



# Level of Satisfaction and Interest in Fertilizer Use NPK 16-16-16 for Horticulture Farmers in Garut Regency, West Java Province, Indonesia

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**Abstract.** Synthetic fertilizers, usually called NPK fertilizers, are commonly used by farmers to meet the nutrient requirements of plants. Horticultural farmers depend on fertilizers to produce high-quality products. There are many types of NPK fertilizers, one of which is NPK 16-16-16, which is widely used by horticultural farmers. The aim of this research is to analyze the level of satisfaction and interest in using NPK 16-16-16 fertilizer among horticultural farmers in the Garut Regency. The number of respondents was 80 horticultural farmers in the Garut Regency. The data were analyzed using the Customer Satisfaction Index and Importance Performance. Eighteen attributes are used to assess the importance and satisfaction attached to NPK 16-16-16 fertilizer, which are grouped into tangible, reliability, responsiveness, and assurance dimensions. The results showed that the farmer satisfaction value was 71.51%, indicating that farmers were satisfied with the performance of the attributes, namely Brand, Composition, Ease of Use, Dosage, Production Results, Quality of Production Results and Resistance to pests and diseases. Performance that needs to be a top priority for improvement is price, bonuses/gifts/vouchers, and the availability of assistant staff/sales performance attributes.

**Keywords:** CSI, IPA, NPK Fertilizer 16-16-16.

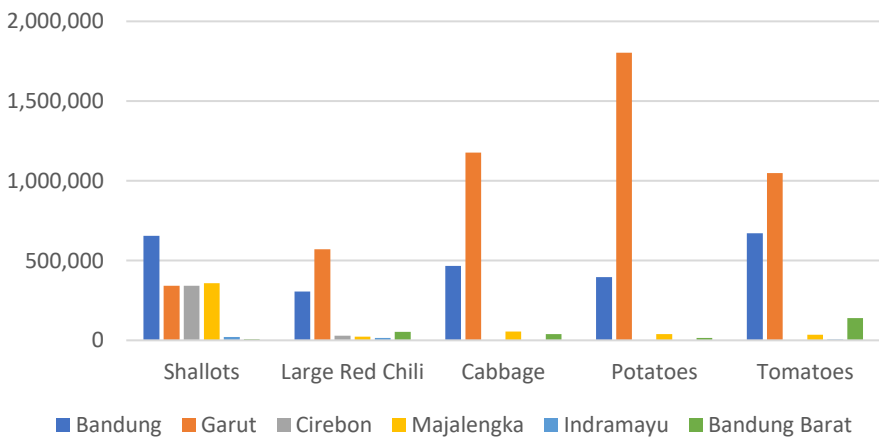
## 1 Introduction

Horticultural crops, consisting of vegetables and fruits, are agricultural commodities that play an important role in the Indonesian economy. They play a strategic role as a source of nutritious food rich in vitamins and minerals for the community, income and employment opportunities, foreign exchange for the country (exports), and raw materials for the agro-industry. However, the conversion of agricultural land to residential land is increasing, while consumer demand for the quality and production of agricultural products continues to increase, which is a challenge in increasing vegetable and fruit production. One effort to increase the production and productivity of horticultural crops is to provide fertilizer recommendations for horticultural crops [1].

Fertilizers are the basic elements that must be used in agricultural cultivation. Plants that are properly fertilized produce more fruits, flowers, or leaves depending on the type of plant, including horticultural crops, where productivity is highly valued. Fertilizers play an important role, because without fertilizer, the farming activities carried out will not meet the farmers' expectations, which will ultimately affect their income level [2].

There are many varieties and types of fertilizers on the market; however, compound fertilizer, also known as NPK fertilizer, is the most sought after, and contains three main nutrients, namely nitrogen (N), phosphorus (P), and potassium (K). The use of compound fertilizer is more efficient because plants can obtain three important nutrients at once with only one application, which can save time and energy and minimize the need for additional or separate fertilization for each nutrient. There are many types of NPK fertilizer on the market, one of them is NPK 16:16:16. This fertilizer contains a balanced proportion of nitrogen, phosphorus, and K, which is suitable for many types of plants at various stages of growth. This combination provides a good balance for overall plant growth, for leaves, roots, and fruits. Because it is in granular form, this fertilizer easily dissolves in the soil, making it easier for plant roots to absorb and be neutral or does not acidify the soil [3].

Garut Regency is the center of horticultural production in West Java, where superior crops with the highest yield of large chilies, cabbage, potatoes, and tomatoes are grown. The production of the five vegetables and the highest Regencies in West Java are presented in Fig. 1.



**Fig. 1.** Production (quintal) of five types of vegetables and production Regencies in 2024 in West Java [4].

High vegetable crop production, apart from being determined by land area, also results from fertilizer use. Using higher levels of mineral fertilizers (150:150:90 kg NPK per ha) with high-yielding and well-adapted potato varieties significantly enhances the

growth, yield, and profitability of potato cultivation [5]. Vegetable farmers generally use large amounts of fertilizer because they perceive that it would always double their yields. The high usage of fertilizer by farmers certainly increases the demand for fertilizer. The high demand for fertilizer is an opportunity for fertilizer-producing companies to compete with farmers as consumers. Various efforts are being made to encourage farmers to adopt the fertilizer they produce. Farmers' willingness to adopt fertilizer is largely determined by their satisfaction felt by the farmer. Farmer satisfaction depends on the comparison between predicted and expected performance. Consumer satisfaction is one of the company's goals to determine the extent of the effect of the company's products. Satisfied consumers are usually loyal to a company's products [6]. The choice of NPK 16-16-16 fertilizer by farmers is worthy of research, whether the attributes of this fertilizer are considered suitable for farmers' needs. Therefore, the aim of this research is to identify the characteristics of horticultural farmers who use NPK 16-16-16 fertilizer, analyze differences in farmer satisfaction levels with the level of interest in NPK 16-16-16 fertilizer and analyze the attributes of NPK 16-16 fertilizer. - 16 which gives farmers satisfaction.

## 2 Methods

This research was conducted in Garut Regency, West Java, consisting of Cikajang, Cigedug, Cisarupan, Pasirwangi, and Semarang Regency, which are the top five horticulture-producing sub-districts. The selection of respondents used a purposive sampling technique, specifically for horticulture farmers who use NPK 16-16-16 fertilizer, and sampling was carried out randomly to obtain 80 farmers as respondents. Data collection used the help of tools in the form of questionnaires and interviews.

The analytical method used to measure the consumer satisfaction index for fertilizer attributes was the customer satisfaction index (CSI), which is a quantitative method used to measure the level of customer satisfaction for each attribute using a Likert scale of 1–5. Each attribute is calculated as the average score for importance and satisfaction. Then, the Weight Factor (WF) is calculated, which shows the relative weight of each attribute compared to the total weight of all attributes. After obtaining the WF value, it was multiplied by the satisfaction score of each attribute to obtain the Weighted Score (WS). CSI is the sum of the WF values of all attributes expressed as a percentage (%) with a maximum value of 100%. Important Performance Analysis (IPA) is used to assess the performance of the attributes of NPK 16-16-16 fertilizer with the main objective of identifying improvement priorities in order to increase customer satisfaction, which is depicted in four quadrants of the Cartesian Diagram, which depicts the level of satisfaction and importance of each attribute. Importance Performance Analysis (IPA) is an easy-to-apply technique for measuring the importance and satisfaction of attributes to advance the development of effective marketing programs [7].

### 3 Results and Discussion

#### 3.1 Farmer Characteristics

Respondents were mostly between 26 and 58 years old (86.3%), with the most recent education having completed high school (43.8%), where being in a productive age with fairly good education would make it easier for farmers to adopt new things, including adoption of fertilizers, which are thought to increase the production of their farms. In a previous study, age was found to be closely related to the level of farmers' productivity in carrying out a job [8]. The age of the farmer is similar to that in a previous study, where farmers aged between 35-64 years old tended to be more receptive to innovations that increased their income [9]. All respondents in this study were male (100%), which is supported by a previous study where it was stated that men are typically the backbone of the family and as the head of the household who has the responsibility to meet the family's needs by means of farming [10].

The average area of land cultivated is under 0.5 Ha (47%), but most of the land is owned (85.0%), which guarantees business certainty so that farmers cultivate it intensively. Agricultural land ownership status influences the income of farmers. A previous study stated that land ownership status is one's own, and can reduce other expenses [11]. Farming was the main occupation of respondents (96.3%), which can provide income per season of more than Rp. 62 million (66.2%) patients, respectively. Long experience in farming is under 20 years (65%), which is in accordance with the average age of many respondents (under 58 years). Farmers' independence was demonstrated by not joining farmer groups (65%). The NPK 16-16-16 fertilizer, which is widely used by farmers in Garut Regency, is the Mutiara trademark (81.3%) in 50 kg packaging (61.3%), at a price level between Rp. 700,000 – Rp. 780,000 per 50 kg, and all respondents bought kiosks in the vicinity.

#### 3.2 Customer Satisfaction Index (CSI)

Consumer (farmer) satisfaction was measured using the Customer Satisfaction Index (CSI) method, along with the average importance score and the average score for the level of satisfaction of the attributes in NPK 16-16-16 fertilizer using the CSI method.

Based on the CSI analysis, the value for NPK 16-16-16 fertilizer was 71.51%, which was obtained by dividing the total weight score value by the maximum scale used [12]. Therefore, the farmer satisfaction index is in the range of 60–80%, which means that the majority of farmers feel "unsatisfied" with the performance of these attributes. This performance is worse than that of a study in which BOC-SRF fertilizer was used, which achieved a satisfactory level of 81% [13]. The attributes of NPK 16-16-16 fertilizer that provide high satisfaction with a value above 4.00 are Brand, composition of NPK16-16-16, ease of use, fertilizer dosage, ease of product production, production results, and quality of production results.

**Table 1.** Distribution of Customer Satisfaction Index (CSI) for NPK fertilizer 16-16-16.

| No.                             | Attribute                     | Level of Importance        |                   | Satisfaction Level           |                 |
|---------------------------------|-------------------------------|----------------------------|-------------------|------------------------------|-----------------|
|                                 |                               | Mean Im-<br>portance Score | Weight<br>Factors | Mean Satis-<br>faction Score | Weight<br>Score |
| 1.                              | Brand                         | 3.78                       | 5.55              | 4.11                         | 22.81           |
| 2.                              | Packaging Form                | 2.95                       | 4.34              | 3.39                         | 14.68           |
| 3.                              | Price                         | 4.75                       | 6.98              | 2.76                         | 19.28           |
| 4.                              | Design                        | 2.88                       | 4.22              | 3.20                         | 13.52           |
| 5.                              | Label                         | 2.85                       | 4.19              | 3.16                         | 13.24           |
| 6.                              | Color of NPK 16-16-16         | 2.35                       | 3.45              | 3.11                         | 10.75           |
| 7.                              | Texture Shape                 | 2.83                       | 4.15              | 3.58                         | 14.84           |
| 8.                              | Composition NPK 16-16-16      | 4.44                       | 6.52              | 4.35                         | 28.37           |
| 9.                              | Ease of use                   | 4.46                       | 6.56              | 4.19                         | 27.46           |
| 10.                             | Fertilizer Dosage             | 4.36                       | 6.41              | 4.15                         | 26.60           |
| 11.                             | Products are easy to obtain   | 4.46                       | 6.56              | 4.16                         | 27.30           |
| 12.                             | Bonuses/Pre-sent/Voucher      | 4.23                       | 6.21              | 2.20                         | 13.66           |
| 13.                             | Information Services          | 2.75                       | 4.04              | 2.95                         | 11.92           |
| 14.                             | Company Response              | 2.76                       | 4.06              | 2.86                         | 11.62           |
| 15.                             | Sales Availability            | 3.85                       | 5.66              | 2.53                         | 14.29           |
| 16.                             | Production Results            | 4.79                       | 7.04              | 4.23                         | 29.72           |
| 17.                             | Quality of Production Results | 4.83                       | 7.09              | 4.33                         | 30.67           |
| 18.                             | Resistant to pest and disease | 4.75                       | 6.98              | 3.84                         | 26.79           |
| Total Weight Score              |                               |                            |                   |                              | 357.53          |
| Customer Satisfaction Index (%) |                               |                            |                   |                              | 71.51           |

### 3.3 Importance Performance Analysis (IPA)

IPA is used to evaluate satisfaction and performance with various product or service attributes from a consumer's perspective. For IPA, existing attributes are grouped into four Service Quality (servQual) dimensions: Tangible, Reliability, Responsiveness and Assurance [14]. The results of the analysis of the satisfaction and performance levels are presented in Table 2.

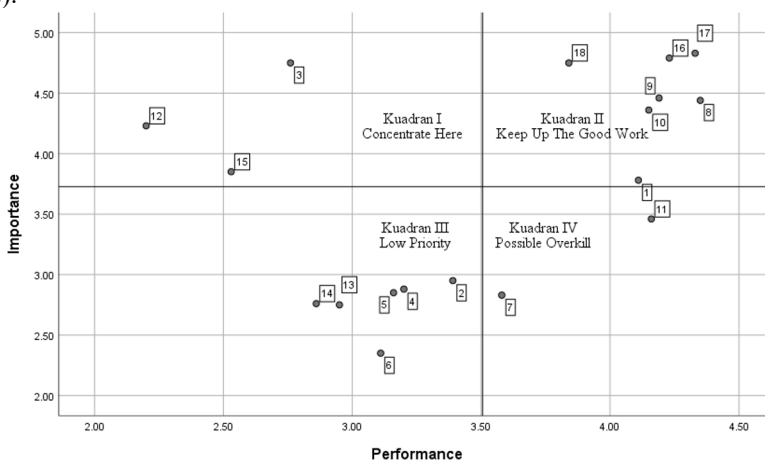
The average value of the level of importance was 3.78, whereas that of the level of satisfaction was 3.50. The attributes that had a lower satisfaction value than the importance value were price, composition, ease of use of the product, dosage of fertilizer, ease of obtaining the product, bonus/gift/voucher, availability of companions/sales, production results, quality of production results, and integrated pest and disease resistance (pests and diseases). Attributes whose level of satisfaction is lower than the level of importance must be considered to increase their value.

**Table 2.** Average satisfaction level and attribute importance score.

| No.            | Attribute                             | Level of Importance | Satisfaction Level |
|----------------|---------------------------------------|---------------------|--------------------|
| Tangible       |                                       |                     |                    |
| 1.             | Brand                                 | 3.78                | 4.11               |
| 2.             | Packaging Form                        | 2.95                | 3.39               |
| 3.             | Price                                 | 4.75                | 2.76               |
| 4.             | Design                                | 2.88                | 3.20               |
| 5.             | Label                                 | 2.85                | 3.16               |
| 6.             | Color of NPK 16-16-16                 | 2.35                | 3.11               |
| 7.             | Texture shape NPK 16-16-16            | 2.83                | 3.58               |
| 8.             | Composition NPK 16-16-16              | 4.44                | 4.35               |
| Reliability    |                                       |                     |                    |
| 9.             | Ease of use                           | 4.46                | 4.19               |
| 10.            | Fertilizer dosage                     | 4.36                | 4.15               |
| 11.            | Products are easy to obtain           | 4.46                | 4.16               |
| 12.            | Bonuses/Present/Voucher               | 4.23                | 2.20               |
| Responsiveness |                                       |                     |                    |
| 13.            | Information Services (email/phone)    | 2.75                | 2.95               |
| 14.            | Company Response                      | 2.76                | 2.86               |
| 15.            | Sales Availability                    | 3.85                | 2.53               |
| Assurance      |                                       |                     |                    |
| 16.            | Production Result                     | 4.79                | 4.23               |
| 17.            | Quality of Production                 | 4.83                | 4.33               |
| 18.            | Resistance against pests and diseases | 4.75                | 3.84               |
| Average        |                                       | 3.78                | 3.50               |

### 3.4 IPA Matrix of NPK Fertilizer Attributes 16-16-16

The IPA matrix was used to map the results of the importance and performance analysis of the NPK 16-16-16 attribute to help companies identify priorities for improvement (Fig. 2).

**Fig. 2.** Importance Performance Analysis (IPA) Matrix for NPK fertilizer 16-16-16.

The IPA matrix is mapped into four quadrants: Quadrant I (Concentrate Here) are attributes with high importance but low performance, consisting of Price, Bonuses/Gifts/Vouchers, and Availability of Assistant/Sales Personnel, which require primary attention for improvement. A previous study shows the same situation, where product prices need to improve their performance by reducing product prices at the farmer's level [15]. This is also strengthened by the results of another study, which states that there is a very important relationship between consumer satisfaction and product price [16]. Likewise, the results of this study state that this demand will almost always depend on the price of products in relation to the price of mineral fertilizers, which fluctuate [17].

Quadrant II (Keep up the Good Work) are attributes with high importance and performance, consisting of Brand, Composition of NPK 16-16-16, Ease of Product Use, Fertilizer Dosage, Production Results, Production Quality, and Resistance to HPT. These attributes meet consumer expectations and must be maintained or improved. This is the same as in previous research, where attributes of Production Results and Quality of Production Results when using BOC-SRF Biological Fertilizer have a high level of importance and performance [13] based on the level of importance and performance of product quality and service quality attributes, which means that consumer expectations are in accordance with the performance provided [18].

Quadrant III (Low Priority) are attributes with low importance and performance, consisting of Packaging Shape, Design, Label, Color NPK 16-16-16, Information Services (email/telephone), and Company Response; these attributes are not top priorities for improvement.

Quadrant IV (Possible Overkill) is an attribute with low importance but high performance, consisting of NPK 16-16-16 Texture Shape and Ease of Obtaining Products, which has exceeded consumer expectations so that the resources used can be diverted to other areas.

Managerial implications and implementation are crucial for converting IPA results into real actions that can improve organizational performance (Table 3). Managerial implications and implementation focus on quadrants I and II because in these quadrants, the attributes have high importance, which means they have a high influence on increasing the satisfaction of horticultural farmers.

The attributes in quadrants III and IV have a low level of importance in the eyes of farmers. NPK 16-16-16 fertilizer companies can improve the performance of attributes in Quadrant III, which will increase consumer satisfaction in the future. However, considering the costs incurred, this will not cause problems for NPK 16-16-16 fertilizer companies.

**Table 3.** Managerial implications and implementation.

| No. | Result                             | Implication          | Implementation                             |
|-----|------------------------------------|----------------------|--------------------------------------------|
| 1.  | Quadrant I (Top Priority)          |                      |                                            |
|     | Price                              | Improve Performance  | Determine Competitive Prices               |
|     | Bonuses/Present/Voucher            | Improve Performance  | Hold Prize Draws/discounts                 |
|     | Sales Availability                 | Improve Performance  | Providing Sales Personnel                  |
| 2.  | Quadrant II (Maintain Performance) |                      |                                            |
|     | Brand                              | Maintain Performance | Maintain Product Brand Image               |
|     | Composition                        | Maintain Performance | Maintaining the Quality of Product Content |
|     | Ease of use                        | Maintain Performance | Maintaining Performance                    |
|     | Usage dosage                       | Maintain Performance | Maintaining Performance                    |
|     | Production Result                  | Maintain Performance | Maintaining Performance                    |
|     | Quality of Production              | Maintain Performance | Maintaining Performance                    |
|     | Resistance of HPT                  | Maintain Performance | Maintaining Performance                    |
| 3.  | Quadrant III (Low priority)        |                      |                                            |
|     | Packaging Form                     | Improve Performance  | Improve Performance                        |
|     | Design                             | Improve Performance  | Improve Performance                        |
|     | Label                              | Improve Performance  | Improve Performance                        |
|     | Color                              | Improve Performance  | Improve Performance                        |
|     | Information Services               | Improve Performance  | Improve Performance                        |
|     | Company Response                   | Improve Performance  | Improve Performance                        |
| 4.  | Quadrant IV (Excessive)            |                      |                                            |
|     | Texture Shape                      | Maintain Performance | Maintaining Performance                    |
|     | Ease of obtaining                  | Maintain Performance | Maintaining Performance                    |

## 4 Conclusion

The level of satisfaction of horticultural farmers with NPK 16-16-16 fertilizer in Garut Regency was 71.51%, indicating that the majority of farmers felt "satisfied" with the performance of NPK 16-16-16 fertilizer on seven attributes: brand, Composition of NPK16-16-16, Ease of use, fertilizer dosage, ease of obtaining products, production results, and quality of production results. The attributes that met consumer expectations were Brand, NPK 16-16-16 Composition, Ease of Use of the Product, Fertilizer Dosage, Production Yield, Production Quality, and Resistance to HPT. Meanwhile, the attributes that need attention for improvement are Prices, Bonuses/Gifts/Vouchers and Availability of Assistant/Sales Personnel.

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