

# Vegetable Cultivation Hydroponics System In Community Economic Zone (KEM) Kanagarian Tikalak Subdistrict X Koto Singkarak Districts Solok

I Ketut Budaraga, Ramaiyulis, Ellyza nurdin

**Abstract:** Current conditions, especially in urban agricultural land is getting narrower, due to the rapid development. If left untreated it can lead to food security and environmental problems. One solution to allow the fulfillment of foodstuffs such as vegetables can be fulfilled for the people to exploit the potential of the narrow yard with continuous production of hydroponic systems. Interest dedication to the community to find ways to introduce a hydroponic vegetable crops that can supplement the family income of farmers. Benefits of the service is expected to increase people's income and the public generally in Community Economic Zone (KEM) Kanagarian Tikalak in particular and can provide lucrative benefits for the environment. Devotion execution method implemented by a lecture and demonstration. The materials used such as husks, seeds of vegetables (kale, collards, caisin), hydroponic media such as slug biogas, rope, bamboo to place the plants grow. The results of this activity the community has been able to make a hydroponic vegetable cultivation system and has been applied to plant vegetables such as kale, collards and caisin.

**Keywords:** Hydroponics, Slug, Tikalak

## 1. Introduction

Nagari Tikalak is one of eight villages in the district X Koto Singkarak, located outskirts of Lake Batur and is one of the tourist destinations in Solok. Geographically located on 60 LU Tikalak Nagari-1370LS and 11 68 0 0 BB-BT with an average temperature of 27 °C and height from sea level is 390-400 m. Kenagarian Tikalak has an area of 1,400 hectares with the surface shape is an area Nagari Tikalak hills and plains that vary the level of general kemiringannya. Secara slope Tikalak Kenagarian region is divided into three, namely Ramps, a bit steep and steep [1]. Nagari Tikalak is one of 74 villages that exist in Solok, located in the northern part of the district of Solok located on the edge of Lake Batur. Tikalak Kenagarian morphology consists of plains and hilly areas has its own characteristics Tikalak Kenagarian. The use of land in the form of settlements, fields, yards, estates and so forth. For the largest land use Plantations is 27.86%, while the land use The smallest is for Places 0:10%. [1] For the status of ownership of land in Nagari Tikalak generally a communal land (land of the) which were for the use of land should be discussed at the stakeholders of Indigenous local to the economic potential of the Nagari Tikalak are based on natural resources available, namely agriculture subsector food crops, fisheries, farms and plantations.

Based on the data on the number of farmers who constitute the majority of people's livelihoods Nagari Tikalak, then obtained the highest number of farmer households are in this kind of farming plantations. Agricultural conditions of Nagari insufficient because they are traditional, and community livelihood in agriculture sector is still trying to find the business side livelihood. Agriculture eye has a problem in terms of agricultural traditions during post-harvest and lack of carrying capacity constraints. Serta agricultural fertilizer prices which is hard to get and the lack of means to support the marketing of agricultural products such as the need for the production to marketing [1]. Facing problems of one of the obstacles such as the culture system is still done traditionally farmers such as planting vegetables it is necessary to look for solutions. Most farmers in Indonesia are still using different ways of farming that is very simple and only done carelessly, especially on the use of fertilizers only use NPK fertilizer alone [2]. In reality vegetable farmers in Indonesia are generally only use 3 types of single fertilizers namely N (Urea, ZA), P (SP 36) and K (KCl, ZK) which extension is done individually or unisex mix. The need for secondary macronutrients and micronutrients are often overlooked, so that in the long term can lead to nutrient deficiency and fertilizer efficiency is reduced and the effectiveness of fertilizer given low [3]. One attempt to overcome this could be done by conducting a hydroponic cultivation of horticultural crops. Increased yield of horticultural crops such as vegetables do with cultivation techniques have a high efficiency and effectiveness. One of the techniques of cultivation is expected to increase the yield of mustard plants are hydroponically. There are several techniques to implement hydroponic cultivation of vegetables, among which techniques floating hydroponic systems, Nutrient Film Technique (NFT), and aeroponics [4]. Aeroponic system has advantages not shared by other hydroponic systems, the plants more easily absorb nutrients for measuring small molecules (Poster, 2013). Aeroponics hydroponics system development, especially the latest one is the installation of a vertical aeroponic. An aeroponic cultivation systems are vertically aligned

- I Ketut Budaraga, Flipmas Minangkabau/Lecturer Faculty of Agriculture, University Ekasakti, Email: [ketut\\_budaraga@yahoo.com](mailto:ketut_budaraga@yahoo.com); [udaraga1968@gmail.com](mailto:udaraga1968@gmail.com)
- Ramaiyulis, Flipmas Minangkabau/Lecturer Politani Payakumbuh Email: [ramaiyulis@gmail.com](mailto:ramaiyulis@gmail.com)
- Ellyza nurdin, Flipmas Minangkabau/Lecturer Faculty of Animal Science, University of Andalas Email: [ellyzanurdin@gmail.com](mailto:ellyzanurdin@gmail.com)

placement allows for the cultivation of plants in a small portion of the room [5]. Some important factors which must be considered in aeroponic cultivation among other nutrients, oxygen supply, and water supply. One important factor that affects the quality of nutrients in the aeroponic cultivation are Electrical Conductivity (EC). EC is a measure of the amount of salt dissolved in the nutrient solution or the concentration of fertilizer in the hydroponic solution [6]. EC value in the solution affects the metabolism of plants, namely in terms of the speed of photosynthesis, enzyme activity, and the potential for absorption of ions by roots. Concentrations of the nutrient solution will also determine the length of use of a nutrient solution in the aeroponic system [7]. Pusdima [8] research results stated that the high level of EC affect the mustard at the age of 14 and 18 days after planting, leaf area at the age of 26 and 30 days after planting, root length at 30 days after planting, and the wet weight at the age of 30 hst, EC level of 2.5 mS cm<sup>-1</sup> gives a good influence on the wet weight. Vegetable crops are capable of contributing to national development in order to realize the welfare of society, such as community nutrition as a food supplement four of five perfectly healthy, is also potentially and prospective to be developed for the cultivation methods tend to be easy and simple. One type of vegetable that is easily cultivated, kale, caisin and mustard (*Brassica juncea* L.). The cultivation technique of mustard plants not vary much with the cultivation of vegetables in generally. The conventional cultivation of land include the processing of land, seed preparation, planting techniques, provision of fertilizers and pesticides, and plant maintenance. No mustard seed planted directly but there are also through first breeding [9]. On the cultivation of the soil media, the plant can obtain nutrients from the soil, but the cultivation of hydroponic crops, plants obtain nutrients from the nutrient solution geared specifically. Nutrient solution can be administered in the form of a puddle or in a state of flow. Hydroponic planting medium can be derived from natural materials such as gravel, sand, coconut fiber, rice husk, pumice stone, peat, and pieces of wood or artificial material such as brick shards [10]. Nutrition is very important for success in growing hydroponically, because without nutrients certainly can not grow hydroponically. Nutrition is a macro and micro nutrients that must be present for plant growth. Every kind of nutrients has a different composition [11]. There are many reasons why a hydroponic cultivation is done, other than as a hobby in itself, it can also prevent the emergence of various pests that often destroy crops and wither. The food or the necessary nutrients dissolved in water, so it can be taken into account and set the concentration of fertilizer used carefully as many times as required course [12]. The use in the cultivation of hydroponic systems is expected to increase growth and yield of mustard. To determine the mustard plants growing hydroponically, then do research on the response of mustard plants growing in hydroponic growing media on the composition and concentration of the liquid organic fertilizer. Organic fertilizer is a nutrient source for plants. Organic fertilizers are fertilizers that are largely or entirely composed of organic material derived from plants or animals that have been through the engineering process, can be solid or liquid. To facilitate the nutrients can be absorbed by plants, the organic material can be made into liquid fertilizer in advance, complete liquid organic fertilizer

containing macro and micro nutrients and organic matter. The advantages of such a liquid organic fertilizer is haranya levels appropriate to the needs of the plant, its use is more effective and efficient, as well as the ability is equivalent to pure organic fertilizer [13]. Novizan [14] states that fertilization can effectively influence it is necessary to pay attention to several things, including the selection of the type of fertilizer, the use of dose / dose according to the needs of plants and how fertilizer placement. According to the [15], prior to the application of fertilizers, the concentration of which is made should really follow the instructions in the packaging. Osman [16] also states that if farmers make lower concentrations than recommended, then to offset fertilizer spraying can be accelerated or shortened time interval of administration. The effectiveness and efficiency of the use of liquid organic fertilizer in the field is determined by various factors among which the accuracy of the selection of the type, concentration, dosage, method and timing of fertilizer application. According to research results [17], which compares organic fertilizer liquid with a concentration of 1, 2 and 3 ml / l of water on the plant chilli influence on some parameters of growth and yield by treatment of 3 ml / l of water as the concentration of the most optimum.

## Target and Outcomes

As the target for this service programs so that farmers would implement hydroponic cultivation of vegetables in their farm activities to achieve cost efficiency of production up to 20%, an increase in the production of at least 10%, and the group can produce their own vegetables from the yard is owned and could be expected. to get a partner for the next farmer groups so that the sustainability program Output indicators dedication program performance is an improvement of the system in hydroponic cultivation system which was originally used to switch the soil medium using the liquid organic fertilizer, resulting in cost efficiency, can take advantage of the empty yard area and an increase in the production of vegetables among households.

## 2. PROCEDURE

### 2.1. Preparation

Steps undertaken in the implementation of this service is as follows:

#### Step 1. Conduct field surveys

The survey was conducted to gather initial information about the problems experienced by farmers in the cultivation of vegetables is still done conventionally. Furthermore, service programs tailored to the needs of farming communities.

#### Step 2. Orientation to the public regarding the cultivation technique hydroponic system.

Outreach activities carried out to the community leaders, traditional leaders, scholars, clerics and farmers who are members of the Group of Public Economy (KEM) Tikalak amounts to approximately 40 people on Wednesday, dated January 18, 2017 at a place of meeting of the Group of Economic Community (KEM) Tikalak, Before socialization begins begins with taking care of licensing. After the new exit permit to disseminate to community members Tikalak



KEM conducted through farmer group meetings.

### Step 3. Preparation of equipment.

Equipment that has been prepared is a permit, the presence of the public administration, the fixtures from the field. Being fittings materials and tools to make a hydroponic cultivation system was prepared by the community in the field such as bamboo, rice husks, rice husk ash making equipment, seeds of vegetables (kale, caisin, mustard), planting media, liquid fertilizer and water. After it made the growing media such as rice husks, bamboo planting medium where a given hole, and planting vegetable seedlings in the planting medium.

### 2.2. Implementation

The event was held for 1 (one) day location. Before the training activity, first designed training materials in accordance with the activity. First made in the introduction of materials for the planting of rice husk ash media, the nature of vegetable crops, and the nature of bamboo through face to face in the field. Furthermore, the practice of making a planting medium is then applied into the planting medium in hydroponic cultivation systems. The method used in this training are: (1) Teaching Method: This method was used to describe the material given that the introduction of the concept of hydroponics farming system and the introduction of material and tool manufacture hydroponics and how the application and maintenance of the plant vegetable crops. (2) Demonstration Method: This method is done by demonstrating the practice of making hydroponic planting medium, planting vegetable seedlings in a hydroponic media was then applied in the field. (3) Reciprocal Method: This method is to ask the public to be familiar with the way that has been applied to the next community to make observations, so that the community participants can perform / apply, so that it can assess the success of mutual friends.

### 2.3. Companion farmers in the field.

In order to obtain optimal results need to do companion to farmers directly in the field together with the extension to helping farmers in terms of preparation tools and raw materials, the practice of media preparation hydroponic plants, cultivation method and application in the field. Assistance has been done for 3 months. People are already able to assess the condition before the advisory including production, then society will also be documenting changes during the mentoring is done. So there is a kind of recording activities on the ground.

## 3 RESULTS AND DISCUSSIONS

Activities already carried out is to start preparation, socialization and the practice of planting vegetable cultivation media preparation hydroponic systems to the application field. The documentation of the manufacturing plant media hydroponic system up to planting vegetables using bamboo installation as shown below.



*Figure 1. Preparation of planting medium husk ash*



*Figure 2. Results are ready husk ash as a growing medium*



*Figure 3. Preparation of liquid fertilizer for plant nutrition*





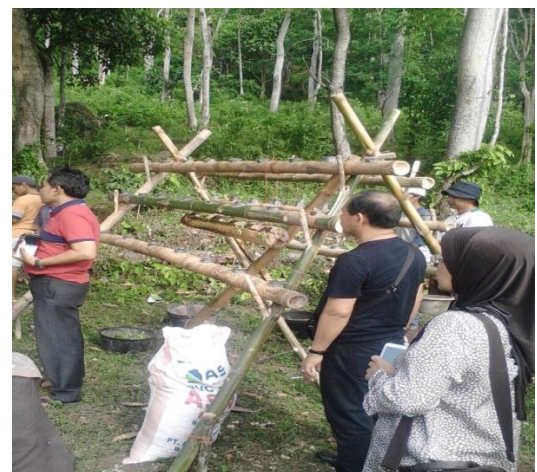
**Figure 4.** Planting vegetable seedlings in the planting medium



**Figure 6.** The setup process media for the cultivation of vegetable seedlings



**Figure 5.** Vegetable seedlings kale, collards and caisin who are ready to plant



**Figure 7.** Activity hydroponic system vegetable crops

By using bamboo From the results of the activities to date very good public response. Especially when most of the farming community that it is expensive to buy vegetables. The existence of the solution of making the cultivation of vegetables with a hydroponic system using a liquid fertilizer greatly help the farming community especially for the people who do the cultivation of vegetable crops such as kale, collards and caisin. The use of hydroponics system is a manifestation of environmentally friendly agriculture and to utilize local potential such as bamboo, rice husks as long as farmers do not yet know this agricultural implement hydroponic system. Farmers usually only know of land plant directly. Agricultural programs that are environmentally friendly hydroponic systems are programs that are already in decides by the Government of West Sumatra Province. Hydroponics is a method cultivation without soil. Not only with water as the medium of its growth, such as lexical meaning of the word hydro means water, but also can use media other than land crops such as gravel, sand, coconut fiber, silicate substances, fragments of rock or brick, pieces

of wood, and foam(18) The use of natural recipes in the cultivation of hydroponic system which is the ancestral heritage History proved very effective help farmers as for farmers dependent on chemical fertilizers. Until now, farmers still have started to decrease use of chemical fertilizer in fertilization. Their activity of making the hydroponic system in vegetables will reduce the failure of farmers to grow vegetables, then the service activities we try to provide solutions to the manufacturing of farming hydroponic system using biogas slug and herb plants as a medium of organic liquid fertilizer. The purpose of this program so that farmers do not always depend on chemical fertilizers, liquid fertilizers naturally then called slug and Organic Herb Plant introduced to the public in Tikalak Economic groups on how making. In this socialization submitted to the fore peasant farmers that it is time to switch to using the system cultivation hydroponic system using a natural liquid fertilizer that has very good properties for the environment (go green) as well as to help reduce environmental pollution especially soil and soil tapped yard narrow. With this event the farmers could receive additional income in the vegetable crop yields and save money in the purchase of production facilities in the cultivation of vegetables.. The process of making the facility and the hydroponic growing media and growing media is quite simple and does not require a high cost that is quite a cost of Rp. 1,200,000, farmers have been able to make one set of hydroponic growing facilities complete with planting medium as well as natural liquid fertilizer and seeds can be used to completely harvest the vegetable crops. The process of making a hydroponic facility, liquid fertilizer plant, seed make to just wait approximately two (2) weeks and after that moved kedia vegetable plants hydroponic facilities. The use of hydroponic systems and the use of natural liquid fertilizer obviously help farmers as it reduces the cost of purchasing pipe, fertilizer, other profit-making raw materials hydroponic facilities can be obtained in the environment around farmers and can be applied directly to crop fertilization. Dose of fertilizer by mixing with water at 10 cc/1 liter of water. From the preliminary results of field observations, vegetable plants look pretty good progress and have been harvested by the community [19]. The problem now is that still being experienced by farmers in the application of the concept of organic farming is generally farmer wants a practical and immediately get good results .. To obtain optimal results it requires perseverance farmers work and takes a long time. Then to promote the cultivation of hydroponic systems to farmers is necessary to change the main set process principally thinking growers. Another problem experienced by farmers, namely the weakness of the existing resources such as the lack of knowledge about the management of the group is good, appear in general farmers' groups do not have an accounting system that is good, meeting system is not well designed so it can not calculate the farm which included both marketing knowledge. So through this service activities has been given additional knowledge in the form of good management which must be applied to the group.

## 4. Conclusion and Recommendation

### Conclusion

- a) Have been implemented socialization and media manufacturing practice cultivation technique of planting to hydroponics system tanama vegetables to the community
- b) There has been a transfer of knowledge and technology from the speaker to the target audience are members of the local economy (KEM) Tikalak ..

### Recommendation

- a) Need the assistance Continuing research on community economic groups (KEM) Tikalak in managing their business.
- b) It needs a change in the pattern of thinking in the farming community that agricultural application of hydroponics system with an organic pattern very beneficial to farmers because it provides more income, and the next it's time farmers have switched to using natural production facilities because they are environmentally friendly.

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