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Journal of Applied Engineering and Technological Science Vol 4(1) 2022 : 429-440 ANALYSIS OF KENAF FARMER’S SATISFACTION WITH CONVENTIONAL FIBER MACHINE Desrina Yusi Irawati1*, Elisabet Junita2, Agrienta Bellanov3 Departement of Industrial Engineering, Universitas Katolik Darma Cendika, Surabaya, Indonesia desrina.yusi@gmail.com Received : 31 October 2022, Revised: 08 December 2022, Accepted : 08 December 2022 *Corresponding Author ABSTRACT The Kenaf plant is a multipurpose plant because the application of its bark in the industry is very high. Indonesia has the largest kenaf plantation in Laren, Lamongan, East Java. The kenaf farmer group in Laren has used a conventional fiber machine to assist in slicing the kenaf stalks. Conventional fiber machine operated by hand. However, the fiber machine is not a priority for farmers to do weeding because the device still has many shortcomings. Therefore, it is necessary to assess the satisfaction of the kenaf farmers with the tool. This study uses the IPA-Kano method to analyze the design attributes of the conventional fiber machine to improve the quality attributes. It determines its user's performance, expectations, satisfaction, and dissatisfaction. According to the integration analysis of the IPA-Kano method, the conventional fiber machine needs to have a more robust frame, better support for the kenaf rods, the ability to leave a small amount of fiber in the kenaf sticks, good ergonomics, the ability to change the height, less fiber left at the cracker joint, and better cracker settings. Keywords: Kenaf Fiber, IPA-Kano Method, Kenaf Stem Fiber, Conventional Fiber Tool, Quality 1. Introduction Due to the extensive industrial use of the bark during the past two decades, kenaf has become well-known as a plant with multiple uses (Dilley & Morrison, 2014; Abdullahi et al., 2018;

Coetzee et al., 2008; Lim et al., 2018; Salman et al., 2017; Pirmohammad et al., 2020; Razak et al., 2018). In Laren, Lamongan Regency, East Java, kenaf is grown to a 99% extent. From year to year, there has been a decline in kenaf cultivation. In 1998, the area of kenaf cultivation reached 1500 ha. In 2018, the planted area was 800 ha, and in 2019 it decreased to 400 hav (Pangannews.id, 2021). The main reasons for the drop in planted area are climate change and the fact that the rainy season is coming later than it used to. The process of kenaf cultivation, which is influenced by weather conditions, is the process of extracting the skin of kenaf from the stems. The method of fiber in Laren is still conventionally, namely soaking the kenaf stalks and then manually tying the kenaf skin. The disadvantages of fiber in this way are that it is more suitable for waterlogged land and requires a sizeable soaking area. In addition, if it is summer, the ground needs a sufficient water supply. One of the ways to overcome this is embedding using a conventional fiber machine. The conventional fiber machine working system separates the skin from the kenaf stem and soaks the kenaf skin in water. The use of a conventional fiber machine has the advantages of reducing linting labor, reducing transportation costs, being suitable for use for kenaf cultivation in the high land, and the ease of the soaking process (Supriyadi-Tirtosuprobo, 2009). Laren's farmer group has used a conventional fiber machine for the process of graining the kenaf stalks. This tool is used by Laren farmers when the harvest location is far from standing water. However, there are other priorities than the use of a conventional fiber machine. Farmer Laren claims that the conventional fiber machine still has certain flaws, one of which is how the placement of the kenaf sticks affects how precisely the kenaf is exfoliated. Therefore, it is necessary to assess the satisfaction of the kenaf farmers with the conventional fiber machine to improve the quality attributes of the conventional fiber machine. The Importance-Performance Analysis (IPA) and Kano methods are used to analyze satisfaction. IPA is a technique for measuring user satisfaction by measuring the importance and 429 performance of each attribute (Pangannews.id, 2021; Hammitt et al., 1996). The IPA method has been widely used in assessing consumer satisfaction tests for several products (Chen et al., 2016; Han et al., 2016; Song & Bae, 2013). The disadvantage of using IPA is that IPA only considers "one dimension" component, i.e., that the level of customer satisfaction is linear with the performance of product or service attributes. On the other hand, Kano determines the quality of product or service attributes based on consumer satisfaction and dissatisfaction (Kano et al., 1984; Shahin & Zairi, 2009). The drawback of the Kano method is that it determines the quality category of product or service attributes based on customer satisfaction and dissatisfaction but ignores performance and interests, even though these two things also affect the results of attribute categorization. Despite all the advantages of the automatic fiber machines, the Laren farmer group has complained about the conventional fiber machine used. As a first step, this study analyzes the design attributes of the conventional fiber machine with the IPA-Kano integrated approach. It aims to determine the performance, expectations, satisfaction, and dissatisfaction with using a conventional fiber machine. This research is expected to be the basis for the improvement and development of the conventional fiber machine. In addition, the kenaf farmers in Laren are willing to prioritize using conventional fiber machines with various advantages. The improvement attribute can help partner companies and local governments to provide appropriate conventional fiber machine assistance to increase kenaf yields and farmers' incomes. Lamongan Regency remains the largest kenaf-producing area in Indonesia. 2. Literature Review 2.1. Kenaf Plantation Kenaf (Hibiscus cannabinus L.) is a family plant with cotton and okra (Y. F. Kuo et al., 2012). Kenaf is suitable in areas with sufficient light intensity and high rainfall. In addition, kenaf was identified as a flax substitute because it provides an excellent cellulose fiber source. In Indonesia, kenaf cultivation has been carried out on Bonorowo land (Irawati & Wulandari, 2019), tidal land (Krismawati, 2003), and red-yellow podzolic (Marjani et al., 2020). The whole process of cultivating kenaf takes about six months. Kenaf is suitable for harvesting when 50% of the kenaf population has flowered. The harvested stems are soaked (retting) for 2-3 weeks. Soaking aims to facilitate the release of the bark from the stems and cooking into fiber strands through a microbiological process. After soaking, the kenaf fiber is removed from the stem manually. The lint work should be done in the soaking pool. The kenaf skin that has been separated from the stem is then washed. Washing is carried out in running water or in a soaking pool. The washed fibers are immediately dried in the sun. Kenaf fiber will dry within 1 to 3 days. 2.2. Kenaf Plantation in Bonorowo Laren Land, Lamongan The Laren District, part of Lamongan Regency, is an area in the northern hemisphere on the banks of the Bengawan Solo River. Its location close to the Bengawan Solo River causes the land in the Laren area to be called Bonorowo land. Farmers use this condition for kenaf cultivation. The Malang-based business and the Laren kenaf farmer group collaborated so that the latter could handle the full kenaf harvest. Based on information from the head of the Laren farmer group, the area for planting kenaf has been reduced to 500–1000 hectares in the last three years. The initial step of kenaf cultivation carried out by Laren farmers is planting seeds. First, seedlings are planted by spreading the seeds. Then, to keep the soil fertile, kenaf plants are fertilized using urea. Kenaf plants also require treatment in the form of insecticides to kill caterpillars and other nuisance insects. Kenaf plants are suitable for harvesting in the range of 3.5–4 months, coinciding with the overflow of the Bengawan Solo River. This condition benefits kenaf farmers because it is helpful for the soaking stage. The harvested kenaf stalks are then soaked in the soil. After 2-3 weeks of soaking, the kenaf fibers are removed from the stems manually. The process of washing and refining the kenaf stems is an action that requires a lot of money and effort. In the past few years, only some of the land around the Bengawan Solo River was flooded during harvest time. This requires farmers to transport their harvested kenaf stalks to the soggy ground. Transportation will increase costs, as will labor and turnaround time. For this reason, for the past two years, kenaf farmers in Laren have tried to use a hand ribbon to pull the kenaf bark from the stems. The technique of weaving using a conventional fiber machine is the opposite of hand-drawn. The kenaf skin is set first with a conventional fibre machine. After that, the kenaf skin is soaked in waterlogged land. 2.3. IPA and Kano Integration Importance-Performance Analysis (IPA) analyses consumer satisfaction with products or services (Martilla & James, 1977). IPA measures satisfaction from consumer satisfaction surveys based on two attribute components: the importance of the product or service to consumers and the performance of the product or service. The intersection of importance and performance produces a two-dimensional matrix. The X-axis indicates interest, and the Y-axis indicates performance. The IPA matrix is divided into four quadrants, each based on importance and performance, high or low. Kano's model is a way to put some of a product or service's features into groups based on how well the product or service is liked and how well it meets consumer needs. The IPA-Kano integration is carried out to complement the advantages and disadvantages of the IPA and Kano methods. The aim is to improve Kano's accuracy in classifying quality attributes and cover the shortcomings of IPA in considering the quality. The IPA-Kano integration model follows the model developed by Y. Kuo et al. (2012). Many kinds of research on the integration of IPA-Kano have been carried out, including to test satisfaction in various fields, including services (Roy et al., 2020; Cheng et al., 2019; Tseng, 2020; Yin et al., 2016) and product development (Li & Xiao, 2020; Akmal et al., 2017). So far, the IPA-Kano method in the agricultural world is still limited (Ganestyani et al., 2019). From previous research, the design of the conventional fiber machine has never been done based on customer satisfaction. Previous studies have discussed the advantages of automatic fiber machines over conventional fibers (Khammueng & Krishnasreni, 1998; Das et al., 2010; Alam & Myser, 2000) and evaluated automatic fiber machines from a technical point of view (Naik & Karmakar, 2016). 3. Study Areas and Research Methods 3.1 Study Areas The most extensive distribution of kenaf in Indonesia is in Bonorowo, Laren, and Lamongan. Bonorowo land is land that becomes swamped during the rainy season. Therefore, kenaf cultivation on Bonorowo land benefits the kenaf cultivation process. However, Bonorowo land has drawbacks because the soil pH and nutrient content are low, while the Fe and aluminium content is high, so sometimes waterlogging is challenging to control. The condition of the Bonorowo land in Laren is shown in Figure 1. Fig.1. – The Study Area 3.2 Research Methods This study collected both primary and secondary data. Primary data was obtained from discussions with kenaf farmers and by filling out a questionnaire. The contents of the discussion include how to operate the conventional fiber machine, the constraints when operating the conventional fiber machine, and to determine the attributes of the conventional fiber machine. This information is used as input in making a questionnaire. The questionnaire contains six assessment aspects that are adjusted to the quality of the conventional fiber machine. Each aspect consists of several questions and attributes. The total number of question attributes is 19. The attributes assessed by respondents are presented in Table 1. The improvement attribute can help partner companies and local governments provide appropriate conventional fiber machine assistance to increase kenaf yields and farmers' incomes. Lamongan Regency remains the largest kenaf-producing area in Indonesia. These attributes are the basis for a questionnaire to obtain data on the IPA and Kano methods. The measurement scale used in filling out the questionnaire is a Likert scale from 1 to 5. The questionnaire was filled out by 35 kenaf farmers who had used the conventional fiber machine. A literature review of the conventional fiber machine and the process of growing kenaf is part of the secondary data collection. Table 1 - Attributes of Questions on The Questionnaire No Aspect Symbols Attribute 1 Economic Aspect 2 Ergonomic Aspect 3 Aspect of Durability 4 Performance Aspect 5 Aspect Features 6 Aspect Conformance X1 A conventional fiber machine's spare parts have affordable prices. X2 The price of the tool varies according to the machine's ability. X3 A conventional fiber machine has adequate ergonomic aspects. X4 A conventional fiber machine is adjustable in height. X5 A conventional fiber machine is easy to operate. X6 A conventional fiber machine has a long service life. X7 A conventional fiber machine frame is durable. X8 The material used in conventional fiber machines is strong. X9 Easy conventional fiber machine maintenance. X10 Working using a conventional fiber machine takes a relatively short time compared to the traditional method. X11 It has a lot of absorbing ability. X12 A conventional fiber engine frame leaves very little lint in the kenaf stem. X13 A conventional fiber engine frame leaves fiber at the cracker joint. X14 Process residual rods are easy to handle. X15 Provide a variety of crackers. X16 A conventional fiber machine is easy to move into position. X17 A conventional fiber machine has a kenaf stem support. X18 A conventional fiber machine is easy to fold into a smaller size. X19 A conventional fiber machine meets the specified fiber specifications. The IPA method in this study measured the satisfaction of kenaf farmers with the conventional fiber machine that had been used. Data processing includes calculating the value of performance and importance. The intersection between the value of performance and importance produces a two-dimensional matrix. The X-axis describes the importance, and the Y-axis describes performance. The IPA matrix is divided into four quadrants: quadrants 1, 2, 3, and 4. The calculation of the Kano method begins with classifying the results of the questionnaire that is filled out by farmers if the attributes are working well (functional) and if the attributes are not working well (dysfunctional) (Kano et al., 1984). Then do Kano categorization for each attribute. The Kano categories are Questionable, Reverse, Attractive, Indifferent, One Dimensional, and Must be categories. After the results of the IPA method and Kano Model are obtained, the two are integrated. The results of this integration process are categorized based on Table 2 and Figure 2 (Shahin et al., 2013). The combination of the IPA and Kano methods aims to determine several attributes that need improvement in the order of priority. All data processing is carried out using SPSS software. Table 2 - Determination of IPA-Kano integration Strategic priorities Series Categories Importance Performance Improvement Keep up the good work Hygiene (Must be) War (One dimensional) Treasure (Attractive) Survival Fatal Chronic disease Fitness Major weapon Defenseless strategy point Defenseless zone Supportive weapon Precious treasure Dusty diamond Rough stone Beginning jewellery High High Low Low High High Low Low High High Low Low High Low Low High High Low Low High High Low Low High Fig. 2. IPA - Kano Method Integration Category Matrix - 1 1 - 2 - - 2 - 3 3 - 4 - - 4 - 5 5 - 6 - - 6 4. Results and Discussions Kenaf (Hibiscus cannabinus L.) is a plant in the same family as cotton and okra (Y. F. Kuo et al., 2012). Kenaf was a flax substitute because it provides an excellent cellulose fiber source. In Indonesia, the largest kenaf cultivation is in Laren sub-district, Lamongan district, East Java province. Laren sub-district is an area in the northern part of the Bengawan Solo River. Its location close to the Bengawan Solo River causes the land in Laren to be called Bonorowo land. Farmers use this condition for kenaf cultivation. The process of turning the kenaf plant into kenaf fiber goes through the stages of harvesting, soaking, fibering, and drying. Only some land around the Bengawan Solo River was flooded during harvest time in the past few years. This requires farmers to transport their harvested kenaf stalks to waterlogged land. Transportation will increase costs, as will labor and turnaround time. For this reason, for the past 2 years, kenaf farmers in Laren have been trying to use a conventional fiber machine to pull the kenaf husk from the stems. A picture of the conventional fiber machine used by Laren kenaf farmers and the results of the fiber is presented in Figure 3 (a). Using a conventional fiber machine has several advantages, including reducing the number of workers, maximizing transportation because it only transports kenaf skin, and reducing the wet area. After all, only the skin is soaked. It does not require ballast during immersion and reduces water pollution. Fig. 3. (a) The Conventional Fiber Machine Used by Kenaf Farmers in Laren; (B) The Result of Gluing with Conventional Fiber Machine IPA is done by calculating the average value of each attribute's level of importance and level of performance. Based on the average value obtained from each attribute, the global average value for performance and importance is calculated. The average value will be the dividing line in the IPA matrix. The average values of performance and importance are presented in Table 3. After getting the average value, as shown in Table 3, the next step is to draw the IPA matrix using the instructions in Figure 4. Table 3 - Value of Importance and Performance Attribute P (Performance) I (Importance) X1 4,26 4,60 X2 3,89 4,46 X3 2,94 4,20 X4 2,37 4,31 X5 3,80 4,57 X6 4,17 4,40 X7 3,49 4,46 X8 3,66 4,60 X9 4,26 4,54 X10 3,86 4,46 X11 4,34 4,54 X12 3,37 4,09 X13 3,50 4,09 X14 4,23 4,57 X15 2,26 4,03 X16 3,60 4,63 X17 1,94 4,60 X18 3,60 4,49 X19 3,54 4,46 Total average 3,53 4,43 Fig. 4. IPA Matrix Quadrant 1 attributes have a high importance value but poor performance. This means that there is a mismatch between expectations and performance in this attribute, so these 2 attributes are priorities that must be improved. There are 11 attributes of the conventional fiber machine in quadrant 2. Attributes in quadrant 2 mean that the level of importance and performance have the same high value, meaning that the conventional fiber machine's performance has met the kenaf farmers' expectations. So, these attributes need to be maintained. The 11 attributes contained in quadrant 2 are as follows: 1. A conventional fiber machine's spare parts have affordable prices. (X1) 2. The price of the tool varies according to the machine's ability. (X2) 3. A conventional fiber machine is easy to operate. (X5) 4. The material used in conventional fiber machines is strong. (X8) 5. Easy conventional fiber machine maintenance. (X9) 6. Working using a conventional fiber machine takes a relatively short time compared to the traditional method. (X10) 7. It has a lot of absorbing ability. (X11) 8. Process residual rods are easy to handle. (X14) 9. A conventional fiber machine is easy to move into position. (X16) 10. A conventional fiber machine is easy to fold into a smaller size. (X18) 11. A conventional fiber machine meets the specified fiber specifications. (X19) Attributes in quadrant 3 are quadrants that describe the level of performance and low importance. This means that the kenaf farmers consider the attributes of the hand ribboner in quadrant 3 to be unimportant. This is an input to consider improvements to these attributes because the effect on the satisfaction of kenaf farmers is very small. There are 4 hand ribboner attributes that fall into quadrant 3, these attributes are: 1. A conventional fiber machine has adequate ergonomic aspects. (X3) 2. A conventional fiber machine is adjustable in height. (X4) 3. A conventional fiber engine frame leaves very little lint in the kenaf stem. (X12) 4. A conventional fiber engine frame leaves fiber at the cracker joint. (X13) 5. Provide a variety of crackers. (X15) Quadrant 4 means low importance and high performance. The kenaf farmers consider the conventional fiber machine attribute included in quadrant 4 to have extreme performance, but this attribute is optional. The attribute of the conventional fiber machine that belongs to quadrant 4 is that the conventional fiber machine has a long service life (X6). The data needed for Kano processing is obtained from the questionnaire results. Kano's questionnaire consists of 11 functional and 11 dysfunctional attributes. Kenaf farmers fill out the questionnaire by giving a Likert scale rating, 1 to 5 for each question item, namely: strongly disagree (1), disagree (2), neutral (3), agree (4), and strongly agree (5). The results of Kano's questionnaire were then categorized into several groups, namely a. Must-be requirements (M), One-dimensional requirements (O), Attractive requirements (A), Indifferent (I), Reverse (R), and Questionable (Q) [30]. The results of Kano processing are presented in Table 4. Based on the results of the Kano model in Table 4, information is obtained that the order of grades from the most to the least must be one-dimensional and attractive. Nine attributes are included in the must-be grade, namely attributes X5, X6, X7, X10.X11, X12, X17, X18, and X19. The must-be category indicates that the kenaf farmers are dissatisfied if the performance of the conventional fiber machine attributes is low. But the satisfaction of kenaf farmers will not increase far above neutral even though the performance of these attributes is high. There are six attributes included in the one-dimensional grade, namely attributes X2, X3, X8, X9, X14, and X16. In the one-dimensional category, the level of satisfaction of kenaf farmers is linearly related to the performance of these attributes, so if the performance of these attributes is high, it will result in high satisfaction for kenaf farmers. Attributes included in the attractive grade are 4, namely attributes X1, X4, X13, and X15. With the increase in the performance of these attributes, the satisfaction level of kenaf farmers will increase to a high level. But these things are not working as well will not make kenaf farmers feel less happy. After obtaining the IPA and Kano analyses, the next step is to integrate the IPA-Kano method. The integration of the IPA-Kano method is presented in Table 5. Table 4 – Kano Model Analysis Attribute A X1 11 X2 8 X3 12 X4 5 X5 12 X6 5 X7 9 X8 8 X9 9 X10 1 X11 5 X12 7 X13 16 X14 8 X15 11 X16 4 X17 9 X18 5 X19 7 M O 7 10 7 11 5 7 13 5 9 11 11 8 12 6 8 10 9 11 15 14 16 8 13 10 13 3 8 15 6 8 8 20 11 9 16 7 13 6 R Q 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 I Total 7 35 9 35 11 35 12 35 3 35 11 35 8 35 9 35 6 35 5 35 6 35 5 35 3 35 4 35 10 35 3 35 6 35 7 35 9 35 Table 5 – Kano Model Analysis A+M+O 28 26 24 23 32 24 27 26 29 30 29 30 32 31 25 32 29 28 26 R+Q+I Grade 7 A 9 O 11 O 12 A 3 M 11 M 8 M 9 O 6 O 5

M 6 M 5 M 3 A 4 O 10 A 3 O 6 M 7 M 9 M Attribute X1 X2 X3 X4 X5 X6 IPA Category Kano Category IPA-Kano Category 2 A Precious treasure 2 O Major Weapon 3 O Defensless zone 3 A Rough stone 2 M Survival 4 M Fitness Priority Strategy Keep up the good work Keep up the good work Improvment Improvment Keep up the good work Keep up the good work X7 1 X8 2 X9 2 X10 2 X11 2 X12 3 X13 3 X14 2 X15 3 X16 2 X17 1 X18 2 X19 2 M Fatal O Major Weapon O Major Weapon M Survival M Survival M Chronice disease A Rough stone O Major Weapon A Rough stone O Major Weapon M Fatal M Survival M Survival Improvment Keep up the good work Keep up the good work Keep up the good work Keep up the good work Improvment Improvment Keep up the good work Improvment Keep up the good work Improvment Keep up the good work Keep up the good work The chronic disease category is an attribute category that is in quadrant 3 (IPA method) and the "must be" category (Kano method). Attributes in this category are in a state that needs to be improved because even though the attributes in this category are considered unimportant, if they are ignored, they can cause a loss of confidence in the kenaf farmers. For example, one attribute in this category, the name attribute, leaves a little fiber in the kenaf stem (X12). The special treasure category is an attribute category that is in quadrant 2 (IPA method) and the "attractive" category (Kano method). Attributes in this category need to be maintained on the conventional fiber machine. There is only one thing in this category, and that is that conventional fiber machine spare parts have affordable prices (X1). The survival category is an attribute category that is in quadrant 2 (IPA method) and the "must be" category (Kano method). Attributes in this category must be maintained so as not to experience a decrease in performance. This category has five features: a conventional fiber machine is easy to use (X5); work with a conventional fiber machine takes less time than with the traditional method (X10); a conventional fiber machine can handle a lot of fiber (X11); a conventional fiber machine is easy to fold up (X18); and a conventional fiber machine meets the requirements (X19). The fatal category is an attribute category that is in quadrant 1 (IPA method) and the "must be" category (Kano method). Attributes in this category cause dissatisfaction, so follow-up improvements need to be made. There are two things in this group: a strong frame for a conventional fiber machine (X7) and a conventional fiber machine with a kenaf stem support (X17). The rough stone category is an attribute category that is in quadrant 3 (IPA method) and the "attractive" category (Kano method). Attributes in this category will later become gems or give satisfaction. This category has three attributes, including the conventional fiber machine attribute that lets you change the height (X4), leaves a little fiber at the cracker joint sometimes (X13), and has a cracker setting (X15). The fitness category is an attribute category that is in quadrant 4 (IPA method) and the "must be" category (Kano method). Attributes in this category are considered the beginning of becoming a gem or giving satisfaction. In this category, there is only one thing, which is that the conventional fiber machine has a long service life (X6). The major weapon category is an attribute category that is in quadrant 2 (IPA method) and the "one-dimensional" category (Kano method). Aspects in this area must be looked for to compete with opponents and maintain a strong performance. This category has five attributes: tool price based on the machine's capabilities (X2), strong material for conventional fiber machines (X8), easy maintenance for conventional fiber machines (X9), easy handling of leftover rods (X14), and easy to move conventional fiber machine position (X16). The defenseless zone category is an attribute category that is in quadrant 3 (IPA method) and the "one-dimensional" category (Kano method). The attributes in this category need to be improved so that the kenaf farmers are satisfied with the performance of the conventional fiber machine. This category has one attribute, the "conventional fiber machine," that has good ergonomic features (X3). The results of the IPA-Kano integration show that seven attributes fall into the category of those that need to be improved. The seven attributes that need to be improved, in order of priority, are as follows: 1. A conventional fiber machine frame is durable. (X7) 2. A conventional fiber machine has a kenaf stem support. (X17) 3. A conventional fiber engine frame leaves very little lint in the kenaf stem. (X12) 4. A conventional fiber machine has adequate ergonomic aspects. (X3) 5. A conventional fiber machine is adjustable in height. (X4) 6. A conventional fiber engine frame leaves fiber at the cracker joint. (X13) 7. Provide a variety of crackers. (X15) 5. Conclusion Based on the integration analysis of the IPA-Kano method, the attributes of the conventional fiber machine that need to be improved are: the sturdy conventional fiber machine frame; the conventional fiber machine kenaf rod support; leaving a little fiber in the kenaf sticks; the conventional fiber machine has adequate ergonomic aspects; the conventional fiber machine is adjustable in height; occasionally leaves a little fiber at the cracker joint; and having cracker settings. References Abdullahi, T., Harun, Z., Othman, M. H. D., Aminu, N., Gabriel, O., Aminu, T., Ibrahim, S. 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ANALYSIS OF KENAF FARMER'S SATISFACTION WITH CONVENTIONAL FIBER MACHINE

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ABSTRACT
The Kenaf plant is a multipurpose plant because the application of its bark in the industry is very high. Indonesia has the largest kenaf plantation in Laren, Lamongan, East Java. The kenaf farmer group in Laren has used a conventional fiber machine to assist in slicing the kenaf stalks. Conventional fiber machine operated by hand. However, the fiber machine is not a priority for farmers to do weeding because the device still has many shortcomings. Therefore, it is necessary to assess the satisfaction of the kenaf farmers with the tool. This study uses the IPA-Kano method to analyze the design attributes of the conventional fiber machine to improve the quality attributes. It determines its user's performance, expectations, satisfaction, and dissatisfaction. According to the integration analysis of the IPA-Kano method, the conventional fiber machine needs to have a more robust frame, better support for the kenaf rods, the ability to leave a small amount of fiber in the kenaf sticks, good ergonomics, the ability to change the height, less fiber left at the cracker joint, and better cracker settings.

Keywords: *Kenaf Fiber, IPA-Kano Method, Kenaf Stem Fiber, Conventional Fiber Tool, Quality*

1. Introduction

Due to the extensive industrial use of the bark during the past two decades, kenaf has become well-known as a plant with multiple uses (Dilley & Morrison, 2014; Abdullahi et al., 2018; Coetzee et al., 2008; Lim et al., 2018; Salman et al., 2017; Pirmohammad et al., 2020; Razak et al., 2018). In Laren, Lamongan Regency, East Java, kenaf is grown to a 99% extent. From year to year, there has been a decline in kenaf cultivation. In 1998, the area of kenaf cultivation reached 1500 ha. In 2018, the planted area was 800 ha, and in 2019 it decreased to 400 hav (Pangannews.id, 2021). The main reasons for the drop in planted area are climate change and the fact that the rainy season is coming later than it used to.

The process of kenaf cultivation, which is influenced by weather conditions, is the process of extracting the skin of kenaf from the stems. The method of fiber in Laren is still conventionally, namely soaking the kenaf stalks and then manually tying the kenaf skin. The disadvantages of fiber in this way are that it is more suitable for waterlogged land and requires a sizeable soaking area. In addition, if it is summer, the ground needs a sufficient water supply. One of the ways to overcome this is embedding using a conventional fiber machine. The conventional fiber machine working system separates the skin from the kenaf stem and soaks the kenaf skin in water. The use of a conventional fiber machine has the advantages of reducing linting labor, reducing transportation costs, being suitable for use for kenaf cultivation in the high land, and the ease of the soaking process (Supriyadi-Tirtosuprobo, 2009).

Laren's farmer group has used a conventional fiber machine for the process of graining the kenaf stalks. This tool is used by Laren farmers when the harvest location is far from standing water. However, there are other priorities than the use of a conventional fiber machine. Farmer Laren claims that the conventional fiber machine still has certain flaws, one of which is how the placement of the kenaf sticks affects how precisely the kenaf is exfoliated. Therefore, it is necessary to assess the satisfaction of the kenaf farmers with the conventional fiber machine to improve the quality attributes of the conventional fiber machine.

The Importance-Performance Analysis (IPA) and Kano methods are used to analyze satisfaction. IPA is a technique for measuring user satisfaction by measuring the importance and performance of each attribute (Pangannews.id, 2021; Hammitt et al., 1996). The IPA method has been widely used in assessing consumer satisfaction tests for several products (Chen et al., 2016; Han et al., 2016; Song & Bae, 2013). The disadvantage of using IPA is that IPA only considers "one dimension" component, i.e., that the level of customer satisfaction is linear with the performance of product or service attributes. On the other hand, Kano determines the quality of product or service attributes based on consumer satisfaction and dissatisfaction (Kano et al., 1984; Shahin & Zairi, 2009). The drawback of the Kano method is that it determines the quality category of product or service attributes based on customer satisfaction and dissatisfaction but ignores performance and interests, even though these two things also affect the results of attribute categorization.

Despite all the advantages of the automatic fiber machines, the Laren farmer group has complained about the conventional fiber machine used. As a first step, this study analyzes the design attributes of the conventional fiber machine with the IPA-Kano integrated approach. It aims to determine the performance, expectations, satisfaction, and dissatisfaction with using a conventional fiber machine. This research is expected to be the basis for the improvement and development of the conventional fiber machine. In addition, the kenaf farmers in Laren are willing to prioritize using conventional fiber machines with various advantages. The improvement attribute can help partner companies and local governments to provide appropriate conventional fiber machine assistance to increase kenaf yields and farmers' incomes. Lamongan Regency remains the largest kenaf-producing area in Indonesia.

2. Literature Review

2.1. Kenaf Plantation

Kenaf (Hibiscus cannabinus L.) is a family plant with cotton and okra (Y. F. Kuo et al., 2012). Kenaf is suitable in areas with sufficient light intensity and high rainfall. In addition, kenaf was identified as a flax substitute because it provides an excellent cellulose fiber source. In Indonesia, kenaf cultivation has been carried out on Bonorowo land (Irawati & Wulandari, 2019), tidal land (Krismawati, 2003), and red-yellow podzolic (Marjani et al., 2020).

The whole process of cultivating kenaf takes about six months. Kenaf is suitable for harvesting when 50% of the kenaf population has flowered. The harvested stems are soaked (retting) for 2-3 weeks. Soaking aims to facilitate the release of the bark from the stems and cooking into fiber strands through a microbiological process. After soaking, the kenaf fiber is removed from the stem manually. The lint work should be done in the soaking pool. The kenaf skin that has been separated from the stem is then washed. Washing is carried out in running water or in a soaking pool. The washed fibers are immediately dried in the sun. Kenaf fiber will dry within 1 to 3 days.

2.2. Kenaf Plantation in Bonorowo Laren Land, Lamongan

The Laren District, part of Lamongan Regency, is an area in the northern hemisphere on the banks of the Bengawan Solo River. Its location close to the Bengawan Solo River causes the land in the Laren area to be called Bonorowo land. Farmers use this condition for kenaf cultivation. The Malang-based business and the Laren kenaf farmer group collaborated so that the latter could handle the full kenaf harvest. Based on information from the head of the Laren farmer group, the area for planting kenaf has been reduced to 500–1000 hectares in the last three years.

The initial step of kenaf cultivation carried out by Laren farmers is planting seeds. First, seedlings are planted by spreading the seeds. Then, to keep the soil fertile, kenaf plants are fertilized using urea. Kenaf plants also require treatment in the form of insecticides to kill caterpillars and other nuisance insects. Kenaf plants are suitable for harvesting in the range of 3.5–4 months, coinciding with the overflow of the Bengawan Solo River. This condition benefits kenaf farmers because it is helpful for the soaking stage. The harvested kenaf stalks are then soaked in the soil. After 2-3 weeks of soaking, the kenaf fibers are removed from the stems manually. The process of washing and refining the kenaf stems is an action that requires a lot of money and effort.

In the past few years, only some of the land around the Bengawan Solo River was flooded during harvest time. This requires farmers to transport their harvested kenaf stalks to the soggy ground. Transportation will increase costs, as will labor and turnaround time. For this reason, for the past two years, kenaf farmers in Laren have tried to use a hand ribbon to pull the kenaf bark from the stems. The technique of weaving using a conventional fiber machine is the opposite of hand-drawn. The kenaf skin is set first with a conventional fibre machine. After that, the kenaf skin is soaked in waterlogged land.

2.3. IPA and Kano Integration

Importance-Performance Analysis (IPA) analyses consumer satisfaction with products or services (Martilla & James, 1977). IPA measures satisfaction from consumer satisfaction surveys based on two attribute components: the importance of the product or service to consumers and the performance of the product or service. The intersection of importance and performance produces a two-dimensional matrix. The X-axis indicates interest, and the Y-axis indicates performance. The IPA matrix is divided into four quadrants, each based on importance and performance, high or low. Kano's model is a way to put some of a product or service's features into groups based on how well the product or service is liked and how well it meets consumer needs.

The IPA-Kano integration is carried out to complement the advantages and disadvantages of the IPA and Kano methods. The aim is to improve Kano's accuracy in classifying quality attributes and cover the shortcomings of IPA in considering the quality. The IPA-Kano integration model follows the model developed by Y. Kuo et al. (2012). Many kinds of research on the integration of IPA-Kano have been carried out, including to test satisfaction in various fields, including services (Roy et al., 2020; Cheng et al., 2019; Tseng, 2020; Yin et al., 2016) and product development (Li & Xiao, 2020; Akmal et al., 2017). So far, the IPA-Kano method in the agricultural world is still limited (Ganestyani et al., 2019). From previous research, the design of the conventional fiber machine has never been done based on customer satisfaction. Previous studies have discussed the advantages of automatic fiber machines over conventional fibers (Khammueng & Krishnasreni, 1998; Das et al., 2010; Alam & Myser, 2000) and evaluated automatic fiber machines from a technical point of view (Naik & Karmakar, 2016).

3. Study Areas and Research Methods

3.1 Study Areas

The most extensive distribution of kenaf in Indonesia is in Bonorowo, Laren, and Lamongan. Bonorowo land is land that becomes swamped during the rainy season. Therefore, kenaf cultivation on Bonorowo land benefits the kenaf cultivation process. However, Bonorowo land has drawbacks because the soil pH and nutrient content are low, while the Fe and aluminium content is high, so sometimes waterlogging is challenging to control. The condition of the Bonorowo land in Laren is shown in Figure 1.

Fig.1. – The Study Area

3.2 Research Methods

This study collected both primary and secondary data. Primary data was obtained from discussions with kenaf farmers and by filling out a questionnaire. The contents of the discussion include how to operate the conventional fiber machine, the constraints when operating the conventional fiber machine, and to determine the attributes of the conventional fiber machine. This information is used as input in making a questionnaire. The questionnaire contains six assessment aspects that are adjusted to the quality of the conventional fiber machine. Each aspect consists of several questions and attributes. The total number of question attributes is 19. The attributes assessed by respondents are presented in Table 1.

The improvement attribute can help partner companies and local governments provide appropriate conventional fiber machine assistance to increase kenaf yields and farmers' incomes. Lamongan Regency remains the largest kenaf-producing area in Indonesia. These attributes are the basis for a questionnaire to obtain data on the IPA and Kano methods. The measurement scale used in filling out the questionnaire is a Likert scale from 1 to 5. The questionnaire was filled out by 35 kenaf farmers who had used the conventional fiber machine. A literature review of the conventional fiber machine and the process of growing kenaf is part of the secondary data collection.

Table 1 - Attributes of Questions on The Questionnaire

No	Aspect	Symbols	Attribute
1	Economic Aspect	X1	A conventional fiber machine's spare parts have affordable prices.
		X2	The price of the tool varies according to the machine's ability.
2	Ergonomic Aspect	X3	A conventional fiber machine has adequate ergonomic aspects.
		X4	A conventional fiber machine is adjustable in height.
		X5	A conventional fiber machine is easy to operate.
3	Aspect of Durability	X6	A conventional fiber machine has a long service life.
		X7	A conventional fiber machine frame is durable.
		X8	The material used in conventional fiber machines is strong.
		X9	Easy conventional fiber machine maintenance.
4	Performance Aspect	X10	Working using a conventional fiber machine takes a relatively short time compared to the traditional method.
		X11	It has a lot of absorbing ability.
		X12	A conventional fiber engine frame leaves very little lint in the kenaf stem.
		X13	A conventional fiber engine frame leaves fiber at the cracker joint.
		X14	Process residual rods are easy to handle.
5	Aspect Features	X15	Provide a variety of crackers.
		X16	A conventional fiber machine is easy to move into position.
		X17	A conventional fiber machine has a kenaf stem support.
		X18	A conventional fiber machine is easy to fold into a smaller size.
6	Aspect Conformance	X19	A conventional fiber machine meets the specified fiber specifications.

The IPA method in this study measured the satisfaction of kenaf farmers with the conventional fiber machine that had been used. Data processing includes calculating the value of performance and importance. The intersection between the value of performance and importance produces a two-dimensional matrix. The X-axis describes the importance, and the Y-axis describes performance. The IPA matrix is divided into four quadrants: quadrants 1, 2, 3, and 4. The calculation of the Kano method begins with classifying the results of the questionnaire that is filled out by farmers if the attributes are working well (functional) and if the attributes are not working well (dysfunctional) (Kano et al., 1984). Then do Kano categorization for each attribute.

The Kano categories are Questionable, Reverse, Attractive, Indifferent, One Dimensional, and Must be categories. After the results of the IPA method and Kano Model are obtained, the two are integrated. The results of this integration process are categorized based on Table 2 and Figure 2 (Shahin et al., 2013). The combination of the IPA and Kano methods aims to determine several attributes that need improvement in the order of priority. All data processing is carried out using SPSS software.

Table 2 - Determination of IPA-Kano integration

	Strategic priorities

Series	Categories	Importance	Performance	Improvement	Keep up the good work
Hygiene (Must be)	Survival	High	High	-	1
	Fatal	High	Low	1	-
	Chronic disease	Low	Low	2	-
	Fitness	Low	High	-	2
War (One dimensional)	Major weapon	High	High	-	3
	Defenseless strategy point	High	Low	3	-
	Defenseless zone	Low	Low	4	-
	Supportive weapon	Low	High	-	4
Treasure (Attractive)	Precious treasure	High	High	-	5
	Dusty diamond	High	Low	5	-
	Rough stone	Low	Low	6	-
	Beginning jewellery	Low	High	-	6

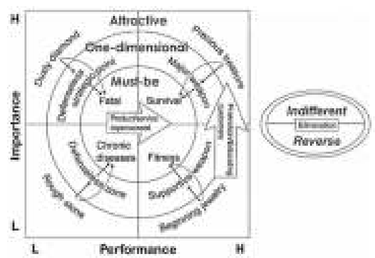

Fig. 2. IPA - Kano Method Integration Category Matrix

4. Results and Discussions

Kenaf (Hibiscus cannabinus L.) is a plant in the same family as cotton and okra (Y. F. Kuo et al., 2012). Kenaf was a flax substitute because it provides an excellent cellulose fiber source. In Indonesia, the largest kenaf cultivation is in Laren sub-district, Lamongan district, East Java province. Laren sub-district is an area in the northern part of the Bengawan Solo River. Its location close to the Bengawan Solo River causes the land in Laren to be called Bonorowo land. Farmers use this condition for kenaf cultivation. The process of turning the kenaf plant into kenaf fiber goes through the stages of harvesting, soaking, fibering, and drying.

Only some land around the Bengawan Solo River was flooded during harvest time in the past few years. This requires farmers to transport their harvested kenaf stalks to waterlogged land. Transportation will increase costs, as will labor and turnaround time. For this reason, for the past 2 years, kenaf farmers in Laren have been trying to use a conventional fiber machine to pull the kenaf husk from the stems. A picture of the conventional fiber machine used by Laren kenaf farmers and the results of the fiber is presented in Figure 3 (a). Using a conventional fiber machine has several advantages, including reducing the number of workers, maximizing transportation because it only transports kenaf skin, and reducing the wet area. After all, only the skin is soaked. It does not require ballast during immersion and reduces water pollution.

Fig. 3. (a) The Conventional Fiber Machine Used by Kenaf Farmers in Laren; (B) The Result of Gluing with Conventional Fiber Machine

IPA is done by calculating the average value of each attribute's level of importance and level of performance. Based on the average value obtained from each attribute, the global average value for performance and importance is calculated. The average value will be the dividing line in the IPA matrix. The average values of performance and importance are presented in Table 3. After getting the average value, as shown in Table 3, the next step is to draw the IPA matrix using the instructions in Figure 4.

Table 3 - Value of Importance and Performance

Attribute	P (*Performance*)	I (*Importance*)
X1	4,26	4,60
X2	3,89	4,46
X3	2,94	4,20
X4	2,37	4,31
X5	3,80	4,57
X6	4,17	4,40
X7	3,49	4,46
X8	3,66	4,60
X9	4,26	4,54
X10	3,86	4,46
X11	4,34	4,54
X12	3,37	4,09
X13	3,50	4,09
X14	4,23	4,57
X15	2,26	4,03
X16	3,60	4,63
X17	1,94	4,60
X18	3,60	4,49
X19	3,54	4,46
Total average	3,53	4,43

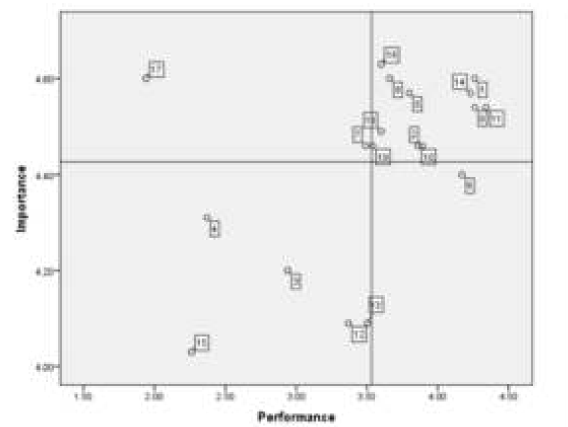

Fig. 4. IPA Matrix

Quadrant 1 attributes have a high importance value but poor performance. This means that there is a mismatch between expectations and performance in this attribute, so these 2 attributes are priorities that must be improved. There are 11 attributes of the conventional fiber machine in quadrant 2. Attributes in quadrant 2 mean that the level of importance and performance have the same high value, meaning that the conventional fiber machine's performance has met the kenaf farmers' expectations. So, these attributes need to be maintained. The 11 attributes contained in quadrant 2 are as follows:

1. A conventional fiber machine's spare parts have affordable prices. (X1)
2. The price of the tool varies according to the machine's ability. (X2)
3. A conventional fiber machine is easy to operate. (X5)
4. The material used in conventional fiber machines is strong. (X8)
5. Easy conventional fiber machine maintenance. (X9)
6. Working using a conventional fiber machine takes a relatively short time compared to the traditional method. (X10)
7. It has a lot of absorbing ability. (X11)
8. Process residual rods are easy to handle. (X14)
9. A conventional fiber machine is easy to move into position. (X16)
10. A conventional fiber machine is easy to fold into a smaller size. (X18)
11. A conventional fiber machine meets the specified fiber specifications. (X19)

Attributes in quadrant 3 are quadrants that describe the level of performance and low importance. This means that the kenaf farmers consider the attributes of the hand ribboner in quadrant 3 to be unimportant. This is an input to consider improvements to these attributes because the effect on the satisfaction of kenaf farmers is very small. There are 4 hand ribboner attributes that fall into quadrant 3, these attributes are:

1. A conventional fiber machine has adequate ergonomic aspects. (X3)
2. A conventional fiber machine is adjustable in height. (X4)
3. A conventional fiber engine frame leaves very little lint in the kenaf stem. (X12)
4. A conventional fiber engine frame leaves fiber at the cracker joint. (X13)
5. Provide a variety of crackers. (X15)

Quadrant 4 means low importance and high performance. The kenaf farmers consider the conventional fiber machine attribute included in quadrant 4 to have extreme performance, but this attribute is optional. The attribute of the conventional fiber machine that belongs to quadrant 4 is that the conventional fiber machine has a long service life (X6).

The data needed for Kano processing is obtained from the questionnaire results. Kano's questionnaire consists of 11 functional and 11 dysfunctional attributes. Kenaf farmers fill out the questionnaire by giving a Likert scale rating, 1 to 5 for each question item, namely: strongly disagree (1), disagree (2), neutral (3), agree (4), and strongly agree (5). The results of Kano's questionnaire were then categorized into several groups, namely a. Must-be requirements (M), One-dimensional requirements (O), Attractive requirements (A), Indifferent (I), Reverse (R), and Questionable (Q) [30]. The results of Kano processing are presented in Table 4.

Based on the results of the Kano model in Table 4, information is obtained that the order of grades from the most to the least must be one-dimensional and attractive. Nine attributes are included in the must-be grade, namely attributes X5, X6, X7, X10.X11, X12, X17, X18, and X19. The must-be category indicates that the kenaf farmers are dissatisfied if the performance of the conventional fiber machine attributes is low. But the satisfaction of kenaf farmers will not increase far above neutral even though the performance of these attributes is high. There are six attributes included in the one-dimensional grade, namely attributes X2, X3, X8, X9, X14, and X16. In the one-dimensional category, the level of satisfaction of kenaf farmers is linearly related to the performance of these attributes, so if the performance of these attributes is high, it will result in high satisfaction for kenaf farmers. Attributes included in the attractive grade are 4, namely attributes X1, X4, X13, and X15. With the increase in the performance of these attributes, the satisfaction level of kenaf farmers will increase to a high level. But these things are not working as well will not make kenaf farmers feel less happy.

After obtaining the IPA and Kano analyses, the next step is to integrate the IPA-Kano method. The integration of the IPA-Kano method is presented in Table 5.

Table 4 – Kano Model Analysis

Attribute	A	M	O	R	Q	I	Total	A+M+O	R+Q+I	*Grade*
X1	11	7	10	0	0	7	35	28	7	A
X2	8	7	11	0	0	9	35	26	9	O
X3	12	5	7	0	0	11	35	24	11	O
X4	5	13	5	0	0	12	35	23	12	A
X5	12	9	11	0	0	3	35	32	3	M
X6	5	11	8	0	0	11	35	24	11	M
X7	9	12	6	0	0	8	35	27	8	M
X8	8	8	10	0	0	9	35	26	9	O
X9	9	9	11	0	0	6	35	29	6	O
X10	1	15	14	0	0	5	35	30	5	M
X11	5	16	8	0	0	6	35	29	6	M
X12	7	13	10	0	0	5	35	30	5	M
X13	16	13	3	0	0	3	35	32	3	A
X14	8	8	15	0	0	4	35	31	4	O
X15	11	6	8	0	0	10	35	25	10	A
X16	4	8	20	0	0	3	35	32	3	O
X17	9	11	9	0	0	6	35	29	6	M
X18	5	16	7	0	0	7	35	28	7	M
X19	7	13	6	0	0	9	35	26	9	M

Table 5 – Kano Model Analysis

Attribute	IPA Category	Kano Category	IPA-Kano Category	Priority Strategy
X1	2	A	Precious treasure	Keep up the good work
X2	2	O	Major Weapon	Keep up the good work
X3	3	O	Defensless zone	Improvment
X4	3	A	Rough stone	Improvment
X5	2	M	Survival	Keep up the good work
X6	4	M	Fitness	Keep up the good work

X7	1	M	Fatal	Improvment
X8	2	O	Major Weapon	Keep up the good work
X9	2	O	Major Weapon	Keep up the good work
X10	2	M	Survival	Keep up the good work
X11	2	M	Survival	Keep up the good work
X12	3	M	Chronice disease	Improvment
X13	3	A	Rough stone	Improvment
X14	2	O	Major Weapon	Keep up the good work
X15	3	A	Rough stone	Improvment
X16	2	O	Major Weapon	Keep up the good work
X17	1	M	Fatal	Improvment
X18	2	M	Survival	Keep up the good work
X19	2	M	Survival	Keep up the good work

The chronic disease category is an attribute category that is in quadrant 3 (IPA method) and the "must be" category (Kano method). Attributes in this category are in a state that needs to be improved because even though the attributes in this category are considered unimportant, if they are ignored, they can cause a loss of confidence in the kenaf farmers. For example, one attribute in this category, the name attribute, leaves a little fiber in the kenaf stem (X12).

The special treasure category is an attribute category that is in quadrant 2 (IPA method) and the "attractive" category (Kano method). Attributes in this category need to be maintained on the conventional fiber machine. There is only one thing in this category, and that is that conventional fiber machine spare parts have affordable prices (X1).

The survival category is an attribute category that is in quadrant 2 (IPA method) and the "must be" category (Kano method). Attributes in this category must be maintained so as not to experience a decrease in performance. This category has five features: a conventional fiber machine is easy to use (X5); work with a conventional fiber machine takes less time than with the traditional method (X10); a conventional fiber machine can handle a lot of fiber (X11); a conventional fiber machine is easy to fold up (X18); and a conventional fiber machine meets the requirements (X19).

The fatal category is an attribute category that is in quadrant 1 (IPA method) and the "must be" category (Kano method). Attributes in this category cause dissatisfaction, so follow-up improvements need to be made. There are two things in this group: a strong frame for a conventional fiber machine (X7) and a conventional fiber machine with a kenaf stem support (X17).

The rough stone category is an attribute category that is in quadrant 3 (IPA method) and the "attractive" category (Kano method). Attributes in this category will later become gems or give satisfaction. This category has three attributes, including the conventional fiber machine attribute that lets you change the height (X4), leaves a little fiber at the cracker joint sometimes (X13), and has a cracker setting (X15).

The fitness category is an attribute category that is in quadrant 4 (IPA method) and the "must be" category (Kano method). Attributes in this category are considered the beginning of becoming a gem or giving satisfaction. In this category, there is only one thing, which is that the conventional fiber machine has a long service life (X6).

The major weapon category is an attribute category that is in quadrant 2 (IPA method) and the "one-dimensional" category (Kano method). Aspects in this area must be looked for to compete with opponents and maintain a strong performance. This category has five attributes: tool price based on the machine's capabilities (X2), strong material for conventional fiber machines (X8), easy maintenance for conventional fiber machines (X9), easy handling of leftover rods (X14), and easy to move conventional fiber machine position (X16).

The defenseless zone category is an attribute category that is in quadrant 3 (IPA method) and the "one-dimensional" category (Kano method). The attributes in this category need to be improved so that the kenaf farmers are satisfied with the performance of the conventional fiber machine. This category has one attribute, the "conventional fiber machine," that has good ergonomic features (X3).

The results of the IPA-Kano integration show that seven attributes fall into the category of those that need to be improved. The seven attributes that need to be improved, in order of priority, are as follows:

1. A conventional fiber machine frame is durable. (X7)
2. A conventional fiber machine has a kenaf stem support. (X17)
3. A conventional fiber engine frame leaves very little lint in the kenaf stem. (X12)
4. A conventional fiber machine has adequate ergonomic aspects. (X3)
5. A conventional fiber machine is adjustable in height. (X4)
6. A conventional fiber engine frame leaves fiber at the cracker joint. (X13)
7. Provide a variety of crackers. (X15)

5. Conclusion

Based on the integration analysis of the IPA-Kano method, the attributes of the conventional fiber machine that need to be improved are: the sturdy conventional fiber machine frame; the conventional fiber machine kenaf rod support; leaving a little fiber in the kenaf sticks; the conventional fiber machine has adequate ergonomic aspects; the conventional fiber machine is adjustable in height; occasionally leaves a little fiber at the cracker joint; and having cracker settings.

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