

## Response of Farmer Women Groups To Effectiveness of Aquaponic Systems on Growth and Production of Lettuce (*Lactuca sativa* L.)

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### ABSTRAK

Tanggapan Kelompok Wanita Tani Terhadap Efektivitas Sistem Akuaponik Terhadap Pertumbuhan dan Produksi Selada (*Lactuca sativa* L.) (dibimbing oleh Syaifuddin, Buhaerah dan Jati Nurcholis). Akuaponik merupakan gabungan dari akuakultur (budidaya ikan) dan hidroponik (budidaya tanaman). Penelitian ini bertujuan untuk : (1) Mengetahui efektifitas sistem akuaponik terhadap pertumbuhan dan produksi tanaman selada (*Lactuca sativa* L.). (2) Mengetahui respon kelompok tani wanita terhadap peningkatan pengetahuan, sikap dan keterampilan terhadap efektivitas sistem akuaponik terhadap pertumbuhan dan produksi tanaman selada (*Lactuca sativa* L.) Penelitian ini menggunakan analisis Rancangan Acak Kelompok (RAK) dengan 4 jenis perlakuan dan 3 ulangan sehingga terdapat 12 perlakuan yaitu P0 : Kontrol (Tanpa Perlakuan), P1 : 70 liter air sumur + 10 bibit lele umur 4 minggu, P2 : 70 liter air sumur + 20 bibit lele 4 minggu tua, P3 : 70 liter air sumur + 30 benih lele umur 4 minggu. Parameter yang diamati adalah tinggi tanaman, jumlah daun dan bobot segar panen. Hasil penelitian menunjukkan bahwa perlakuan 70 liter air sumur + 30 benih lele umur 4 minggu efektif meningkatkan pertumbuhan dan produksi tanaman selada dengan tinggi tanaman rata-rata 22,68 cm, rata-rata jumlah daun mencapai 10,58 dan panen segar mencapai 42,67 gram pada umur 5 minggu setelah tanam. Tingkat pengetahuan, sikap dan keterampilan responden mengenai materi penyuluhan tentang efektivitas sistem akuaponik terhadap pertumbuhan dan produksi selada mengalami peningkatan pada tingkat pengetahuan meningkat 46,00%, tingkat sikap meningkat 26,60% dan pada tingkat keterampilan meningkat sebesar 44,40%.

**Kata Kunci** : Akuaponik, Efektivitas, Kelompok Wanita Tani, Selada, Respon.

### ABSTRACT

Responses of Farm Women Groups on the Effectiveness of Aquaponic Systems on Growth and Production of Lettuce (*Lactuca sativa* L.) (supervised by Syaifuddin, Buhaerah and Jati Nurcholis). Aquaponics is a combination of aquaculture (fish farming) and hydroponics (plant cultivation). This study aims to : (1) Determine the effectiveness of the aquaponics system on the growth and production of lettuce (*Lactuca sativa* L.). (2) Knowing the response of the female farmer groups to increasing knowledge, attitudes and skills towards the effectiveness of the aquaponic system on the growth and production of lettuce (*Lactuca sativa* L.) This study used a randomized block design (RBD) analysis with 4 types of treatment and 3 replications so that there were 12 treatments, namely P0: Control (Without Treatment), P1: 70 liters of well water + 10 catfish seeds aged 4 weeks, P2: 70 liters well water + 20 catfish seeds 4 weeks old, P3: 70 liters of well water + 30 catfish seeds 4 weeks old. The parameters observed were plant height, number of leaves and fresh weight of harvest. The results of the study showed that the treatment of 70 liters of well water + 30 catfish seeds aged 4 weeks was effective in increasing the growth and production of lettuce plants with an average plant height of 22.68 cm, the average number of leaves reaching 10.58 and fresh harvest reached 42.67 grams at the age of 5 weeks after planted. The level of knowledge, attitudes and skills of respondents regarding counseling materials concerning the effectiveness of the aquaponics system on the growth and production of lettuce has increased at the knowledge level increased by 46.00%, the attitude level increased by 26.60% and at the skill level increased by 44.40%.

**Keywords** : Aquaponics, Effectiveness, Farmer Women Group, Lettuce, Response

## PENDAHULUAN

### 1. Background

Vegetables are an important aspect of agriculture in Indonesia because vegetables are useful as a source of food to fulfill vitamins, minerals and sources of body fiber. Vegetables as a side dish for the main diet are very much needed nowadays because more and more people are aware of their health which can be supported by consuming healthy natural vegetables regularly (Fatimah, 2018). Lettuce (*Lactuca sativa* L.) is a horticultural commodity that is widely consumed by the public. It is because of the texture and color that makes food attractive so that it can increase the appetite. Lettuce (*Lactuca sativa* L.) is generally consumed raw or fresh and made in salads or served in various forms of cooking. In 2015, the consumption of lettuce (*Lactuca sativa* L.) in Indonesia was 39.29 tons/year however the national production of lettuce was still lower than the consumption, approximately 35.30 kg / capita / year so that the import volume of lettuce amounting to 21.10 tons. Based on the data, there are opportunities to increase the production in order to fulfill the level of national consumption of lettuce (*Lactuca sativa* L.) (Badan Pusat Statistik, 2016). The rapid rate of population growth in cities can cause environmental problems, ranging from land conversion to degradation of environmental quality due to pollution and waste. If the condition of population growth is greater than the rate of food production, it will cause a food crisis. The insufficient amount of foodstuffs will have an impact on the dependence of one area on another. This is especially true for urban areas in developing countries because these areas are increasingly becoming centers of population and settlement (Fauzi *et al.*, 2016). Makassar City Government has pursued various policies, programs and activities to initiate and develop the agricultural sector in Makassar City. Head of the Makassar City Fisheries and Agriculture Service, Evi Apriliyati, said that the development of the agricultural sector in Makassar City refers to the existing carrying capacity, considering that agricultural land in Makassar City is very limited. Based on statistics, Makassar City has 7,000 hectares of yards and 7,526 alleys that have the potential for horticultural development (Anonymous, 2019). Therefore, the urban agricultural system needs to be applied in order to minimize the problem of food needs in urban areas, especially in Makassar City. One type of urban agriculture that can be applied is the aquaponics system. Aquaponics is a cultivation technology that combines fish farming with plants (Zahidah *et al.*, 2017). Catfish pond water can be used as fertilizer for plants, especially for vegetable crops such as kale, chilies, tomatoes, spinach, lettuce (*Lactuca sativa* L.) and others, because catfish pond water contains nutrients that are beneficial for plant growth such as  $\text{NH}_3$ ,  $\text{NO}_2$  and  $\text{NO}_3$  elements (Eka, 2019). The advantages of the aquaponic cultivation system include that it can be applied in narrow yards, does not require planting media, fertilizer, watering, is healthy, has high aesthetic value and is free of contaminants. So, aquaponics is very good for development in places where water and soil are scarce and expensive, such as in urban areas, in dry areas, deserts and small islands (Yudi, 2016). Fish farming systems in 80 liter buckets can be used as a solution for fish farming, especially in narrow areas (July, 2018). In the aquaponics system with the treatment of different catfish numbers, treatment 1 is 3 catfish per bucket, treatment 2 is 5 catfish per bucket and treatment 3 is 7 catfish per bucket with a water volume of 40 liters has not had an effect on growth cultivated plants. However, in terms of plant types, lettuce (*Lactuca sativa* L.) produces a higher selling value compared to kale, spinach, pakcoy and mustard greens (Fatimah, 2018).

## **2. Perumusan Masalah**

Perumusan Masalah penelitian ini adalah :

1. How effective is the aquaponics system on the growth and production of lettuce (*Lactuca sativa* L.) ?
2. How do women farmer groups respond to increasing knowledge, attitudes and skills to the effectiveness of aquaponic systems on the growth and production of lettuce (*Lactuca sativa* L.) ?

## **3. Tujuan Penelitian**

Adapun tujuan penelitian ini adalah :

1. To determine the effectiveness of the aquaponics system on the growth and production of lettuce (*Lactuca sativa* L.).
2. Knowing the response of the female farmer groups to increasing knowledge, attitudes and skills on the effectiveness of the aquaponic system on the growth and production of lettuce ( *Lactuca sativa* L.)

## **4. Manfaat Penelitian**

Manfaat penelitian ini adalah :

1. As a contribution to increasing the knowledge, attitudes and skills of the women farmer groups on the effectiveness of the aquaponic system on the growth and production of lettuce ( *Lactuca sativa* L.).
2. For information to the authors, extension agents, branches of the agricultural service and related agencies as well as the local government about the potential application of the aquaponics system to the growth and production of lettuce ( *Lactuca sativa* L.).

## **I. METODE**

### **A. Place and Time**

This study was carried out at the Hydroponic Laboratory of the Agricultural Development Polytechnic (POLBANGTAN) Gowa from March 2020 to May 2020. The extension activity is planned to be carried out at Dewi Sari's Women Farmers Group (KWT) in Tamalanrea Village, Tamalanrea District, Makassar City, South Sulawesi Province in May 2020. Nevertheless, related to the outbreak of the corona virus (covid-19), social activities which are association-related are currently prohibited by the central and local governments. Therefore, the implementation of extension activities was transferred to the Prosperous Rural Prosperous Rural Community Empowerment National Program Group (PNPM) in Pakatto Village, Bontomarannu District, Gowa Regency, South Sulawesi Province in May 2020 . This location is the author's hometown which still allows for the implementation of extension activities.

### **B. Tools and Materials**

The tools used in the implementation of this study are wire scissors, electric drill, 80 liter water bucket, fishing nets, drill bits, rulers, pens, scissors, hacksaws, scoops, pH meters, hoses, plastic pans, scales and camera. The materials that used in the implementation of the study is that the seeds of lettuce, *rockwool*, seed catfish age of 4 weeks, wells water, catfish feeds,  $\frac{3}{4}$  inch pipes, masking tape for pipe,  $\frac{3}{4}$  inch pipe faucet,  $\frac{3}{4}$  inch inner and outer pipes, *netpot* for hydroponics installation, paranet, rubber bands, paper and slippery wire.

### **C . Implementation of the Study**

#### **1. Method of Implementation**

This study was carried out using a randomized block design (RBD) method with 4 treatments and 3 replications so that there were 12 treatments. The population of lettuce

plants in each treatment bucket was 4 plants so that the total population of lettuce was 48 plants and all of them became sample plants. The treatments are as follows:

P0 = Control (without treatment)

P1 = 70 liters of well water + 10 catfish seeds aged 4 weeks

P2 = 70 liters of well water + 20 catfish seeds aged 4 weeks

P3 = 70 liters of well water + 30 catfish seeds aged 4 weeks

### Data analysis

Data from the measurement results will be processed using the F test formula (Ardiwirinata, 2018) as follows:

$$Y_{ij} = \mu + T_i + B_j + \epsilon_{ij}$$

with:

$Y_{ij}$  = The response or the observed value of the i-th treatment and j-th repetition.

$\mu$  = Median

$T_i$  = Effect of treatment

$B_j$  = Effect of block

$\epsilon_{ij}$  = Effect of experimental error from i-th treatment and j-th repetition.

If there is a difference in real or very real effect, then proceed with the Least Significant Difference (LSD) test with the following formula:

$$BNT \alpha = t_{\alpha}(v) \times \frac{\sqrt{2 \cdot \text{middle square of the error}}}{\text{repetition}}$$

with:

$T_{\alpha}(v)$  = The standard value contained at the test level  $\alpha$  and the degree of error free v

N = total treatment

## II. HASIL

Table 1. Results of analysis of catfish pond water samples

No.	Samples	Measurable Parameters				
		Organic Material			HNO <sub>3</sub> : HClO <sub>4</sub>	
		C	N	C/N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
		----%----			-----%-----	
1.	P0	0,09	0,06	1	0,0810	0,0074
2.	P1	0,42	0,29	1	0,2411	0,6311
3.	P2	0,63	0,39	2	0,3621	0,8436
4.	P3	0,91	0,52	2	0,4824	0,0245

### A. Plant Height

The results of plant height observations showed that the different number of catfish treatments responded to different plant height growth. From the analysis of different tests on the data from the measurement of plant height at the age of 1 WAP to 5 WAP can be seen in

Table 2. Observation results of plant height in the aquaponics system with the treatment of different amounts of catfish on the growth of lettuce plants aged 1 - 5 MST

Treatment	Lettuce Plant Height (cm) at Age (WAP)				
	I	II	III	IV	V
P0	1,66 a	1,37 a	0,00 a	0,00 a	0,00 a

P1	5,07 b	9,37 b	11,11 b	13,20 b	14,05 b
P2	5,96 c	11,23 c	13,20 c	15,21 c	17,60 c
P3	6,86 d	12,09 c	16,57 d	18,92 d	22,68 d
BNT (0,05)	<b>0,86</b>	<b>1,48</b>	<b>1,98</b>	<b>1,43</b>	2,33
KK (%)	8,81	8,72	9,69	6,04	8,60

Based on Table 2, it shows that the different number of catfish treatments shows different plant growth. In the treatment, 70 liters of well water + 30 catfish seeds aged 4 weeks showed the highest growth pattern of plant height when compared to other treatments. The effectiveness of the aquaponics system on the height growth of lettuce (*Lactuca sativa* L.) as shown in Table 2 shows that the treatment of different fish numbers for each experimental bucket will be followed by a different increase in plant height. This indicates that lettuce plants are still very responsive to the treatment of 70 liters of well water + 30 catfish seeds aged 4 weeks. Evaluation of agricultural extension was carried out to determine the response of women farmer groups in participating in extension activities using the group approach method with lecture, discussion and demonstration techniques. The media used are real objects and other media such as folders. In this case what will be measured is how the level of knowledge, attitudes and skills of respondents before and after attending counseling. The recapitulation results are shown in Table 4.

Table 4. Average levels of knowledge, attitudes and skills of respondents from the PNPM Mandiri Rural Sejahtera group in Pakatto village.

Description	Max Score	Scores				Alteration	
		Pre Test	Percentage (%)	Post Test	Percentage (%)	Score	Percentage (%)
Pengetahuan	500	270	54,00	500	100,00	230	46,00
Sikap	500	354	70,80	487	97,40	133	26,60
Keterampilan	500	278	55,60	500	100,00	222	44,40
Jumlah	1.500	902		1.487		585	

Table 4 shows that counseling about the effectiveness of the aquaponics system on the growth and production of lettuce, can change the level of knowledge, attitudes and skills of respondents. Before attending the counseling, the respondent's knowledge level was in the knowing category (54.00%), the respondent's attitude level was in the agreeing category (70.80%) and the skill level was in the skilled category (55.60%). After attending the counseling, the level of knowledge, attitudes and skills of the respondents increased to be very knowledgeable (100.00%), strongly agree (97.40%) and highly skilled (100.00%).

### III. KESIMPULAN

#### Conclusion :

1. The treatment of 70 liters of well water + 30 catfish seeds aged 4 weeks is effective in increasing the growth and production of lettuce plants with an average plant height of 22.68 cm, the average number of leaves reaching 10.58 and the fresh weight of the harvest reaching 42.67 grams at the age of 5 WAP.
2. The level of knowledge, attitudes and skills of respondents to counseling materials regarding the effectiveness of the aquaponics system on the growth and production of lettuce has increased at the level of knowledge increased by 46.00%, the level of attitude has increased by 26.60% and at the level of skills has increased by 44.40%.

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