ☑ No: ☐

If yes, please provide further details: **The data also stored in the personal computer for data analysis actions.**

After the research:

Where will the data be stored? **Data will be stored in google store service**

How long will the data and records be kept for and in what format?**: Data will be stored about 1 year.**

Will data be kept for use by other researchers?

Yes: ☐ No: ☑

If yes, please provide further details:

Section Five: Ethical issues

Are there any particular features of your proposed work which may raise ethical concerns? If so, please outline how you will deal with these:

It is important that you demonstrate your awareness of potential risks that may arise as a result of your research. Please consider/address all issues that may apply. Ethical concerns may include, but are not limited to the following:

- Informed consent.
- Potentially vulnerable participants.
- Sensitive topics.
- Risks to participants and/or researchers.
- Confidentiality/anonymity.
- Disclosures/limits to confidentiality.
- Data storage and security, both during and after the research (including transfer, sharing, encryption, protection).
- Reporting.Dissemination and use of your findings.

Section Six: Declaration

I have read, understood and will abide by BTEC FPT International College Research Ethics Policy:

Yes: ☑ No: ☐

I have discussed the ethical issues relating to my research with my Unit Tutor:

Yes: ☑ No: ☐

I confirm that to the best of my knowledge:

The above information is correct and that this is a full description of the ethics issues that may arise in the course of my research.

Name: **Nguyen Tan Anh**

Date: **9/12/2021**

Please submit your completed form to: