

## THE AGRICULTURAL SECTOR IN THE HYDROPONICS SECTOR IN IMPROVING THE HOUSEHOLD ECONOMY IN SIANTAN TENGAH

Dina Khairunnisa<sup>1\*</sup>

<sup>1</sup>Islamic Economics and Buisness Faculty , IAIN Pontianak

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### Abstract

### Article Info

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**Introduction/ Purpose:** This study aims how people who grow some vegetables using hydroponics become easier and more practical in improving the household economy. Hydroponics is the choice of the agricultural sector for people who do not have large areas to grow crops. The purpose of holding a hydroponic program is to make members of farmer groups independent in the economy. **Research Methods:** This study uses primary data qualitative research, the researcher observes the phenomena around it without any numerical measurements by analyzing in-depth case studies in the Central Siantan village. **Results:** The results of this research are hydroponics can improve household economy because it can become independent in the agricultural sector in food for daily consumption. The household economy is no longer dependent on high market prices, but we can even create household income.

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\* Corresponding Author; E-mail address: dinakhairunnisa93@gmail.com

## 1. Introduction

Agriculture is the activity of utilizing biological resources by humans to produce food, industrial raw materials or energy sources, as well as to manage their environment. The agricultural sector is the strongest sector that is not drained by time, because there grows food that is continuously needed by the entire surrounding community. All agricultural businesses are basically economic activities, so they require the same basic knowledge of business location management, selection of seeds/seeds, cultivation methods, yield collection, product distribution, product processing and packaging, and marketing. So, if we know the knowledge about agriculture, we can produce our daily basic needs from home.

During the COVID - 19 pandemic that has been experienced since 2020, the community's economy has declined, people have had a lot of difficulties buying staples to eat. To simply survive with existing food creates a lack of health in the daily diet. Hydroponics is a growing medium that is easy and can be applied even if you don't have a lot of empty land to grow crops. So that hydroponic media can be one of the solutions in overcoming the problems of the household economy. This is because hydroponic growing media really helps the economy for the household scale so that even narrow land can be used to grow vegetables such as spinach, lettuce, pakcoy, mustard greens, kale and other vegetables that have economic value.

Hydroponics is the cultivation of plants using only water without using soil. The priority is to meet the nutritional needs of plants. The water needed in hydroponic planting is of course less than the water requirements in cultivating plants with soil. With the current conditions, the area of agricultural land is decreasing along with the increase in settlement land and land conversion which is increasing day by day cannot be controlled. If left unchecked, of course it will be very worrying about the availability of food that can be obtained from agriculture. To avoid food shortages, new techniques in agriculture are needed. For example, a planting technique that can be done without using soil media is by means of hydroponic techniques. Although planting is done in water, hydroponic techniques require very little water. So that hydroponic planting is very suitable in areas with minimal water supply.

The community's understanding of hydroponics is very lacking, they do not understand land use and human resources as well as the marketing of hydroponic products. It is hoped that the use of yard land through planting with hydroponic media will be able to provide benefits both in terms of health and the family economy. The results of in-depth interviews and discussions with several families in the Siantan Tengah Village area show that there are real problems faced by several families, which can be seen from social and economic aspects. From the social aspect, housewives work in the non-formal sector, such as traders in small stalls, market traders, casual laborers and some who only take care of the household without income. Meanwhile, from the economic aspect, the community has a household income that is still relatively low and has not been able to utilize the yard as a source of family income.

In general, housewives who don't work have a lot of free time so they can grow hydroponic vegetables in their yard. The benefits obtained from hydroponic planting are beautiful gardens and hydroponic planting results will provide nutritional intake for the family. Better benefits are being able to provide economic benefits to support economic families.

### 1.1 Hydroponic Engineering

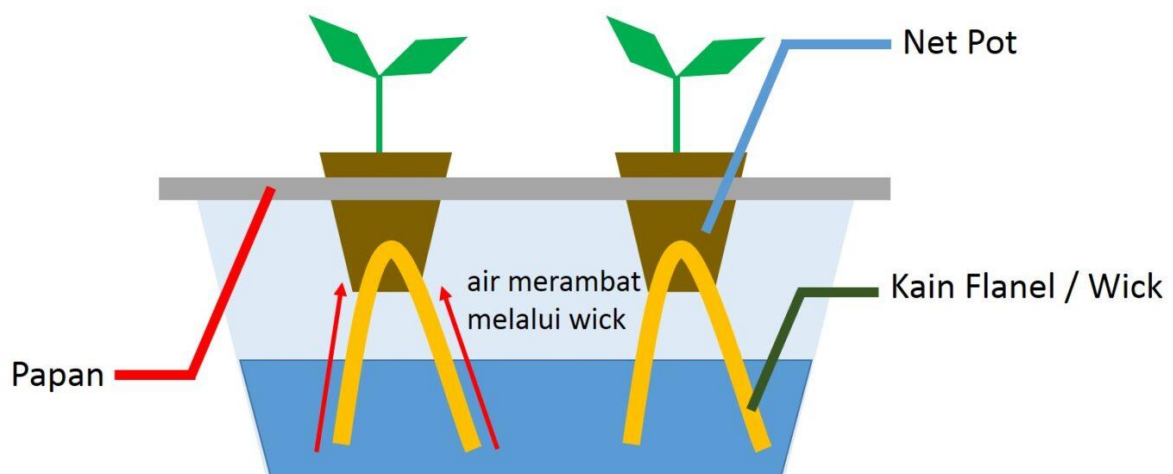
Hydroponics is a technique of cultivating plants that can be planted such as types of vegetables and fruit without using a planting medium in the form of soil. Hydroponics actually comes from the Greek language, where the word hydroponics is divided into 2 (two) syllables, namely "hidros" and "ponos" Hidros (hydro in English) means water, while Ponos (ponic in English) means work. So in terms, hydroponics is a farming method using water as a medium. The planting medium used is in the form of rockwool, roasted husks, hydroton, or sand with an

emphasis on meeting the nutritional needs of plants. The narrowing of productive land, especially in big cities, makes the cultivation of plants through hydroponic techniques attractive and increasingly important. Moreover, the human need for plants such as vegetables and fruit is increasing along with the growth in world population.

Cultivating plants with this hydroponic technique is very easy. We can do it around the yard without the need for a large area. Things to consider in cultivating with this hydroponic method are light, oxygen, water availability, and nutrients. One of the hydroponic cultivation techniques is DFT. The DFT (Deep Flow Technique) system is a stagnant water mode in PVC pipes or gullies, water is still flowing through nutrient reservoirs through water pumps that are flowing in each gully, the water that is flowing does not flow directly, but is stagnant first, then it will flow if the maximum limit has been exceeded, it will be flowed back to the reservoir. The DFT system has the advantage of using electricity, if the power goes out, the nutrient water in the gully is still there, so it can back up the nutrient water reserves in the PVC or gully pipes. The success rate of the hydroponic DFT system for plants is still reliable, because there are some vegetable plants that are very suitable for using this system.

## 1.2 Wick System

The Wick System is one of the simplest of all hydroponic systems because it has no moving parts so it doesn't use a pump or electricity. The axis system is a passive system in hydroponics because the roots are not in direct contact with water (Figure 1). It is called the wick system because in providing nutrients through plant roots it is channeled with media or assistance in the form of wicks. Some of the common materials used for wicking systems include, flannelette, fibrous rope, propylene type, tiki torch wick, rayon or mop head strand, polyurethane braided yarn, thick wool, woolen rope or strip, nylon rope, cotton rope, stripe cloth. from old clothes or blankets. The working principle of the Wick System: The wick system uses the capillary principle, namely by using the axis as a connector or bridge for nutrient water to flow from the water-holding container to the plant roots. The wick used in this system is usually flannel or other materials that can absorb water.<sup>1</sup>

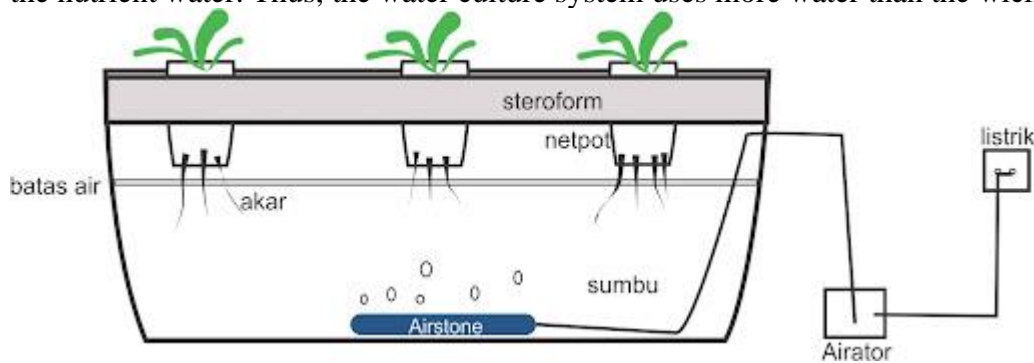


Picture 1. Wick System

<sup>1</sup><https://dispertan.semarangkota.go.id/products/hidroponik-sistem-technique/#:~:text=Description,hidros%20dan%20E2%80%9Cponos%20%9D%20.>  
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### 1.3 Water Culture System

**Water Culture System** is the simplest of all active hydroponic systems, quite easy to use because it doesn't require too many tools, what is needed is a box or container which can be made of plastic, styrofoam and an aerator (Figure 2). Water Culture System hydroponics is the development of a hydroponic farming system that can be used for commercial purposes on a large scale or on a household scale. The Working Principle of the Water Culture System System: The Water Culture System System is almost the same as the axis system, namely in the form of a static system and a simple hydroponic system. The difference is that this system does not use a wick as a water capillary aid, but the planting medium and plant roots directly touch the nutrient water. The container where the plant is in a floating state and is in direct contact with the nutrient water. Thus, the water culture system uses more water than the wick system.

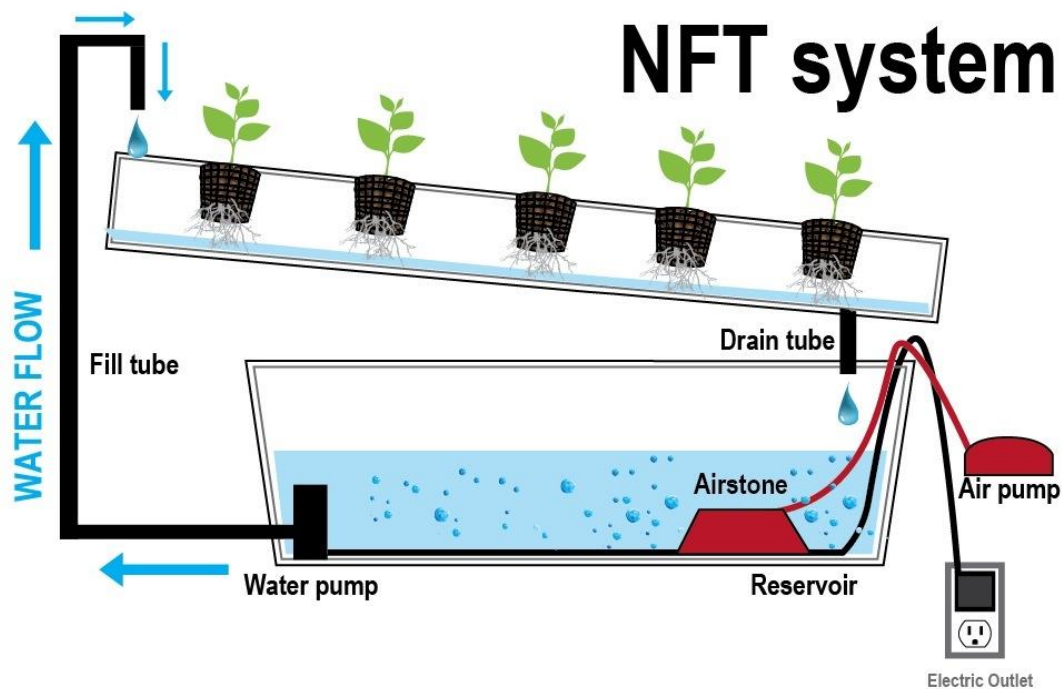


Picture 2. Water Culture System

### 1.4 Nutrient Film Technique System (NFT)

The basic concept of NFT is a method of cultivating plants in which plant roots grow in a shallow, circulating layer of nutrients so that plants can get enough water, nutrients and oxygen. Plants are grown in a polyethylene layer with plant roots submerged in water containing a nutrient solution which is circulated continuously by a pump (Figure 3). Working Principle of the NFT System: Solutions (water and nutrients) that flow to plant roots by being pumped from a reservoir, with a flow / current thickness of 2-3 mm, circulate continuously for 24 hours in gutters with a slope of 5%. The incoming flow rate is set to range from 0.3-0.75 liters/minute when the faucet is opened. The flow in the system may be stopped for a maximum time of 10 minutes and after that the solution must be circulated again, because plant roots cannot dry out for too long. In the NFT system, the core components that support include gutters (beds), storage tanks (accommodate nutrient solutions) and water pumps.<sup>2</sup>

<sup>2</sup> <https://dispertan.semarangkota.go.id/products/hidroponik-sistem-technique/#:~:text=Description,hidros%E2%80%9D%20dan%20%E2%80%9Cponos%E2%80%9D%20.>  
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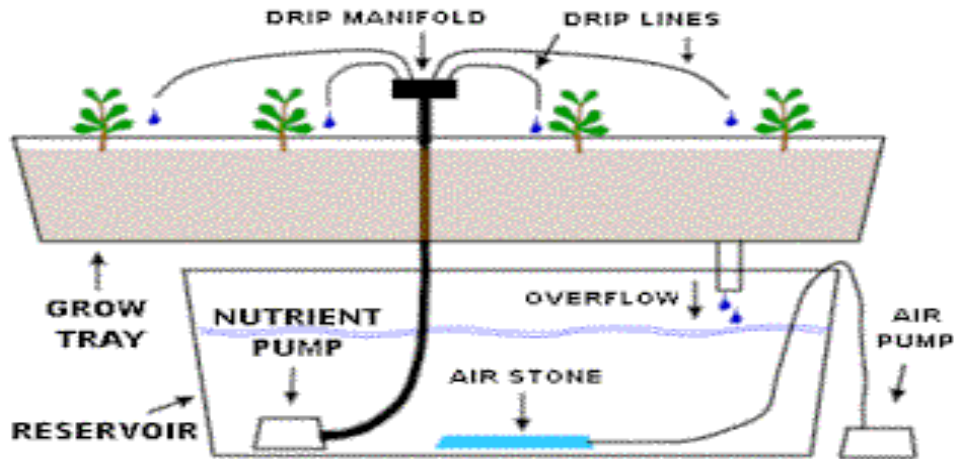


Picture 3. System NFT (Nutrient Film Technique System)

### 1.5 Drip System

The drip system is a hydroponic system that uses a technique that saves water and fertilizer by dripping the solution slowly directly on the plant roots (Figure 4). The drip irrigation system (drip system) is also called the Fertigation system because irrigation and nutrition are carried out simultaneously. Working Principle of Drip Irrigation: The principle of irrigation is to distribute nutrients, To distribute nutrients using a hose driven by a pump that has been installed as a timer as a regulator. Nutrients are dripped near the plants so that the garden media and roots will get wet quickly so that the nutrients are more effectively absorbed by the roots. While the plants are placed on the planting medium which is placed in the pot. There are two working principles of drip irrigation, namely 1) The recovery drip system has a very simple working principle where the nutrient solution is placed in a reservoir and then pumped and flowed using a hose to wet the planting medium and roots so that it is more easily absorbed by plant roots. The rest of the nutrients that are not absorbed by the plants will be accommodated and returned to the nutrient reservoirs. The remaining nutrients will be re-circulated again and again so this system is called recovery drip. The flow of nutrients is controlled using a timer mounted on the pump. Circulated nutrients make the use of nutrients more economical and efficient so that no nutrients are wasted. 2) The working principle of hydroponic non-recovery drip is almost the same as recovery drip, the only difference is that the nutrients that have been used are not stored or discarded.<sup>3</sup>

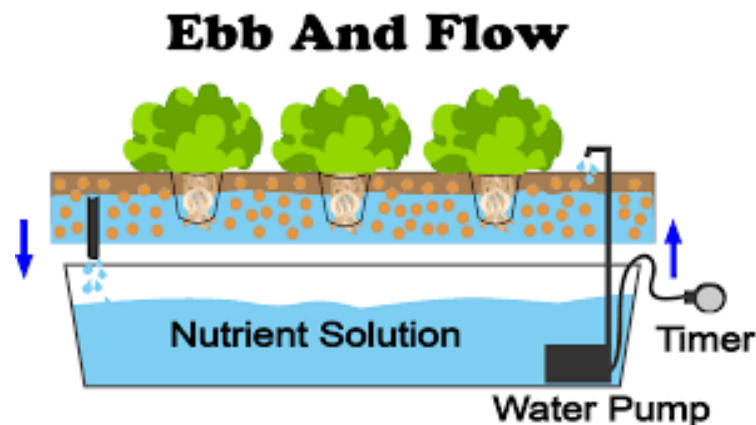
<sup>3</sup> <https://dispertan.semarangkota.go.id/products/hidroponik-sistem-technique/#:~:text=Description,hidros%20dan%20E2%80%9Cponos%20%9D%20.>  
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Picture 4. Drip System

### 1.6 Ebb and Flow System

The Ebb and Flow System or also called the Flood and Drain System or Tidal System is a hydroponic system with a quite unique working principle. In this hydroponic system, plants get water, oxygen and nutrients through pumping from a reservoir which is pumped into the media which will later be able to wet the roots (tide). After some time the water along with the nutrients will fall back into the reservoir (low tide). The tide and ebb times can be adjusted using a timer according to the needs of the plants so that the plants will not be stagnant or lack of water. The working principle of this system is that there are two phases, namely the high tide phase where the plants are flooded with nutrient solution, and the low tide phase where the plants are not given nutrients (nutrients are receded). Such systems are generally carried out with a water pump that is immersed in a nutrient solution (submerged pump) connected to a timer. When the timer starts the pump, the nutrient solution will be pumped into the grow tray (basket/place/plant pot). When the timer turns off the water pump, the nutrient solution will flow back into the holding tank (Figure 4). The timer is set to turn on several times a day, depending on the size and type of plant, temperature, humidity, and the type of growth medium used. This technique uses a circulation system in which the nutrient solution that has been used will be reused repeatedly. In doing the circulation is done in a gradual way, using irrigation that allows for ups and downs.<sup>4</sup>

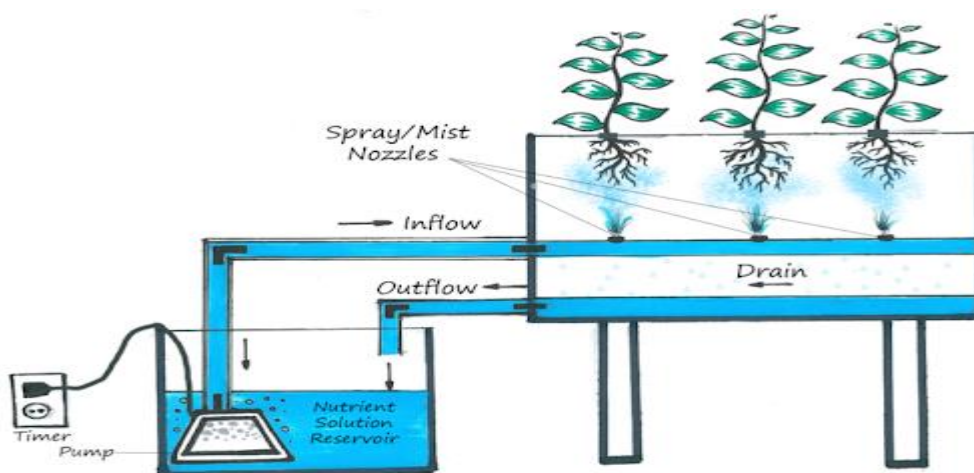


Picture 5. Ebb and Flow System

<sup>4</sup> <https://dispertan.semarangkota.go.id/products/hidroponik-sistem-technique/#:~:text=Description,hidros%E2%80%9D%20dan%20%E2%80%9Cponos%E2%80%9D%20.>  
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## 1.6 Aeroponik

Aeroponic system is a way of farming by spraying nutrients to plant roots. The nutrients that are sprayed are shaped like a mist. Aeroponics is the best vegetable growing system using air and water ecosystems without using soil. This technique is a hydroponic planting method using technological assistance. Aeroponic design is the most sophisticated design of all hydroponic systems. The plant roots hang into the container and the nutrients are sprayed continuously with alternating bursts continuously (eg one minute "on", one minute "off") (Figure 6). Aeroponic System Working Principle: The use of a sprinkler can guarantee the timeliness of watering, the amount of water and the uniform distribution of water on the surface of plant roots continuously during plant growth and development. This method can create water vapor in the air around the plant and provide a layer of water on the roots, thereby lowering the ambient temperature of the leaves and reducing evapotranspiration. The emission or fogging system can be set alternately on-off using a timer. Pumping is done for 15 to 20 minutes.<sup>5</sup>



Picture 6. Aeroponik System

## 2. Research Model

The research used in this theme is qualitative research. In this case the researcher observes the phenomena around him without any numerical measurements. The aim of qualitative research is to develop a more detailed and in-depth understanding of certain phenomena, to study how phenomena occur in natural settings, or to learn how to express concepts in everyday terms. This study focused on in-depth analysis so that the data was collected through interviews and observations.

Researchers obtained data from the research location, namely in the hydroponic land of RT/RW 01/06 Siantan Tengah Village, North Pontianak District, Kab. Pontianak. Sources of data in this study used two sources of data, namely primary data and secondary data. Primary data is data obtained by researchers from sources directly obtained from the Head of RT 01/06 Siantan Tengah Village, North Pontianak District, Kab. Pontianak and people who grow hydroponics in the house area. Secondary data is data obtained from other parties, in this case researchers do not obtain data directly. This can be obtained from various sources, for example books related to economic theory, scientific journals on community empowerment, agriculture, government or private institutions and related websites.

<sup>5</sup> Ibid

The technique of collecting data in this study through interviews is a question and answer directly to respondents as members of the community in research with the aim of obtaining accurate information. In this case, in-depth interviews were conducted with informants related to the research. Interviews in this study were conducted with people who really understand the hydroponic program in RT/RW 01/06 Siantan Tengah Village, North Pontianak District, Kab. Pontianak as the mobilizer of the community, is in control of the program. In the observations made, the researchers observed several conditions carefully, carefully and recorded what happened in the environment around the study, namely at the hydroponic location of RT/RW 01/06 Siantan Tengah Village, North Pontianak District, Kab. Pontianak.

This observation method is also known as the observation method which is a primary data collection method that is carried out through the process of recording the behavior of subjects, objects (hydroponic plants), or systematic events without any questions or communication with the individuals studied. Based on the observations obtained while at the hydroponic location of RT/RW 01/06 Siantan Tengah Village, North Pontianak District, Kab. Pontianak., the researcher makes a note of the results of the observations in the form of a description which is then used as a source to find the true meaning of the observations.

After obtaining the data needed in the research, data processing will then be carried out using various techniques, one of which is editing which is the initial process in data processing, namely by examining the data that has been collected by the researcher, then it will be seen whether the data obtained is relevant to the research. research to be carried out or not. Then, organize the data by grouping which ones are needed and arrange the data to make it easier to do the analysis. Finally, by analyzing the results of these conclusions, it is the answer to the formulation of the problems in the research.

## **2. Result**

The condition of the people of the Siantan Tengah Village can be said to be like that of society in general, who live on the outskirts of urban areas. Communities come from various regions, ethnicities, races, religions and plus indigenous people. The living conditions are not well organized, and generally have very narrow yards, so that empty land is rarely found in the home environment. Most community activities work in the private sector and trade. Until now, the community, especially mothers, have not used much of their free time to do business or useful activities.

The community's understanding of hydroponic activities is very minimal, because they cannot distinguish which vegetables are healthier but have a slightly high price from vegetables sprayed with chemical fertilizers which are dangerous to consume continuously at affordable prices. There are several houses that have tried to grow crops with a hydroponic system in their yards, compared to those who have not made good use of their yards.

Information related to the development, types and hydroponic systems in Indonesia is still very minimal, this is due to a lack of information carried out as counseling about the advantages, methods and hydroponic systems on narrow land. Hydroponics requires up-to-date products, high investment and special skills that can be learned when there is good socialization. These factors hinder hydroponic farming opportunities when not utilized properly. Even so, there are already Indonesian hydroponic entrepreneurs who have succeeded in exporting their garden products. In the past, hydroponic cultivation only focused on the Jabodetabek environment. From now on in West Java, simple hydroponic cultivation can be seen in the Lembang, Purwakarta and Garut areas. While in East Java it can be found in Nangkojajar (Pasuruan) and Batu (Malang). For the Pontianak area, there are only certain sectors, so there



are still very few to use it as a medium for household cultivation or the trade sector in the market.

Some of the advantages and disadvantages of hydroponics are that all forms of plants are easily renewed regardless of land conditions and seasons that occur at certain times, growth and crop quality can be adjusted according to needs, saves energy at work, clean and more hygienic plant products, saves water and fertilizer. safe for environmental sustainability), shorter planting period, low operating costs. The weakness in hydroponic planting is that the initial investment cost is more expensive and is strongly influenced by the concentration and composition of fertilizer, pH and temperature.

There are many types of hydroponic plant systems, one of which is to provide food in a mineral or nutrient solution that plants need by flushing or dripping. Secondly, through this technique, more plants can be grown in a narrower space unit. Third, even without soil media, a number of more productive plants can be maintained. Finally, the system of hydroponic plants must be free of pesticides so that there are no pests and diseases.

Dissemination of the hydroponic system as a basis for improving the community's economy which is a value added booster for family income in several households in the Siantan Tengah Village area with the introduction of tools and materials for hydroponic media. Actually hydroponic equipment can be made from simple materials and does not require a large amount of money, but if used for business there are also tools that are quite expensive, depending on the capabilities of each person.

The tools provided in the process of growing plants hydroponically are: 1. Paralon pipes, pipes of various sizes are used to accommodate water and nutrients needed by plants in hydroponic media. 2. Net Pot, a net pot is a container or a certain type of plant pot which is usually small and has holes. We can make a net pot at home using used plastic cups of mineral water, bottles which are then perforated like a net pot. The use of net pots from used water cups will be very economical. 3. Rockwool, rockwool is one of the ingredients needed in hydroponic media as a planting medium. Rockwool is made from basalt rock which is heated to very high temperatures to form foam and rockwool is formed with good water absorption and is easy to apply to plant seeds. 4. pH meter, this tool functions to control the level of acidity in nutrient solutions and planting media to ensure optimal plant growth. 5. Seeds/seeds that are categorized as equipment needed in the hydroponic method even though seeds are actually not tools but materials. Hydroponic plant seeds are almost the same as seeds from other growing media. When choosing seeds, we must pay attention to their quality and economic value, so that the results can be in accordance with what we want. 6. A bucket or tub as a container for storing dissolved nutrient water, this container or tub should not leak and must be cleaned before use. 7. Panel wick, this tool serves to distribute nutrients to plants, can be made of flannel or stove wick which has a fairly high water absorption capacity. 8. Nutrition, nutrition is a material that is needed in hydroponic media, what is meant by nutrition is a formula of minerals or nutrients that are mixed to grow plants, nutrients are usually given differently depending on the type of plants planted, you can say liquid fertilizer that increases plant growth.

Socializing the program and providing counseling on the hydroponic system on this occasion explained what hydroponic plants are and some of the benefits of which can increase the use of yards and narrow land around settlements by planting food needed on a household scale. Then as a support for the provision of food, in this case vegetables as a source of fulfilling family nutrition independently, can also create productive economic businesses so as to increase family income while protecting and preserving the environment. The hydroponic plant system is a farming system without using soil media where the advantages are that it can produce higher quality plants, is more free from pests and diseases, uses water and fertilizer more sparingly,

can overcome soil problems, can overcome the problem of limited land, and cultivates more cleaner and simpler on minimal land.

Direct practice on planting vegetable seeds using hydroponic media after in-depth counseling was carried out, the implementing team was prepared to carry out direct practice, preparing the seeds until they became seedlings. After the seedlings are approximately 1-2 weeks old which are planted in rockwool, the seedlings are ready to be planted in hydroponic media, but their growth must be controlled and evaluated regularly. dead or damaged. Furthermore, until harvest time comes, we must continue to monitor plant growth, we must control the water and provide nutrition to the plants which is done every two days so that they can automatically see how the plant growth process is going and if a plant dies it will be replaced again. with healthy seeds. This stage is very important because the quality of monitoring and controlling will determine crop yields. At this time pests or diseases can also be controlled, but in general planting with a hydroponic system is able to minimize pest and disease attacks so the use of chemical pesticides can be avoided automatically plants from hydroponic results will certainly be healthier. Harvesting is done when the plants are 30 days old after planting to see if the vegetables are ready to be harvested and growing well. This shows that vegetables grown using a hydroponic planting system will produce plants that grow faster, are more fertile and have a shorter harvest age.

In the process that is carried out when using a hydroponic system, it makes one of the strengths in the family economy. The community no longer needs to buy staple food to eat daily, but can harvest many times in the hydroponic system and can even provide vegetable crops to several neighbors for consumption and even for sale. So that the economy becomes orderly and is not shaken by various economic problems, disasters, and other unexpected problems.

### **3. Conclusion**

Based on the results of the research that has been done, several conclusions can be drawn, namely hydroponics is something that is easy to do even in narrow places, so in this case we can see that hydroponics is able to improve the people's economy during a pandemic. When we are faced with food matters that we ourselves should be able to make more easily and practically cheaply for the household, so that we can cut expenses to be more economical and not burdensome. The Hydroponics Program is one of the programs that can be continued by the people of Central Siantan so that the people's needs for vegetables and food needs can be met to the fullest. Apart from that, we hope that this program can become one of the choices for residents who want to open a business where they live, so that the economic situation of the family can be easily resolved properly without any obstacles in the economy.

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