# SUSTAINABLE URBAN GARDENING PRACTICE IN THE MARSHALL ISLANDS USING SEAWEEDS COMPOST FOR GROWING WATER SPINACH (*IPOMEA REPTANS*)


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# INTRODUCTION

- According to recent data, food production in the Pacific Islands Countries (PICs) is decreasing (ADB, 2011). Due to the limited supply of local food resources, dependency on imported food is prevalent in the Marshall Islands and ranked the highest (91%) among the PICs. This situation gives rise to many cases of non-communicable diseases (NCDs) especially diabetes because most of the imported foods like white rice and refined flour, high fructose corn syrup in the soda drinks and other sweet tasting foods are high in calorie content.

# INTRODUCTION

Water spinach (*Ipomea reptans*) also known as kangkong is one of the vegetable that is promoted in the island to grow due to its good nutritive value and fiber content. In addition, kangkong is easy to grow and uses less water if planted in a pallet or raised pots.. The problem lies on the supply of compost and fertilizer that are mostly imported and expensive.

With the use of dry seaweeds that are usually carried away on the shorelines this study aims to investigate whether seaweeds would help plant to grow well. This experimental research investigation wants to answer the question; will seaweeds provide enough soil nutrient to sustain plant growth like the commercial garden soil and fertilizer. There were five treatments on this experiment as follows; top soil (T1, control) topsoil plus seaweeds (T2), top soil plus chicken manure (T3), top soil plus miracle grow potting mix (T4), and top soil plus NPK fertilizer (16-16-16).

# HYPOTHESIS

We hypothesize that in using seaweeds for growing kangkong, there will no significant difference as compared to the other treatments.

# OBJECTIVES

1. To assess the growth performance of kangkong on different growing media in terms of:

    a. Plant height

    b. Leaf width

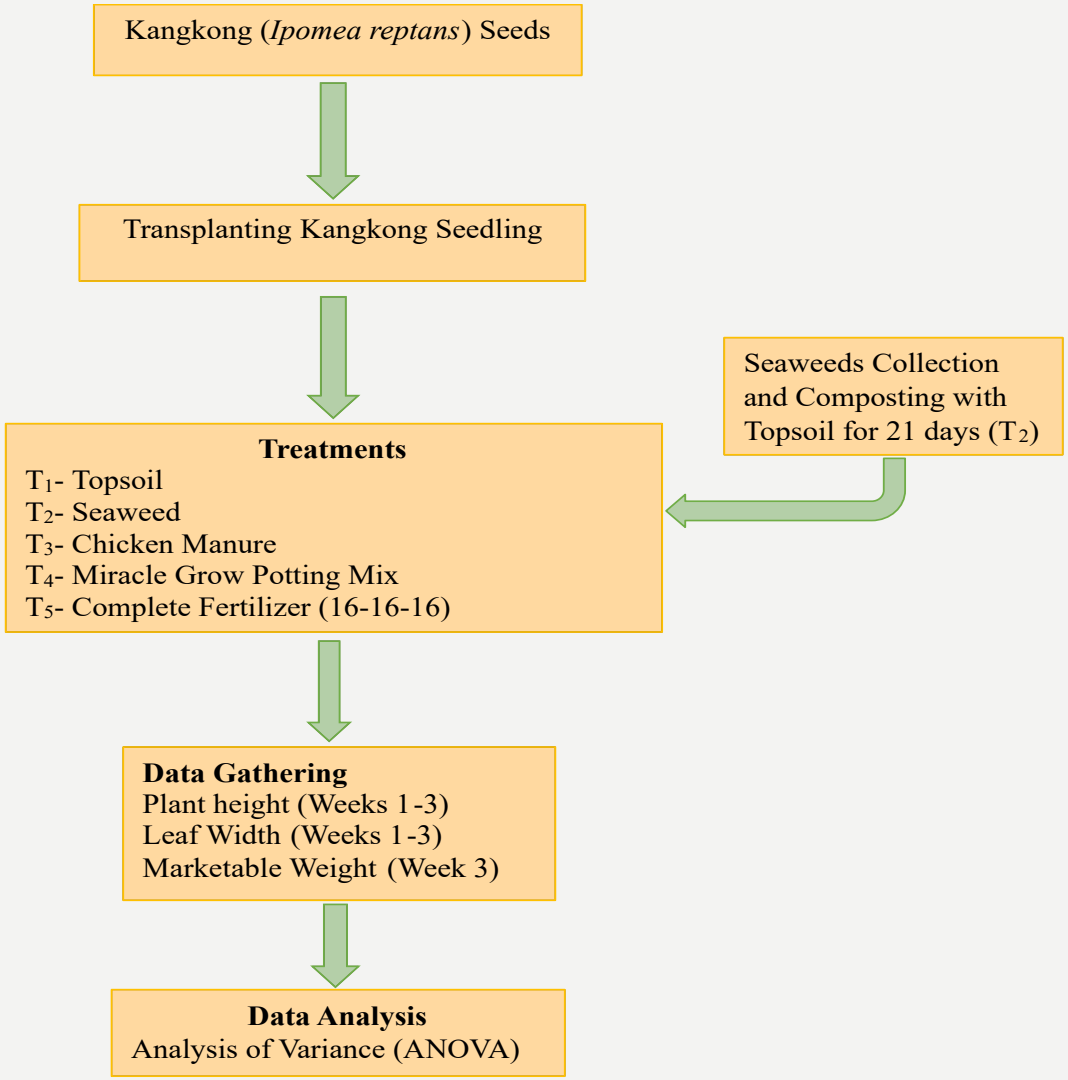
    d. Marketable weight

2. To determine statistically the growth performance of kangkong on seaweeds compost in relation to other growing media using ANOVA analysis.

# SCOPE AND LIMITATIONS

- This experimental research focused only in the growth performance of kangkong on different growing media in terms of plant height, leaf width, and marketable weight to test the effectiveness of seaweeds compost at the CMI-Arrak demonstration garden condition under the prevailing weather condition at the time and period where the experiment was conducted. The use of other vegetable crops and chemical analysis of the soil medium were beyond the scope of the study.

# METHODOLOGY



# RESULTS

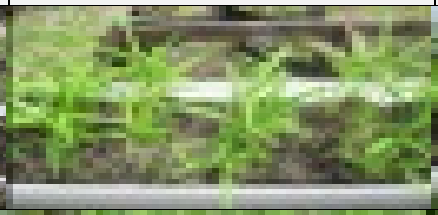
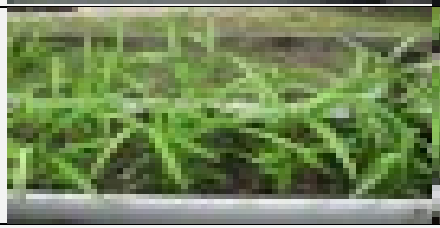
| TREATMENTS | WEEK 1 | WEEK 2 | WEEK 3 |
|---|---|---|---|
| Control (topsoil) |  |  |  |
| Topsoil with Seaweeds Compost |  |  |  |
| Topsoil with Chicken Manure (1:1) |  |  |  |
| Topsoil with Miracle Grow Potting Mix (1:1) |  |  |  |
| Topsoil with Fertilizer (16-16-16) |  |  |  |

*Figure 1.* Appearance of Kangkong with different growing media from week one to the end of week three.

# RESULTS

Table 1

*Comparative growth of Kangkong on seaweeds compost and other growing media from week one to week three, the same letter on the line indicates no significant difference ($p<0.05$)*

# RESULTS


*Figure 2.* Overall pattern of Kangkong growth performance on seaweeds compost in comparison with other growing media.

# DISCUSSION

This results agreed with Haq et al (2011) that seaweed compost was as effectively comparable to other commercial product like Biogold organic compost. The effectiveness of seaweed compost might be due to higher percentage of NPK compared to cow dung as showed in the study of Alvarado et al (2008). As also observed, the rate of growth from week one to week three suggests that seaweed compost has enhancing growth ability as compared to commercial fertilizer. This could due to increased water and nutrient holding capacity of the sandy atoll soil of the Marshall Islands. As compared to the topsoil (control) which mostly sand particle, water and nutrients are not so intact.

# DISCUSSION

But with the use of seaweeds compost Kangkong growth was enhanced. This observation agreed with the findings of Haq et al (2011) and Winberg et al (2011) that seaweed compost helped to increased the growth leaves on tomatoes and radish. Furthermore, it was also observed that the one of the reasons why seaweed compost was effectively affecting plant growth performance because it could promote higher bio-accumulation of micro and macro nutrients from the soil as compared to commercial chemical fertilizer (Kabirinejad and Hoodaji, 2012).

# HEALTH AND ENVIRONMENTAL IMPLICATIONS OF THE RESEARCH

As green vegetables like Kangkong are gaining popularity in the Marshall Islands especially in the highly populated people urban areas, the way to produce it in a sustainable manner is the biggest challenge for the people here. Macro algae also known as seaweeds are mostly available in the seashores and sometimes becoming a pollutant, attracting flies and giving off foul smell. With the research we employed, these seaweeds can now be used as fertilizer with no cost of buying imported commercial fertilizer and soil products. With more green vegetables as source of vitamins, minerals and fiber, instead of relying on high sugar foods, the risk of having diabetes will be reduced in effect (SPC, 2014) In addition, because chemical fertilizer will be avoided and nutrient recycling will be promoted, the environmental impact will be less.

# SUMMARY

The use of seaweeds in growing Kangkong in this experiment showed no significant difference as compared to imported chemical fertilizer (16-16-16), Miracle Grow Potting Mix, and commercial Chicken Manure. This shows that seaweed compost has a great potential to be employed as organic fertilizer. The Republic of the Marshall Islands is always trying in many years on how to reduce the risk of NCDs especially type II diabetes. With the increase of migration in the main islands of Majuro and Ebeye, the supply of local food is not sufficient. Producing more local foods like green vegetable in a sustainable manner is one of the problems to be addressed. The use of seaweeds in this research shows a potential for a good source of organic matter to be used unlimitedly to enhance good soil quality and food production.

# CONCLUSION

In conclusion, the composting of waste seaweeds using the simple techniques described in this experiment must be used in order to promote environmental protection and health through production of more local green vegetables and other food nutrients and fiber source. In addition, the utilization of renewable resources (such as seaweeds) for agricultural purposes not only promote plant growth, it could also help to improved the physicochemical properties of the soil if used consistently.

# RECOMMENDATION

For recommendation, composting seaweeds in a large scale for the Marshall Islands should be studied further. Another thing is the possibility of seaweeds bioaccumulation of toxic materials from the polluted ocean. This part of research should be employed in order to ensure safety for growing crops. The use of seaweeds with other composting materials like green manure plants, coconut husk and other fresh or dry organic materials should also be studied further to see the results in growing different vegetable and fruit crops.

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Kommol Tata