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## Increasing Household Revenues Through Hydroponic Agricultural as Sustainable Agricultural Efforts

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### Abstract

*The aims of the study were to analyze the increase in household income of hydroponics doers, to analyze how much increase in income obtained by hydroponic doers through the transfer of hydroponic farming technology in Bali Province and whether hydroponic agriculture can be made into sustainable agriculture. The study was conducted in Bali Province. Study time March-June 2017. Data collection method in this research was through survey and interview. The variables observed in this study were household income from hydroponic farming. The survey and interview data were analyzed by quantitative method by calculating all initial investment, income per harvest, the amount of other costs during one harvest. The quantitative data, then qualitatively explained to give explanation and the meaning of the numbers obtained from the quantitative calculation. The results of the analysis indicate that farming hydroponic systems can increase or be able to provide additional income to households. Therefore, through hydroponic farming, sustainable agriculture efforts will be realized. The increased income can be calculated by comparison of initial investment of Rp.5,000,000.00, compared to income derived from the sale of the vegetables. The income consists of: 1) kale vegetable, per one harvest (3 months) of 10 kg Rp.50,000.00= Rp.500,000.00. In one year, 3 times harvest= Rp.1,500,000.00. 2) Lettuce income three times harvest in one year 10 kg x Rp.75,000.00= Rp.750,000.00.(3 times harvest/year). Then, the total income/year of the hydroponic plant is Rp.2,250,000.00. Costs incurred for 1 year for both vegetable plants is Rp.400,000.00. Income difference and expense of Rp.1,850,000.00 - depreciation Rp.715,000.00 (7 years benefit period)= net income Rp.1,135,000.00. If the investment period is 7 years, the net value for 7 years x Rp.1,135,000.00= Rp.7,945,000.00 - Rp.5,000,000.00 (initial investment)= Rp.2,945,000.00. The conclusion that can be drawn that household income from hydroponic cultivation is profitable, with an income value greater than the costs incurred (revenue>cost).*

*Keywords: increased income, hydroponic*

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### 1. Introduction

Along with more advanced development of Bali tourism, the transfer of land from agriculture to non-agricultural can not be avoided. According to [1] that today the industrial development is progressing rapidly, the development of which shift the agricultural land more in urban areas, consequently the agricultural land will become narrower. On the other hand, the need for agricultural products is increasing as the population increases. Therefore, it is necessary to think of a way out to over-

come the condition. Hydroponics is one alternative that can be used to increase the productivity of plants, especially in narrow land. Therefore, to adjust to the current agricultural conditions, increasing the productivity is required, therefore, it is expected to improve the production [2].

According to [3], various efforts have been made by agribusiness actors to increase the food supply of the community. One of the efforts made is through technology. Appropriate technology to achieve increased production, especially vegetables with good quality and continuity, is by hydroponic cultivation [2]. Hydroponics is agricultural cultivation land without using soil media. Hydroponics is an agricultural activity run by using water as a medium to replace the soil [4].

Hydroponics is one of the future agricultural systems because it can be cultivated in various places, whether in the village, in the city, on open land, or on the apartment. Narrow land area, critical soil conditions, uncontrolled pests and diseases, limited amount of irrigation water, erratic seasons, and different quality products can be overcome with hydroponics system. Hydroponics can be cultivated throughout the year regardless of season. Therefore, the selling price of the harvest will not fall. Maintenance of hydroponics plants is easier because the place is relatively clean cultivation, sterile planting media, plants protected from exposure to rain, pest and disease attacks are relatively small, as well as healthier plants and higher productivity [5].

Hydroponic cultivation according to [4] is widely used by some communities to take advantage of land that is not too broad. There are many advantages and benefits that can be obtained from the system. This system can benefit from the quality and quantity of agricultural products, and can maximize existing agricultural land because it does not require too much land. The main reason for growing hydroponics is to grow many types of vegetables throughout the season with abundant and high quality results. In addition there are several advantages of hydroponic planting ie: (1) Vegetables productivity is higher than conventional planting; (2) Vegetables grow faster; (3) When there are plants that die, they can be replaced with new plants with ease; (4) Plants will give continuous results; (5) The quality of leaves, fruit and flowers is more assured; (6) Some types of plants can be planted out of season; (7) Reduce the dependence of natural conditions; (8) Overcoming the limitations of space; and (9) Plant pest control is more assured [6].

The development of sustainable agriculture should look at the merits of economic, natural ecology, dan human resources. This can be seen from the results of research conducted by [7] that optimizing the yard with the cultivation of plants in hydroponics is a good alternative with many advantages such as producing plants with high quantity and quality easily, practical, and simple so that can be done by all communities.

Based on the above description, hydroponic agriculture can be used as an alternative to sustainable agriculture development. The media used are also environmentally friendly, do not damage nature, and do not burden humans. In addition, economically hydroponic commodity results are also not less superior to regular farming [8]. Therefore, it is very interesting to research and analyze the increase in household income through hydroponic farming, so that it can be an alternative in maintaining agriculture sustainably. In addition, through this study, it can analyze how much increase in income gained through the transfer of hydroponic agricultural technology in the province of Bali and whether it can be an effort toward sustainable agriculture.

According to [9]. that household income is the income of all of a person's or a person's financial resources over a specified period of time, including all income earned unearned, property from withdrawal of receipts on investment and receipt of a monthly transfer of pay and household income Derived from all household members derived from income (main/principal), and additional work. According to [10] family income is a family income in the form of money or in other forms that can be cashed from the results of efforts made by family members.

The term hydroponics was first introduced by Setchle in connection with the success of gerickle in the development of cultivation techniques using water as a growing medium. Hydroponics is a term used to describe several ways of farming without using soil as a place for growing plants. This term is commonly referred to as "groundless cultivation", including using pots or other containers that use water or other porous materials such as pebbles, sand, charcoal husk or shrapnel as a growing medium [6].

Hydroponics is derived from Greek, Hydro which means water and Phonos which means work, so hydroponics means work that uses water or more broadly can be interpreted as a landless way of farming. The medium used in hydroponics is a porous medium, light and sterile so as not to affect the amount of nutrients provided. Examples of media used in hydroponics are charcoal husk, sand, zeolite and coconut powder [2]. According to [4] hydroponics is a method of cultivation by using planting media other than soil, such as pumice, gravel, sand, coconut husk, wood pieces or foam. This is done because the function of soil as a supporter of plant roots and intermediate nutrient solution can be replaced by flowing or adding nutrients, water and oxygen through the medium. Therefore, the hydroponic cultivation system can take advantage of the narrow land. Agriculture using hydroponic system does not require extensive land in its implementation, this system can be done in the yard of the house, roof of the house and other land.

The hydroponics is a technique of cultivation of plants by using water media without using soil media [8]. This cultivation technique is also often referred to as soilless technique. Soil is often referred to as the main factor supporting nutrients to support the nutrients of plants, in fact can be replaced with the role of water. Water as a planting medium is water that contains nutrients to support plant growth.

The hydroponic plant system is: (1) Provide food in mineral or nutrient solution that plants need by flush or dripping. (2) Through this technique can be maintained more plants in a unit of narrow space [4]. Hydroponic cultivation activities require a controlled environment to grow, plants must be protected from rain water, strong winds, and direct sunlight. Therefore developed a plastic house system (green house), so it can control natural factors [11].

Hydroponic cultivated crops in quantity and quality is better than crops grown in the soil [12], it is an opportunity for farmers to increase their income by planting crops (ornamental plants, fruits and vegetables) that have high economic value. According to [4] the advantages of the hydroponics system are (1) The success of plants to grow and produce more secured. (2) More practical treatment and more controlled pest disorders. (3) Use of fertilizer is more efficient (efficient). (4) Dead plants are easier to replace with new plants. (5) It does not require a lot of rough energy because the working method is more efficient and has standardization. (6) Plants can grow more rapidly and with circumstances that are not dirty and damaged. (7) Production results are more continuous and higher compared to ground cultivation. (8) The hydroponic selling price is higher than the non-hydroponic products. (9) Some types of plants can be cultivated off-season. (10) No risk of flooding, erosion, drought, or dependence on places can be done on limited land or space, for example on the roof, kitchen or garage.

Hydroponics has the advantage of being a sustainable agriculture alternative that emphasizes the effectiveness and efficiency of land and time. Although hydroponics is a cultivation technique of plants by utilizing water media, the use of water is less than the use of water in the soil media. In hydroponics, the water used is not wasted because it always rotates (cycle), while on the soil media, water will be wasted because it seeps in the soil. The use of less water is proving to be beneficial for areas with limited water supply, so farmers are beginning to shift to this water-saving hydroponics technique. In addition, hydroponics also does not pollute the environment. Unlike in soil media

where the use of pesticides will have an impact on soil fertility, the water cycle in hydroponics will not pollute the environment such as soil fertility [8]. Agriculture with the concept of hydroponics although provides many benefits, but the concept has also weaknesses, ie; (1) Initial investment is expensive. (2) Requires special skills to weigh and mix chemicals. (3) The availability and maintenance of hydroponics devices is rather difficult.

## **2. Material and Methods**

### **2.1 Research sites**

This research was conducted in Bali Province with the consideration that currently the doers and the hydroponic farming community already have members of about 165 members. Of these people, some of them also do agriculture with the concept of hydroponics through the utilization of yard land. One of the agricultural activists with the hydroponic concept in the yard of the house can be seen in Figure 1 below:



Figure 1  
Hydroponic Plants Activist at House Yard in Ubud Area, Gianyar Bali  
(Document of Pasma, 2016)

### **2.2 Data source**

Sources of data in this study consist of: 1) primary data is data collected and processed by researchers, which obtained directly from the results of observations in the field, including interviews conducted to informants in the form of respondent identity, respondent motivation, education, experience, income/Household income. While secondary data is data collected, processed, and presented by others in the form of publications and journals of research results, literature, electronic journals obtained through electronic media.

### **2.3 Data analysis technique**

In this research, the data analysis technique used is qualitative analysis technique with three activity flow as follows [13] : (1) Data reduction which is data obtained from the field is recorded in the report in detail. Direct data reduction is done continuously during the study. During data collection, data reduction is done by summarizing. (2) The presentation of data is to simplify the results of information obtained from the field into a simple form that is easier to understand. (3) Drawing conclusions which means narrating the results of data collection obtained during the study, takes place that is both quantitative and qualitative data. The conclusion is made by checking repeatedly to get accurate data so that the conclusion obtained is also an accurate conclusion.

### 3. Results and Discussion

#### 3.1 Research results

Based on observations and field interviews, the initial investment for the hydroponic farming concept utilizing the yard cost is Rp. 5,000,000.00. The useful life of the equipment is estimated for 7 (seven) years. The details of these costs are to purchase the various equipment that can be shown in Table 1.

Table 1  
Details of Expenditures on Investment of Equipment and Materials

Description	Income (Rp.)	Expenses (Rp.)
1. Harvest of kale vegetable per year (3 x 10 kg x Rp 500,000.00)	1,500,000.00	
2. Harvest of Lettuce per year (10 kg x Rp 75,000.00)	750,000.00	
3. Costs incurred for 1 year for both vegetable crops as big as		400,000.00
4. Depreciation (straight-line method) (7-year benefit period)		715,000.00
<b>Total</b>	<b>2,250,000.00</b>	<b>1,115,000.00</b>
<b>Net income per year of hydroponic plants</b>		<b>1,135,000.00</b>



Figure 2  
Type / model of Hydroponics Plants at House Yard  
(Document of Suryathi, 2017)

Based on the investment value of the issued equipment, it will be known the return period of the investment, whether the value of the investment issued can provide additional income in the household or not, can be seen in the following income details. The proceeds of sales (net income) obtained from the concept of hydroponic farms at home can be seen in Table 2.

Table 2  
Net Income per Year of Hydroponic Plants

Description	Income (Rp.)	Expenses (Rp.)
1. Harvest of kale vegetable per year (3 x 10 kg x Rp 500,000.00)	1,500,000.00	
2. Harvest of Lettuce per year (10 kg x Rp 75,000.00)	750,000.00	
3. Costs incurred for 1 year for both vegetable crops as big as		400,000.00
4. Depreciation (straight-line method) (7-year benefit period)		715,000.00
<b>Total</b>	<b>2,250,000.00</b>	<b>1,115,000.00</b>
<b>Net income per year of hydroponic plants</b>		<b>1,135,000.00</b>

### **3.2 Discussion**

Based on the calculation of total revenues and the details of expenditures performed simply, as detailed above, indicates that the investment issued of Rp. 5,000,000.00 could provide benefits for families who have limited land. Net income for one year is Rp. 1,135,000.00. If calculated using the payback period, then the investment refund amounting to Rp. 5,000,000.00 is as follows:

a. The amount of investment value	= Rp. 5,000,000.00
b. First year's acceptance (Rp. 5,000,000.00 - Rp. 1,135,000.00)	= Rp. 3,865,000.00
c. Second year's acceptance (Rp. 3,865,000.00 - Rp. 1,135,000.00)	= Rp. 2,730,000.00
d. The third year of acceptance (Rp. 2,730,000.00 - Rp. 1,135,000.00)	= Rp. 1,595,000.00
e. Fourth-year acceptance (Rp. 1,595,000.00 - Rp. 1,135,000.00)	= Rp. 460,000.00

In the fifth year the remaining investment value of Rp 460,000.00 will return within 130 days (Rp 5,000,000.00: Rp 460,000.00 x 12 months = 130 days or about four months. Therefore, based on the calculation by using payback period ie the return period of investment for 4 years, 4 months. This means that the investment is still feasible to be implemented, because it provides an advantage with a payback period of 4 years, 4 months. This means that economic life for the rest of 3 years will provide a profit of Rp 1,135,000.00 x 3 tahun = Rp 3,405,000.00. If technically the investment of these tools can still be used, this indicates that the value of the profits will continue to be increased, until the technical age of the equipment is no longer usable.

### **4. Conclusion**

Based on the results of observations and field interviews on hydroponic farm doers, as well as simple calculations (in order to be easily imitated to calculate for households) in hydroponic plants at home, it can be concluded that agriculture with the concept of hydroponics with households scale was able to provide additional income for Households (families) that have a narrow land but have the innovation and creations in helping to keep the farming in a sustainable manner.

The value of investment with a useful life of 7 years, with an annual yield of Rp 1,135,000.00 will give a net result of Rp 7,945,000.00. So the profit earned is Rp 7,945,000.00 - Rp 5,000,000.00 (initial investment) = Rp 2,945,000.00. The conclusion can be drawn that household income from farming with the hydroponic concept is advantageous with the value of income greater than the costs incurred (*revenue > cost*).

Based on the results of the research conducted through a very simple calculation, the agribusiness actors, especially vegetable planters, with hydroponic concepts that amounted to about 165 members should provide experience and guidance to friends who have yard and desire to farm with the concept of hydroponics. Many people who can enjoy healthy vegetables and additional income for households willing to run the concept of hydroponic farming.

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