

# Marketing Strategic for Hydroponic Vegetable Product to Improve Marketing Performance Base on Digital Technology

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**Abstract.** Agriculture is one of the sectors that has been the backbone of human civilization since the beginning, undergoing major transformation along with technological. The hydroponic vegetable market continues to grow along with increasing demand for healthy and sustainable agricultural products. In this digital era, marketing strategies based on digital technology are the key to increasing visibility and sales of hydroponic vegetable products. The purpose of this study is to investigate different digital marketing tactics that may be used to enhance the marketing effectiveness of hydroponically grown vegetables. By examining digital marketing techniques like social media marketing and the use of e-commerce platforms, this research identifies effective ways to strengthen the market position of hydroponic vegetable products in the digital era. The study also highlights the important role digital technology plays in changing the way manufacturers interact with consumers, measure marketing performance, and develop long-term relationships with customers. It is believed that the research's conclusions would give hydroponic vegetable growers insightful information and marketing practitioners in optimizing their marketing strategies in this increasingly digital market.

**Keywords:** Marketing strategic, Vegetable, Hydroponic, Digital technology, Marketing performance.

## 1. Introduction

One of the industries is agriculture that has been the backbone of human civilization since the beginning, undergoing major transformation along with technological developments

[1][2]. This significant change involves the application of digital technology in agricultural operations, and includes its application in hydroponic cultivation itself [3][4]. Hydroponics offers a method of cultivating plants without using soil, with essential nutrients absorbed by plants directly from water solutions, viewing technology as an important element for increased efficiency and productivity [5].

Hydroponics can be cultivated more quickly, because this method has many advantages, namely plants can grow and produce better compared to conventional planting techniques [6]. In addition, in the context of hydroponic cultivation, technology is used to monitor and control the plant growing environment, in order to ensure better plant growth conditions compared to traditional methods [5]. This technology includes environments, lighting systems, temperature and humidity control, as well as applications for remote monitoring and maintenance [7]. However, the spread of technology is not only limited to agricultural activities, but also includes the marketing and sale of harvested crops [8].

Meanwhile, the function of product sales and marketing has also drastically changed in the contemporary digital era [9]. Digital marketing via social media utilization, SEO (Search Engine Optimization), electronic mail marketing (email marketing), and other online strategies, has become an important tool in business [10]. Apart from that, by understanding and mastering this aspect, you will be able to provide a competitive advantage for the industry of hydroponic farming. The advantages of a hydroponic business are farming without using soil, water consumption is lower, because the water can flow continuously and circulate, nutrient processing is quite simple, the harvest is quite large compared to traditional methods, harvest time can be adjusted without seasons and harvesting is easier. The result is that hydroponic vegetables tend to be cleaner and sterile, plant diseases and pests are easily controlled, plants grow faster, and hydroponics is very suitable for limited land [5].

This hydroponic vegetable business also has the ability to compete with vegetables using conventional methods [8]. Hydroponic technology produces higher quality vegetables compared to traditional vegetables [5]. Based on previously conducted research, it was found that the vitamin and mineral content of hydroponic plants produced can be compared with conventional non-hydroponic plants [11][12]. Test results prove that hydroponic plants contain higher levels of minerals and vitamins from plants produced by the hydroponic method and are more beneficial for the health of the human body. Apart from the quality of vegetables, using land that is not too large is also one of the advantages in increasing the competitive advantage of the hydroponic business [5]. Sustainable and higher production results, controllable plant pests, more practical maintenance, stable selling prices can also increase the competitive advantage of the hydroponic business [8].

In Indonesia, hydroponic vegetable production was introduced as an alternative to meet the need for vegetables that are high quality, clean, and can be produced sustainably, in accordance with research by [13] The marketing of hydroponic goods has grown more intricate and riskier as a result of the advancement of hydroponic techniques. In the process of marketing, there are various risks that can hamper the flow of the supply chain, considering that agribusiness is greatly influenced by risk factors and uncertainty [14]. Agricultural products have seasonal characteristics, are easily damaged, and vary in shape and size of harvest [15]. Despite the great potential that hydroponic farming has, producers often face challenges in marketing their products in an increasingly competitive market. In this digital era, digital technology has played an increasingly significant part in changing how manufacturers engage in conservation with consumers and promote their products. Digital technology-based marketing strategies, such as social media marketing, search engine

optimization, and the use of e-commerce platforms, have become the key to increasing the visibility and sales of hydroponic vegetable products.

Kotler and Armstrong define marketing strategy as a marketing rationale used by entrepreneurs to generate value and profit from their connections with customers. Kurtz defines marketing strategy as the company's overarching plan for identifying the target market in order to satisfy customers through the development of a mix of marketing mix components, including product, distribution, promotion, and pricing.

## 2. LITERATURE REVIEW

### A. *Hydroponics*

Greek words hydro, which means water, and ponous, which means work, are the origins of the word hydroponics. Simply put, hydroponics is defined as cultivating plants using media other than soil, thus, hydroponics is an agricultural practice that substitutes water for soil in the planting process [16]. Hydroponics is a technique for growing plants without using soil, but by placing plant roots in a nutrient solution that is provided regularly [17]. The advantages of hydroponic cultivation include: it does not require incentives for heavy labor (land processing and weed eradication), the nutrient solution can be measured according to plant needs, it does not require large and fertile land, because the production is greater and cleaner in both quantity and quality, and because it is not seasonally dependent, planting and harvesting may be controlled to meet market demands [18].

### B. *Marketing*

From a macro perspective, marketing is a series of activities or activities that direct products from farmers to reach final consumers. In the process of product flow towards the final consumer, there are various productive activities carried out to increase or create use value (such as form, location, time and ownership), with the aim of meeting final consumer satisfaction [19]. Marketing is defined as a business function that recognizes consumer needs and desires, which are then produced by other parties in order to meet these requirements, either through products or services [20].

Marketing facilitates the creation of more efficient allocation of resources and production activities. Without marketing, each individual would be faced with the task of meeting their own living needs. With marketing, collaboration occurs between individuals who create and exchange products with each other [21]. The marketing concept is not limited to the sales function alone. Marketing involves a series of processes aimed at providing use value in terms of form, place, time and ownership of a commodity. The aim is to meet and satisfy consumer needs and generate profits for producers in an effective and efficient manner [22].

### C. *Marketing Strategy*

A marketing strategy is a set of goals and objectives, guidelines, and policies that serve as a firm's reference point, allocation, and direction for its marketing initiatives across time. It is particularly important when the company is responding to the dynamic market and competitive situations [23]. However, marketing strategy, in Swasta's view, is the whole system of commercial operations that include organizing, setting pricing, advertising, and distributing products and services that fulfill and suit the demands of customers [24].

### D. *Digital Technology*

Agricultural technology is the application of engineering science to agricultural activities. From a scientific perspective, agricultural technology can be defined as the use of mathematical and natural science principles, in terms of the economics of cultivating plants, agricultural resources and natural resources for the benefit of human welfare. When

considering metrics or standards for gauging a strategy's effectiveness, digital marketing offers several benefits over traditional marketing tactics (offline marketing)[25]. Companies can also find it simpler with digital marketing to keep an eye on and fulfill every need and demand of potential customers. Conversely, customers can get product information by simply surfing the internet, thus making the search process easier [26]. In the digital age, methods based on digital marketing must be put into practice to accomplish goals more quickly and precisely [27]. SMEs will have the chance to reap major business benefits in terms of revenue, employment prospects, innovation, and competitiveness if they have access to the internet, participate in social media, and enhance their e-commerce skills [28].

Technology is believed to have a major impact on business success [29]. Using digital technology effectively is crucial for enhancing the performance of all businesses, especially Micro, Small, and Medium-Sized Enterprises (MSMEs). The Covid-19 pandemic has also motivated MSME players to apply digital technology in marketing strategies [30]. The development of hydroponic farming techniques in Indonesia has promising opportunities in terms of meeting domestic needs and opening up export opportunities to countries that need a supply of vegetables with high demand.

In the era of rapid technological advances and digital transformation, agriculture has experienced significant changes, especially in product marketing. Traditional methods have evolved into digital platforms, reshaping industries and the way products are marketed and sold. The increasing popularity of online purchasing has led to increased use of e-commerce in the agricultural sector. Chinese farmers, for example, are increasingly adopting e-commerce as a way to reduce costs and increase efficiency in the agricultural sector.

Digital transformation in agriculture has also led to the development of new marketing channels for agricultural products. The continuous improvement of modern agricultural circulation systems has facilitated dramatic changes in China's agricultural product marketing channels (FPMC). FPMC contributes significantly to the advancement of agricultural growth and transferring agricultural products from farmers to consumers. In addition, digital transformation has enabled the development of agriculture goods e-commerce brands. By studying the challenges and difficulties in the actual construction of e-commerce brands for agricultural products, researchers have developed ideas and remedies to have a beneficial effect on e-commerce development in the agricultural sector.

In short, the use of Online stores and digital networks has reshaped the agricultural industry, changing traditional marketing methods and enabling more efficient and cost-effective ways for farmers to market and sell their products.

### **3. Method**

A qualitative descriptive research approach was employed in this study. This method aims to provide an in-depth overview of marketing strategies for hydroponic vegetable products to improve marketing performance based on digital technology. In this case, the data collection technique chosen is a review of previous research findings that have been published online as journal articles. Literature studies make it possible to gather information from various relevant sources and gain a better understanding of the topic under study.

The inquiry about strategy utilized could be a bibliometric examination by collecting information through looking on Google Researcher, the watchword utilized is "computerized promoting, hydroponic vegetable, execution". Information were collected and chosen to meet distribution criteria distributed in international diaries and have been cited within the 2015-

2023 period. Information investigation of the slant outline of innovative advancements for distribution in diaries within the field of social science of computerized promoting was dissected utilizing the program VOSviewer.

### **3. Results and Discussion**

#### *A. Result*

In this research, we analyze marketing strategies for hydroponic vegetable products based on digital technology to improve marketing performance. We found that implementing marketing strategies that integrate digital technology has a positive impact on visibility, market penetration and customer engagement. Online branding and identity strategies help increase brand awareness, while leveraging e-commerce platforms allows wider market access. Relevant digital content and active interactions with customers through social media increase consumer engagement and strengthen brand-customer relationships. The use of analytical technology also helps in understanding consumer behavior and increases efficiency in market targeting.

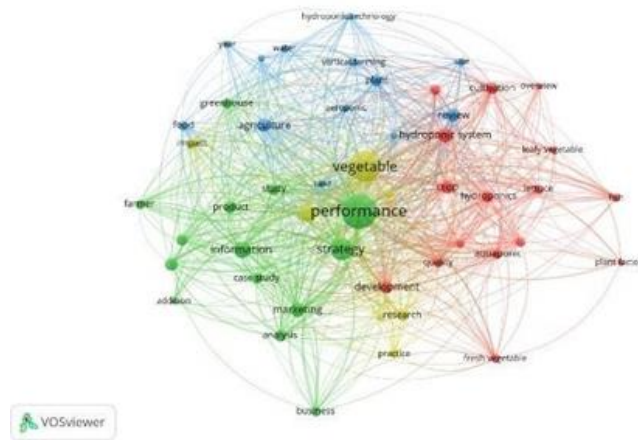
In accordance with short-term order targets, the company can carry out a retrenchment type consolidation strategy which is carried out by withdrawing from the old market, while in the long term it can carry out growth strategies.

Marketing is used to use marketing mix elements such as product, price, promotion and location to produce what is expected in the target market. In determining product prices, farmers determine the selling price based on the total calculation of plant seeds, fertilizer nutrients, water, planting media, and labor. Social media can be an advertising account when selling hydroponic vegetables because it can use advanced technology to disseminate information more easily and promote more effectively. Development of strategies that leverage the benefits of e-commerce while addressing associated challenges. Identification of research gaps also points to avenues for future exploration, such as the socio-economic impact of e-commerce on smallholder farmers and the effectiveness of specific digital marketing strategies.

Based on national publication data taken from the Google database for 2018 – 2023 using Publish or Perish, the following are the results of 300 publications which are described in three terms, namely 1) Network Visualization, 2) Overlay Visualization, 3) Density Visualization.

#### **1) Network Visualization**

Outcomes of the network visualization examination of Hydroponic Marketing Strategy to Improve Marketing Performance Based on Digital Technology (see Fig. 1). Cluster 1 is shown in red, with a total of 12 items. The keywords obtained in Cluster 1 are development, quality, fresh vegetable, plant factory, aquaponic, hydroponics, lettuce, crop, leafy vegetable, hidriponic system, cultivation, and overview. Cluster 2 is shown in green and has 13 items, namely performance, strategy, study, product, greenhouse, farmer, addition, business, case study, marketing, information, analysis, and impact. Cluster 3 is shown in blue and has 12 items, namely hydroponic technology, review, agriculture, food, aeroponic, case, plant, vertical farming, water, year, and user. Cluster 4 is shown in yellow and has 4 items, namely research, practice, performance and vegetable.

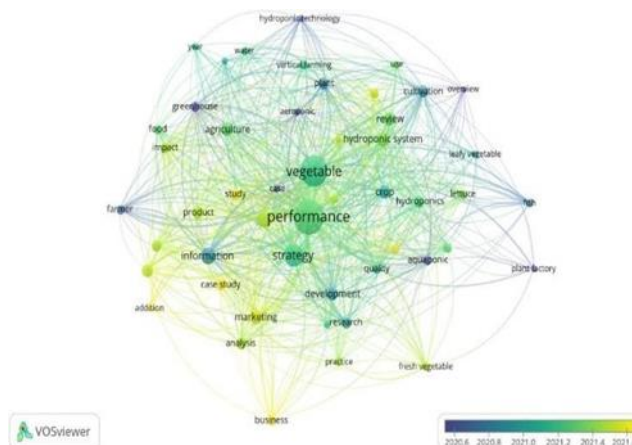


**Fig. 1.** Network Visualization

## 2) Overlay Visualization

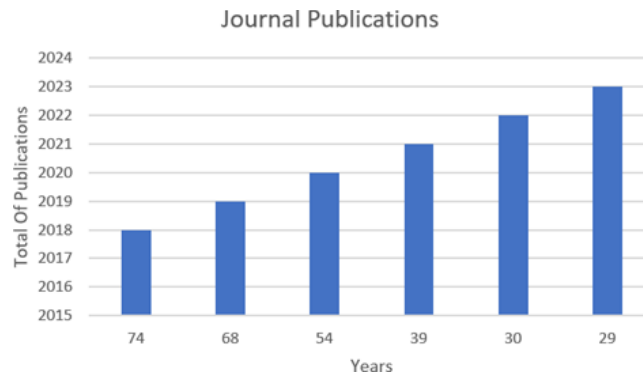
Overlay Visualization is the examination of trends and patterns found in research on Hydroponic Marketing Strategies to Improve Digital Technology- Based Marketing Performance. Trends on this subject in this study were only seen in 2018 - 2023. Overlay visualization is used to view the trends, patterns, and content of a set of Google Scholar article papers that have been published in national journals (see Fig. 2).

Dark colours indicate that these keywords have been extensively researched. Yellow (brighter) keywords indicate that the topic is more recent and hotter for research. This means that articles with performance, vegetable, practice and research have not been carried out much. Research on the following topics will only be carried out in 2021, even though the data included in this bibliometric research uses article data until 2023. This shows that in 2023, this research has never been done.



**Fig. 2.** Overlay Visualization

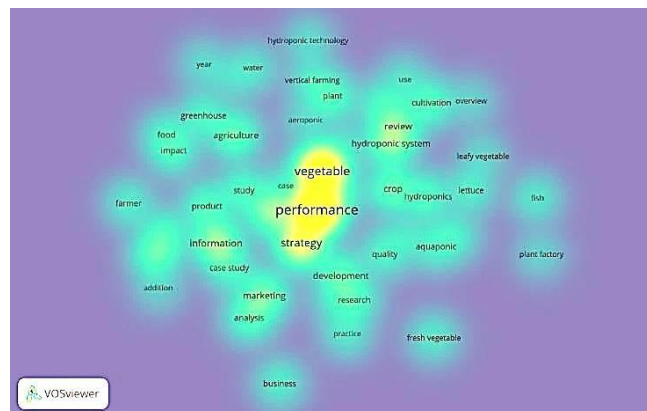
The research development trend from 2018 - 2023 is quite decreasing. The highest number of publications occurred in 2015, namely 74 publications (see Fig. 3).



**Fig. 3.** Research Trends on Marketing Strategies for Hydroponic Vegetable Products to Improve Marketing Performance based on Digital Technology from 2018 - 2023.

### 3) Density Visualization

Performance keyword density is analyzed using density visualization. The colors that show up in the Density Visualization graphic represent the most often researched subjects. Researchers most frequently employ brilliant yellow as their research topic, with veggies, performance, and strategy being among them. The yellow hue, which is becoming less intense, indicates that study on this subject which includes hydroponic technology, agriculture, and vertical farming is still seldom ever conducted (see Fig. 4).



**Fig. 4.** Density Visualization

### B. Discussion

The terms "veggies," "performance," and "strategy" are the subjects of the vast majority of research papers in the discipline. Agricultural laborers seem to have been the focus of a lot of study between 2000 and 2009. The fact that agriculture is seen as low-paying, labor-intensive,

and capital-intensive [31,32], and thus less appealing to the younger generation, may account for this interest in the themes. Additionally, the subject of agricultural laborers was strongly linked to "crop-production," which is covered under automation and robotics in agriculture. This might be because of the process of agricultural mechanization that is leading to a significant loss of jobs [33,34]. We also believe that the broad knowledge gap on agricultural laborers should be the focus of study.

The integration of e-commerce in agricultural product marketing has gained momentum in the digital era, reshaping how farmers and agribusinesses interact with consumers and markets. As the field develops, new research trends are emerging that reflect the dynamic nature of agricultural marketing in the digital era. In conclusion, the e-commerce landscape in marketing agricultural products is evolving rapidly, opening new avenues for research and innovation. This emerging trend highlights the interdisciplinary nature of the field, spanning technology, consumer behavior, sustainability, policy, and more. By staying abreast of these trends, researchers, professionals, and legislators can aid in the progress of e-commerce strategies that increase the efficiency, accessibility, and sustainability of agricultural marketing in the digital era.

The application of digital technology-based marketing strategies shows great potential in improving the marketing performance of hydroponic vegetable products. However, challenges faced include gaps in digital access and skills among agricultural industry players. Small farmers do indeed face unique challenges when adopting digital marketing compared to larger-scale agricultural operations. These challenges arise from differences in resources, knowledge, and market reach [35]. Some key challenges that small farmers encounter include limited resource [36], lack of technical expertise [37], time constraint and smaller market reach [38]. Adoption rates for all technologies sampled lag clearly behind those in many other large-scale agricultural regions worldwide. It would be inaccurate to characterize Bavarian farmers as highly digitalized. Adoption rates are rarely in the double digits, with the exception of smart technologies like trade and communication platforms or forecast applications. The adoption rates of barn cameras, farm management information systems, and behavioural monitoring sensors do not surpass 17% in the cattle industry, which has a higher proportion of full-time farms. A few digital and PA technologies, with possible adoption rates of 15 - 20% over the next five years, including section control, barn robots, variable-rate applications, and maps derived from satellite data [39].

The government must work together in this endeavour, educational institutions and other stakeholders to ensure that all parties can adopt and make good use of digital technology.

#### **4. Conclusion**

In the context of marketing hydroponic vegetable products, the implementation of digital technology-based strategies has proven effective in improving marketing performance. By utilizing several digital channels, including social media, websites, and e-commerce, manufacturers can increase product visibility, reach a wider market, and increase customer engagement. In addition, the use of analytical technology allows businesses to understand consumer behavior more deeply and optimize their marketing strategies.

In conclusion, adopting a marketing strategy based on digital technology is a must for hydroponic vegetable producers who want to remain competitive in an increasingly competitive market. However, challenges such as the digital divide and costs of implementing

technology need to be addressed with support from governments, educational institutions and other stakeholders. In this way, the hydroponic vegetable industry can continue to develop and make a greater contribution to meeting market needs for quality agricultural products.

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