UNIVERSITI TEKNOLOGI MARA

DESIGN AND DEVELOPMENT OF INDOOR AQUAPONICS

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ABSTRACT

This project aims to address common challenges in hydroponic systems, such as nutrient imbalance, declining water quality, and algae growth, by integrating aquaculture and hydroponics into a single indoor aquaponics system. The fabricated system leverages the symbiotic relationship between fish and plants to maintain consistent nutrient levels and improve water quality. This study outlines the design and fabrication of an indoor aquaponics system using SolidWorks for design and available materials for construction, with a budget constraint of RM300. The system employs a 12W 1800L/H submersible water pump, PVC piping, a plastic fish tank, and supporting frame rods. The objectives include designing the system, building a working prototype, and demonstrating that indoor grown plants can thrive as well as outdoor plants. The expected outcome is a sustainable, easy-to-maintain system that provides a continuous supply of nutrients, hydration, and light to plants, while the fish waste naturally fertilizes the plants. This project has significant implications for individuals seeking sustainable homegrown food sources, urban communities aiming to cultivate vegetables indoors, and the broader adoption of symbiotic farming methods that produce both fish and plants, potentially replacing traditional gardening methods.

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CHAPTER ONE
INTRODUCTION

1.1 Background of Study

Traditional gardening has been a cornerstone practice for food production and leisure for centuries, enabling individuals and communities to cultivate a variety of plants and crops in open fields using natural soil. This method of gardening not only provides a route for producing fruits, vegetables and herbs but also promote some sort of connection with nature. It fosters outdoor physical activity, offers opportunity for recreation and educations. It also becomes a food supplier.

However, Following the rapid growth of the global population has posed challenges to traditional gardening practices specifically in crowded urban area. The lack of space and suitable land for traditional gardening often restrict people's opportunity to grow their own crops. This limitation can be harsh for individuals that interested in cultivating their own fresh produce as they are constrained by the limited outdoor space such as apartments, townhouse and densely populated neighborhood. The shortage of available land and the high cost of urban real estate make it almost impossible for city dwellers to start traditional gardening, leaving them with very little option for homegrown food.

To address this issue, indoor hydroponic system comes into play. An indoor hydroponic system is a method of growing plants without soil, where the plants roots are directly exposed to the nutrient solution, which provides essentials elements for a healthy plant growth. All of this can be done indoor, meaning people with lack of space or land can still start a homegrown food.