**INFO 103 – Project description**

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Instructions: Groups may have a maximum of **four** and a minimum of **two** people. Turn in one document for your whole group.

1. **(5 pts)** Your project should fit into one of three categories. Please select one, below. We choose a.
   1. **Data product or project development.** Study the development of an existing or hypothetical data product or project, focusing on value and marketability.
   2. **Data collection and curation.** Study an existing or hypothetical data source, focusing on its challenges in curation, storage, and collection.
   3. **Data technology and processing.** Study an existing or hypothetical processing methodology or big data technology, focusing on problems and applications.

Our choice is   **a. Data product or project development.**

1. **(15 pts) Who’s on this project’s team?** Whether existing or hypothetical, what team member specialties did or would this specific project require? Identify three or more **roles** from the data science spectrum, and discuss how the skills of the individuals filling these roles support the needs of this data science project. **Note: it may help to complete task 3 before completing this task!**

1. A statistician. If you take a look at Question3, you can easily find out that the first step of our project is analyzing the market. We plan to use surveys to do that. We need to know how to design surveys and conduct surveys to get the most realistic and effective data. That is why a statistician is essential.

2. A data scientist. The role of data scientists is to turn data into effective information, and in our project, the key to this step is to build a data model based on the collected data. Without data scientists, we can't build accurate models to make decisions with data.

3. An electronic engineer. In our project, the deployment of a large number of sensors is a must. Therefore, we need electronic engineers to deploy and properly configure them. We also need them to handle these electronic devices to collect data.

4. A botanist or agronomist. In modern society, most people know nothing about how to grow crops correctly. The cultivation and stimulation of crops is a science, so we need botanists to provide their expertise to participate in the construction of the model.

5. A Geographer or meteorologist. When making farm location choices, we need professionals to determine which metrics can predict future weather conditions. At the same time, we need them to work with data scientists to help determine the impact of specific indicators on the overall model.

1. **(25 pts) Identify your specific topic of study, and provide a summary, below.** Now that you have selected your project category, you must select and describe the specific topic on which you will focus. Using complete sentences, this should include a clear description of any **product**, **data**, **market**, **technology**, or **processing method**. In addition, this section should include a discussion of the topic’s **impact** and **use**. **This summary should be 1–2 pages in length, single spaced at font size 12.**

**Introduction**

The goal of our project is to make full use of the data currently available to establish a production-sales-distribution integrated agricultural product sales network, while using data to improve the productivity of agricultural products.

**Market**

Our project begins with an analysis of market demand. Fresh fruits and vegetables are a necessity for residents and have an important impact on the lives of residents. The traditional fresh-keeping industry adopts the model of “place of origin – wholesale market at all levels – vegetable market”, with many intermediate links, low transportation efficiency, and high terminal prices.

The market for the data product designed by our project mainly includes individuals, restaurants, supermarkets, and fresh markets.

First, we need to do market surveys based on collected and statistical data. Market demand surveys include the types of commodity demand in the market, the demand for market commodities, and the demand time. These information helps understanding the types, quantities, time and location of products that consumers need. At the same time we can arrange the farm’s production plan and estimate the running expenses of the farm.

Then, by combining these data together and put them in a specific model, we can select the location of the far.

**Location Selection**

The location of the farm is very important. We will use data to establish a model to evaluate the score of Every alternate location.  The growth of the crops depends on the sunshine, wind, trace elements in soil and the soil humidity.  After the analysis of the market, we have been able to get a general idea of the demand for agricultural products in this region or city. The fit between these natural conditions and the growth conditions of the target plant can be calculated as a "bumper coefficient” The “bumper coefficient” will be added to the model as an important indicator to calculate the score.

Unpredictable natural disasters such as high winds, hail, floods or mudslides can occur in every place. These natural disasters are likely to have a devastating impact on farm production. Therefore, we can collect natural disaster data from this place in recent years and predict the probability of future natural disasters and estimate the corresponding losses of natural disasters. These data can generate a “hazard coefficient”. This “hazard coefficient” will be added as an important variable to our location choose model.

As we know, the running of the farm need to spend large amounts of water, chemical fertilizer and so on which need to be transported from other places. The goods delivery also need to be considered. So the convenience of transportation is also a very important indicator in the model.

The land of the farm needs to be paid. Obviously, the better the production conditions, the more expensive the land rent. Therefore, we need to add land rent as an important variable to the location model and integrate and compare with other variables.

After these important variables was collected, we can calculate the score of every available location to make a rational decision.

**Growing**

After the farm, whatever it is a vertical or traditional, was established. We use data collected from the inner of this farm to help improving the running of the farm.  We plan to put a series of sensors in the farm to collect data. In order to know the growing situation of the crops. In general, arranging so many sensors in a large farm would be very expensive. Fortunately, the rapid development of civilian drone technology and network technology offers us another possibility.

Our choice is to arrange a wireless network in the farm. Of course, if the farm has been covered by the communication base station provided by the official operator, we can even omit this step. Then we can use the drone equipped with a camera and integrated sensors to complete the data collection of the entire farm. Thanks to advances in lithium battery technology, even economical civilian drones have a long battery life. Therefore, we only need a limited number of drones to achieve data collection for large areas of farm.  The camera on the drone can take pictures of the crop growth in the field and upload the image to the server. The server's image analysis program can get the growth situation of crops based on the image. Imagine if the customer wants to customize a batch of pollution-free crops through us, we can even broadcast the field to the users through the camera on the drone to meet the user's curiosity about crop production and supervision of our production process.

We also can combine the image data with other data collected by the drone like temperature or soil moisture and trace element composition in soil and adjust the plan of Irrigation and fertilization to the current situation to make the crops grow better.

**Transport**

After the crop is ripe, there will be a big problem that how can we sell these crops and make the profit of farmers and customers maximum. This challenge is depends both on the type of the products and the current transportation situation in the city.

Firstly, we should build a model which uses parameters to describe the planting cycle and storage time among every kinds of crops. Root vegetables are long planting cycle and easy store such as potato, yam and radish, and fruits or green leafy vegetables are short planting cycle and uneasy store such as spinach, lettuce and strawberry. Then we can arrange the planting and storage plan according this model. After that, we will face the transportation problem. We are facing multiply kinds of customers. So it is important to arrange and adjust our deliver plan to fit the need of customers. We should create different models for different customers to arrange the transportation plan because the proportion and quantity of supplies they need are very different. The variables in the model should contains the Real-time traffic conditions in the city, especially the traffic situation near the customer's shipping address. In addition, the model variables also need to include the type and quantity of agricultural products required by the customer, the temperature of the day, because at different temperatures, the speed of agricultural product quality decline is not the same, when the temperature is too high, we even need Send our cold chain transporter.

In order to collect these data we required, we may need to work with map application providers such as Goldtech Maps to get a portion of their data to predict traffic conditions in the city. At the same time, the government’s meteorological department generously opened up their weather forecast results for reptiles to obtain weather data so that we can predict the weather condition for the day. This model is also self-improving, and we will collect operational data during the transportation process, such as the damage rate of the goods, the punctuality rate of the delivery of the goods, and so on. With this data, we can improve our model to improve transportation efficiency.

1. **(25 pts) Support your topic with reference materials and briefly summarize what each piece of reference material tells you about your topic.** These materials should relate to key components of your topic, and might include **academic papers**, describing related methods or data sets; **news articles**, indicating market demand, changing use, or ethical concerns; **blog posts**, describing products, updates, and opinions; **patents**, describing system details; **APIs**, describing data and software access; or **any documentation** detailing structure, licensing, and use. Note that all projects should have substantial reference material, **regardless of topics being existing or hypothetical.** For example, a hypothetical project might focus on references for market potential, competition, and predecessor methods, while an existing project might focus on its history, system descriptions, product updates, and ethical impacts.

**Reference [1]**

[《一篇完整的市场调查方案、计划、策划书包含哪些内容》](https://wenku.baidu.com/view/350318c5777f5acfa1c7aa00b52acfc789eb9ff1.html)

Original text cited：

*“市场需求调查市场商品需求调查主要包括市场商品需求量、需求结构和需求时间的调查。即了解消费者在时何地需要什么，需要多少。市场商品需求量主要取决于社会购买力水平。调查市场商品需求量主要是调查社会购买力，是一种有支付能力的消费需求。对企业来说，调查市场需求量，不仅要了解企业所在地区的需求总量、已满足的需求量和潜在的需求量，而且还必须了解本企业的市场销售量在市场商品需求量中所占的比重，即本企业销售的市场占有率，以及开拓地区市场的可能性。”*

What it tells us about our topic:

In order to know the detail of a market, what do we need to do. What features we need to consider, what form of result should we deliver so that the data scientist can understand our result.

**Reference [2]**

[《我国生鲜市场调研报告》](https://wenku.baidu.com/view/aacd0b61951ea76e58fafab069dc5022aaea469c.html)

 Original text cited：

“*随着*“*互联*+*农业*”*趋势不断深化，生鲜电商保持着高速发展的态势，正日益成为电商行业的突破性增长点。巨大的市场前景吸引了众多生鲜电商的积极入市：京东*7000*万美元领投天天果园；阿里巴巴投资易果；顺丰跨界开办顺丰优选；苏宁超市推出*“*苏鲜生*”*；亚马逊公布了筹备已久的生鲜馆，包括*21cake*、都乐、獐子岛等；联想佳沃推出金艳果猕猴桃，*“*柳桃*”*与*“*橙*”*、*“*潘苹果*”*一起掀起水果络营销的浪潮。*   *新事物的发展不可能是一蹴而就的，行业的成长阶段必然要经历艰难的探索时期。生鲜电商普遍存在盈利难的问题，截至*20XX*年*7*月份，国内*4000*多家生鲜电商，仅*40*家实现盈利，*95%*的生鲜电商企业仍处于不同程度的亏损，其中包括京东、天猫、顺丰优选等生鲜电商巨头。大型综合电商们有雄厚的资金支持，短期亏损尚能维持，但许多中小型生鲜电商由于资金链断裂而被迫退出市场，曾经风光一时的优菜、美味七七、菜管家等垂直电商的失败，显示出生鲜电商面临的严峻形势。生鲜电商虽然道路曲折，但其发展前景仍被业内所看好，资本的青睐为生鲜电商的发展注入了新的活力。*20XX*年资本*“*寒冬*”*的大背景下，中粮我买完成了*C*轮亿美元融资，创下行业新高，本来生活、天天果园、多点等其它多家公司也完成了新一轮融资。传统农批市场转型电商的实力强大，成为生鲜电商发展的新增长点。面对生鲜电商的迅猛发展给传统生鲜行业带来的*>*中击，许多农批市场积极转型，借力互联信息化大趋势，开展农产品电子交易、电子拍卖和期货交易等业务。例如，寿光农产品物流园建立起蔬菜电子拍卖中心，日交易量达*100*多万斤，成功实践了*“*未收先卖，未种先卖*”*的订单农业模式。*”

What it tells us about our topic:

Investigate and study of the current situation of China's fresh market. It reminds us where the defect of the market is and what is already exist in the market. So we can figure out a new way to improve the market.

**Reference [3]**

基于LoRa的智能农业系统设计与实现.pdf

[What is LoRa?](https://www.semtech.com/lora/what-is-lora)

Original text cited：

“*设计一套基于*LoRa*技术的智能农业系统*,*能够实现实时准确地采集农作物生长环境中各种参数*,*并能* *实时精准地控制大棚中的设备*,*让大棚中的生长环境保持* *在一个平衡的状态*,*从而满足农作物生长的需求。从现实* *意义上看*,*本系统可以提高农业生产效率与农业产量*,*同时改善农业安全以及粮食安全。*

*智能农业系统从整体上由* *四部分构成*,*分别是*:*用户访问平台、农业云平台服务器、* LoRa*基站和终端节点。其中用户访问平台指的是* PC *端和* *手机客户端*,*通过它们来监控大棚内的环境情况。农业云* *平台服务器负责对整个系统的数据进行处理*,*并且在其数据库内进行数据保存*,LoRa*基站负责对终端节点和农业云* *平台服务器之间数据的交互*,*终端节点包括采集节点和控制节点。*

*温湿度采集节点、光照采集节点、*CO2 *采* *集节点等称为采集节点*,*同时控制节点包括风扇控制节点、* *卷帘控制节点、加热控制节点等*,*另外一个* LoRa*基站负责* *多个农业大棚的终端节点*,*一个农业云平台服务器负责多个*LoRa*基站。在本系统的总体设计中支持上与下双向数据* *传输。从下至上时*,*首先通过采集节点采集到大棚内温湿* *度、光照强度、*CO2 *浓度等信息的数据*,*经* LoRa *网络自组* *网方式传输到*LoRa*基站*,*然后经过*3G/4G/*有线宽带网络* *上传到农业云平台服务器*,*实现与用户访问平台的对接。* *从上至下时*,*用户访问平台首先通过互联网发送指令给农* *业云平台服务器*,*然后经由* 3 G/4 G/*有线宽带网络发送给* LoRa*基站*,*最后再经过* LoRa *无线网络发给控制节点*,*通* *过控制风扇、卷帘、加热器的开关来调节大棚内的环境*, *从而实现了对控制设备的控制。*“

What it tells us about our topic:

1. Learn about how the LoRa system works and the structure. We got the idea about creating a smart farm system from it.

2. Research on integrated sensors: Use sensors to collect data on soil fertility, soil moisture, trace elements, light and other growth environments and to monitor plant growth status.

**Reference [4]**

[“Drones and Neural Networking Used to Identify Citrus Trees from Above”，Stefan Tasevski](https://dronebelow.com/2018/11/27/drones-and-neural-networking-used-to-identify-citrus-trees-from-above/)

Original text cited：

*“ Nowadays, remote sensing is one of the processes used in precision agriculture. The use of drones or unmanned aerial vehicles (UAVs) in this field is revolutionizing precision agriculture workflows for measurement of crop conditions as well as yields over the growing season. Aside from this, practices in the monitoring of trees for growth, individual fruit production, monitoring the weeds and others are found to be very useful for long-term farm management.*

*UAV imagery collection for agricultural applications is increasing globally and more of these individual cases are needed to develop more standard workflows that will help field and research managers deal with large volumes of high resolution imagery.*

*Methods to delineate, enumerate and monitor individual trees in an agricultural setting from high resolution optical imagery are required for efficient and precise crop management. Monitoring of individual trees for growth, fruit production and pest and disease occurrence remains a high research and operational priority and the delineation of each tree using automated methods as an alternative to manual delineation will be useful for future long-term crop management.”*

What it tells us about our topic:

1. UAVs represent a low-cost method for image acquisition with successful and promising usage in tree identification analysis, particularly in agricultural settings.

2. Research on image recognition (analysis of plant growth and results using images collected by drones).

3. Research on the application of small civilian drone technology. How can we use it to achieve many goals at the same time and save expenses.

**Reference [5]**

The\_Effects\_of\_Cold\_Chain\_Logistics\_and.pdf

Original text cited：

*“While Globalization has made the relative distance between two regions of the*

*world vastly smaller, the physical separation of these same regions is still a very*

*important reality.  Phone calls, emails and videos can be transmitted in fractions of*

*seconds to all corners of the globe, but physical objects such as a bushel of grapes, a drug*

*or a bodily organ cannot.  It takes time and coordination to efficiently move a shipment*

*and every delay can cost money and in some cases may even cost lives.  To ensure that*

*cargo does not become damaged or compromised throughout this process, businesses in*

*the pharmaceutical, medical and food industries are relying more and more on the cold*

*chain technology.*

*Current and Future Innovations*

*As the pharmaceutical and food industry companies that rely on cold chain*

*transportation for their economic livelihoods move into the future, new technological*

*advancements and inter-industry cooperation seminars aimed at strengthening every link*

*in the supply chain will continue to emerge.  One growing technological improvement to*

*the supply chain is radio frequency identification (Refrigerated Transportation 2006) or*

*the use of identification tags that provide up to the minute reports of where a shipment is*

*located anywhere in the world (Murphy-Hoye et al 46). The use of a tracking device such*

*as these offers the prospect of being able to provide total accountability and service*

*control while a shipment is moving through the supply chain.  Any delays or location*

*questions will be able to be answered immediately, making logistical pre-planning much*

*easier.  RFID technology also reduces the amount of labor hours needed for tasks*

*associated with accounting for and recording stock piles of inventory (Murphy-Hoye et al*

*46). The tracking system also offers better protection against potential counterfeit drugs*

*infiltrating the pharmaceutical market (Basta 1).   ”*

What it tells us about our topic:

Research on urban transportation and cold chain distribution. With these research, we have the materials to analyze the traffic situation and road arrangement in the inner city.

**Reference [6]**

Design\_and\_fabrication\_of\_Windchill\_for.pdf

Original text cited：

*“Windchill is the lowering of body temperature due to the passing-flow of lower-temperature air. In the windchill food preservation system, only a fan sucked the air into the chamber through aluminum tubing. The tube was buried into the ground where the temperature is less than the atmosphere. When the air was passed through the tubing it was cooled by exchanging the heat with soil via aluminum tubing and also by the expansion of the volume of air when entering into the chamber. Temperature and relative humidity (rh) are two most important parameters that affect the shelf-life of vegetables. It was found that low-temperature storage protects the quality of vegetables like texture, nutrition, aroma, and flavor (Paull, 1999). The freshness quality of vegetables has an influence on the market price of the vegetables. Low temperature and high humidity also reduce the loss of moisture which results in a low weight loss of vegetables. So it is needed to control the temperature and rh to increase the shelf-life of vegetables and maintain the freshness quality.*

*A windchill vegetable storage chamber was designed and fabricated in the FPM departmental workshop. This study was adopted on the principle that some insects keep their living place comfortable under the ground and on the principle of ideal gas. As the temperature was low and rh was high inside the chamber from the outside, vegetables kept inside the chamber was found fresher and weight loss was less as compared with those kept outside for 3-5 days. From the panel test result, it was assured that the vegetables were consumable after four days which kept inside the chamber. Based on this study, it can be concluded that this storage chamber can be used as temporary means of cost effective storage in farmers’ levels for several days.”*

What it tells us about our topic:

Research on the storage of crops. We gain the experience of arrange our warehouse. It also provide us with how to do planting and sell plans according to the storage of crops.

**Reference [7]**

Economist 0831.pdf   page60 Growing brighter

Original text cited：

*“From the outside, it looks like a tall, metal-clad barn. But step in, through a large airlock designed to keep out the bugs, and a kaleidoscopic scene emerges. A central aisle is flanked by two pairs of towers. Each tower is stacked with a dozen or so trays on which are growing strawberries, kale, red lettuce and coriander. And each tray is bathed in vibrant light of different colors, mostly hues of blue and magenta. Douglas Elder, who is in charge of this artificial Eden, taps some instructions into an app on his mobile phone and, with a short whirr of machinery, a tray of lush, green basil slides out for his inspection.  Mr. Elder is a product manager for Intelligent Growth Solutions (IGS), a “vertical farming” company based at Inver Gowrie, near Dundee, in Scotland. Each of the nine-meter-high towers in the demonstration unit that he runs occupies barely 40 square meters. But by stacking the trays one on top of another an individual tower provides up to 350 square meters of growing area. Using his phone again, Mr. Elder changes the colors and brightness of the 1,000 light-emitting diodes (LEDs) strung out above each tray. The app can also control the temperature, humidity and ventilation, and the hydroponic system that supplies the plants, growing on various non-soil substrates, with water and nutrients. Armed with his trusty phone, Mr. Elder says he can run the farm almost single-handedly.”*

What it tells us about our topic:

Research on vertical farms.  It reminds us that the technology of vertical farming is growing rapidly so that if there is some trouble about traditional farm, maybe vertical farming is a good choice.

**Reference [8]**

[Natural Disaster Prevention](https://sites.google.com/site/naturaldisasterpreventiongin/prevention-prediction)

Original text cited：

*“Prediction of natural disasters using technology requires extensive research and funding. Scientists need to analyze past disasters to find patterns in natural phenomena. They study tracking radar systems of seismic waves deep inside the Earth. By comparing past records with live data, specific trends give scientists a warning of future events. Trends are used to predict earthquakes, tsunamis, and volcanic eruptions.*

*Another way that technology is used in the prediction of natural disasters is with constant surveillance. Using off-shore cameras in hurricane-prone areas ensures that strong winds and waves can be recognised. This also helps to predict tsunamis. Additionally, by monitoring ocean currents, weather patterns can be predicted in advance, warning populated areas under risk of hurricanes and tornados. The surrounding areas can be evacuated, saving many lives. However, these short-term warnings are effective only if relief programs are planned and efficiently carried out. ”*

What it tells us about our topic:

Natural disaster prevention, providing technical support for farm site selection. With these information, we have the possibility to support the disaster prediction, which is the core of choosing the location of the farm.

1. **(30 pts) Identify how your topic intersects with the different areas of the data science life cycle.** Each stage of the data science life cycle is listed below. Using complete sentences, fill in how your topic crosses over into each area. If your topic generally does not cross over into an area, please indicate why this is the case in that stage’s area. Note that even if your topic does not specifically engage in a particular stage of the life cycle, **it may still have significant impacts to other to other data science projects.** For example, even though a **data collection and curation** may have a greater focus on **preparation**, there may be important implications in **acquisition** for others who want to use this data. Be sure to include these impacts.

**Data acquisition**

Different data should be acquired by different sources.

1: market data. can be acquired from markets survey, which are mainly about the quantity and kind of vegetables or fruits people prefer. and the price they can accepted so that we can arrange our plant plan and make the price properly.

2: location data. can be acquired by looking up the websites which shows the land price around the city. and the natural condition like soil and the sunshine of the land of the available locations can be acquired by the  evaluation of our geologist.

3: Transportation data. Thanks to the government, all the roads map in the city is available from the official website. We also plan to work with map providers to get the current traffic jam situation inner city.

4: Growing-process data. These data need to be acquired in the growing process of plants, the data which are collected by cameras  and sensors equipped in the drones.

**Data processing**

Data acquired may be not clean, there may be incorrect data, repeated data, or other useless data. That is where our data scientists is required to do — clean data.

For example, some data are wrong because of the electronic malfunction of the drone, and some data may be repeated like components of the land, because a small area of soil may contain same components, and some data may be occasional, especially take place in some extreme condition, for example, after a heavily rain, the humidity of the land may increase dramatically, but it can not be the representation of the whole month. So we need to clean these data so that they can be used in modeling.

**Hypothesis and modeling:**

After we get the clean data, we need to make hypothesis, for example, what kind and concentration of fertilizer and water can promote the growth of crops best. We may need to set an experiment to test whether the hypothesis is correct. We can put several sets of crops in lab so that we can know which model is most suitable.

Before making hypothesis. The EDA is also important, first of all, explore the descriptive analyses and diagrams so that we can characterize every angle of the data to help us make proper hypothesis. In the modeling process, we need to use different rates of the variables to determine which  combination is most suitable for crops to grow.

**Evaluation & interpretation:**

In this part, we should do some test to make sure that the model can work properly. At first, we should usetest initially on a small part of data, if these data tests in the model can get the expected outcome, then we can do more tests in a bigger range.

For example, when test the optimal transportation routes, we can test one part of the city, and in this part we combine several expected delivery time and the actual delivered time, then the use feedback of customers as references. If the feedback is positive such as ninety percent of customers feel good about our service. Then we can know this model is feasible at present. Then we can test the whole city routes in the model to get the outcome. If the output appear as expected, we just need a double-check as insurance. And Use this model with confidence. If not, we will back to modify the model and test again until the model work as our expected.

**Deployment:**

After test is completed, the model can be deployed. we will search for intended customers to explore the product because we think that the best way to test data products is actually using it.  Firstly we should set low expectations for users start with limited functionality. For example our farm building plan can be divided into several stages. We will build the first stage of it and supply some common crops as a start. The intended customers are individual people or family. and we do not serve customer like restaurant or supermarket at first because the kind and quantity they need is huge and if there is something going wrong ( Which is very possible at the beginning ), it will cause a huge loss.

After the basic functions are deployed and running for a period, we can deploy more things like the 2nd or 3rd stage of the farm and live broadcast of farm, supply various of crops for restaurants and supermarket.

**Operations:**

When we do deployment, operations are essential to deployment. Because when customers use the product, there always be some problems or bugs. So we must provide ways for customers to report problems they met, and we will set employees to record and check the reported problems.

It is also important to receive problems and adjust problems on time so that we can reduce the users’ discontent and make leave a good impression of our product for customers. Besides, we also should transform problems to documents because documents is easy to query and can be used for long-term record.

**Optimization:**

It is the last part of the life cycle. In this step the most important thing is  focusing on the movements of the product. the customers and market is always changing so we must optimize the product constantly. For example when a kind of crop is not popular or not tasty at this period, we should change the ratio of planting and distribution of this crop. Sometimes when we have too much product in our warehouse, we should doing some sale like giving discount to accelerate sales of products. And when there are some new technologies or methods to plant or transport, we should compare them with the current one to determine if we need to update our devices.