

Economic Feasibility of Hydroponics Production System under Polyhouse: A Case Study in Gazipur, Bangladesh

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Abstract

Hydroponics system is more input-intensive that requires a large amount of investment than the conventional crops production system. There is a need for economic analysis of the hydroponics for emerging growers in Bangladesh. The study aims to find out the economic feasibility of this production system and compare it with the traditional system. To do so, this study employed the case-study methodology to evaluate the profitability and feasibility of the farm, which uses this system. A thorough inspection of costs and production structure and gross margin was performed. Our results displayed that the estimated profitability indicators showed better economic results for the hydroponics system. The results on feasibility study showed that all economic indicators were in line with the acceptability of the project. We found that the NPVs are positive for all polyhouses. Despite the high level of fixed costs, this system provided the high internal rate of return which was supported by the previous studies. This result can be used to start new method of agricultural system which can help to fulfill the demand for seasonal crops off-season and can mitigate the risk of climate change in aggregating crop production in Bangladesh.

Keywords: Hydroponics, Polyhouse, Economics feasibility, Cost-Benefit Analysis

1. Introduction

Food production of the future world has been propelled by the rapid extension of urban area over the rural farming systems considering a great uncertainty about food production. According to FAO, by 2050 world population might be reached over 9 billion and 70% growth in current food production will require to meet this immense population pressure [1]. Meeting this growing demand under confined natural resources, technical innovation in farming system entails facilitating higher efficacy in tapping natural resources, mainly water, energy, and land [2]. Hydroponics refers to a similar emerging technology of cultivating plants in mineral nutrients solutions where water is used as solvent [3]. Hydroponics endorses food production technologies formed as innovative, eco-friendly, sustainable [4], reliable and compliant; thus, globally being more cost-effective in optimizing resources than soil-based agricultural practices [5]. According to Muller, et al. [6] hydroponics is the most progressive method of crop production at substantial scale without soil. This study focuses on conventional hydroponics to meet the above-mentioned demands. Hydroponics is an approach to cultivating crops devoid of soil in greenhouses or polyhouses by using mineral nutrient

solutions [6]. More control over crop yield has been established by this technique which allocates an enhanced production in areas with reduced crop densities, in addition to shortening crop cycles and increasing quality of produces [2]. Hydroponics is progressively relevant in the global agricultural development and is commonly found in areas with difficult access to soil [7].

In the context of a developing country like Bangladesh where food security issues are considered as one of the vital aspects, Hydroponics can be an emerging technology for ensuring that this issue does not challenge the future due to immense pressure of population and conversion of agricultural land into urbanization increasing in this territory day by day [8]. Moreover, hydroponics crops can offer healthier and stronger produces that attract quality-oriented consumers, thus ensuring a market niche which has an economical potential for the farmers of this region [9]. Producers can attain higher profitability by hydroponic produces due to the increase in crop variation [10]. Hydroponic vegetables are increasingly cultivated without pesticides, satisfying consumers who are concerned about pesticide risks to health and who have therefore, willingness to pay more for quality