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## Implementation of Quality Management for Food Combining on Startup Business PT. Beras Jagung Nusantara

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PT. Beras Jagung Nusantara. This research aims to make the business activities to be conducted are in accordance with the plan; and to be able to find out the company's current position, the direction of the company's goals and how to achieve the target market that the company wants to achieve. This research is also influenced by the strategy that we choose. The companies must be aware due to the amount of demand for the products which are being made, by looking at market conditions and corporate strategy. The results shows the company are trying to offer Food Combining products, which are different from the products that are already on the market; both in terms of taste, quality and more affordable prices. The company's operational activities are very possible to be conducted, therefore the company can offer more competitive prices compared to the imported products that have already entered the market. This Type One Waste activity must be eliminated, or at least reduced. Type One Waste is often referred to as Incidental Activity or Incidental Work, which is a non-value adding work or activity. The next type of waste is Type Two Waste, which is an activity that does not create added value and can be eliminated immediately. For example, produce product defects or make mistakes (errors). Type Two Waste is often referred to only as 'waste', because it is wasteful and must be identified and eliminated at once. The relationship between Sigma and DPMO of PT. Beras Jagung Nusantara began in February.

**Keywords:** Food Combining, Product Defect, Six Sigma, and Waste.

### 1. INTRODUCTION

The number of world population that affected by diabetes keeps increasing. In 2000, the number of world population suffering from diabetes has reached 171,230,000 people and by 2030, it is estimated that the number of diabetics in the world would reach 366,210,100, or an increase of 114% over the past 30 years. Indonesia occupies the 4<sup>th</sup> largest place with growth of 152% or from 8,426,000 people in 2000 to 21,257 .000 people in 2030. Mining is considered as one of the main anthropogenic activities which results in environmental contamination with potentially toxic elements (PTE), including: arsenic (As), cadmium (Cd), cobalt (Co), copper (Cu), lead (Pb), manganese (Mn) and zinc (Zn) [1]. All of these PTEs represent human health risks. Inorganic As (iAs) is a highly toxic carcinogen associated with many health problems, including *cardiovascular* and *neurological* infertility and disorders [2]. Cadmium can

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cause many pathological problems such as high blood pressure, diabetes, skeletal damage and cancer [3]. In China, mining activities are mostly carried out in rural areas. As a consequence, these activities (along with other industrial processes) have caused the population of rural villages to be exposed to elevated levels of PTE (and other toxins). In 2009, journalist Deng Fei published a 'Google' map showing the number 100 "Cancer Villages" in China [4]. Recently, a map published online identified 247 "Cancer Villages" in China [5]. The negative human health impacts stemming from acute and chronic exposure to high levels of PTE are widely documented [6]. Rice (*Oryza sativa Linnaeus*) is one of the world's leading food plants, with an annual global production estimated at around 480 million metric tons (based on ground rice), and is currently cultivated in more than 100 countries on every continent except Antarctica. It is a staple food for more than half of the world's population, especially in Asian Countries where it provides the

majority of protein intake for millions of people. The total food protein production per hectare is second only to wheat, although the yield of utilisable protein is actually higher in rice than wheat, because of the superior quality of rice protein [7]. Corn is an ideal source of dietary fiber and phenolic antioxidants for human food. A number of studies support the intake of dietary fiber which sufficiently play a protective role against people with obesity and many other chronic diseases [8]. A quality control according to three different experts, the Definition of Quality Control is all efforts to guarantee (assure), so that the results of the implementation are in accordance with the predetermined plan and could satisfy consumers (1); Quality control determines which components are damaged and protects materials for future production from damage. Quality control is a tool for management to improve product quality when needed, maintain the already high quality and reduce the amount of damaged material (2); Quality in general is making products or services that are timely, suitable for use in the environment, have zero defects and satisfy consumers (3).

2. METHODOLOGY

Six Sigma is a continuous effort to reduce waste and variance, also to prevent defects. It is a business concept that seeks to answer customer's demand for the best quality and flawless business processes. Customer's satisfaction and improvement are the highest priorities, and Six Sigma tries to eliminate the uncertainty of achieving business objectives. Six Sigma is in accordance with the meaning of Sigma, which is the distribution or deployment (variation) from the average (mean) of a process or procedure. It is applied to minimize variation see (Table I).

Table I. Relationship between Sigma and DPMO

Results (Flawless probabilities)	DPMO (Defect per-Million Opportunity)	Sigma
30.9 %	690.000	1
69.2 %	308.000	2
93.3 %	66.800	3
99.94 %	6.210	4
99.98 %	320	5
99.9997 %	3.4	6

Six sigma as a measurement system uses Defect per Million Opportunities (DPMO) as a unit of measurement. DPMO is a good measure of product or process quality, because it correlates directly to defects, costs and wasted time. By using the ppm and sigma conversion level can be found. In addition to using the appendix as a reference to find the sigma level, the correlation between DPMO and the sigma level can be defined as follows:

$$\sigma = 0,8406 + \sqrt{29,37 - 2,221 \times \ln(DPMO)} \quad (1)$$

Six sigma is an activity carried out by all members of the company, that becomes a culture and in accordance with the company's vision and mission. This goal can be improved a business process efficiency and satisfy customer's demand due to increasing the company's value. The six sigma implementation strategy with referred to as The Six Sigma Breakthrough Strategy. This strategy is a systematic method that uses data collection and statistical analysis to determine sources of variation and ways to eliminate them. PT. Beras Jagung Nusantara achieved six sigma performance levels by flowing products (material, work-in-process, output) and information, using a pull system from both internal and external customers, to pursue excellence and perfection in the form of producing only 3,4 defects for every one million occasion or operation - 3,4 DPMO (See Figure 1).

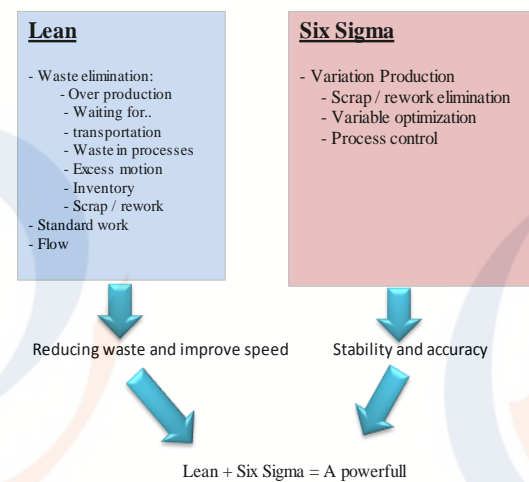


Figure 1. Lean Six Sigma

A. Business Opportunities

Corn rice has a distinctive savory taste and be able to give a full effect like rice. However, when one is eating corn rice, the stomach will not immediately satisfied; therefore, usually it will be eaten in large portions. Corn rice is now relatively more difficult to find compared to rice, but the price is much cheaper (see table II).

Table II. Problem at PT. Beras Jagung Nusantara

Problem
The increase of healthy lifestyle awareness of Indonesian people. The society is becoming more aware of the importance of healthy living
Changes in the behavior of Indonesian consumers in consuming food, the current lifestyle trend of people is that they want products that are practical and instant
Excessive consumption of rice can increase sugar levels in the body, so that it can cause various diseases
Indonesia was ranked 4th for the most diabetics in the world in 2000, at 8,426,000 people, and is expected to continue to increase with 152% growth in 2030, reaching 21,257,000 people
The cause of diabetes is unhealthy lifestyles
Based on its characteristics, the prevalence of cancer in Indonesia tends to increase with age, which is why cancer is called a degenerative disease.
Customs in consuming rice is about to be replaced by consuming corn rice.

Food Combining provides choices for people to get nutrition and fiber that have been packaged practically with ease of getting it, different sensations and delicious taste, and do not contain additives that are harmful for our body when consumed in excess. Food Combining is a solution for the efforts of healthy living, which is run by the society. This is an opportunity to learn technology, therefore corn is chosen according to food texture to maximize its taste and maintain the flavor (See Table III).

Table III. Comparison of Nutritional ingredients between Corn Rice (Combining), Red Rice (single), and White Rice (single)

No	Nutritional Content	Corn Rice (Combining)	Red Rice (Single)	White Rice (Single)
1.	Energy	150 kkal	110 kkal	204 kkal
2.	Carbohydrate	11,4 gr	22,78 gr	44,08 gr
3.	Fat	0,6 gr	0,89 gr	0,44 gr
4.	Fiber	0,4 gr	1,8 gr	0,6 gram
5.	Phosphor	47 mg	-	-
6.	Vitamin B2	0,04 mg	-	-
7.	Protein	6,8 gr	2,56 gr	4,2 gr
8.	Vitamin A	30 mg	-	-
9.	Vitamin B1	0,07 mg	-	-
10.	Vitamin B3	60 gr	-	-
11.	Vitamin C	3 gr	-	-
12.	Iron	0,3 gr	-	-
13.	Calcium	2 mg	-	-

Table IV. Opportunities

Opportunities
Policy package V is related to water management and licensing simplification at BPOM.
The rise of e-commerce will increase trade in food and beverages through these actors.
Food combining products are increasingly in demand by the public Instant lifestyle
Society's awareness in healthy lifestyle is increasing each year
The cause of diabetes is unhealthy lifestyles
The role of education in rice and corn agribusiness is high
Alternative foods for people with diabetes and for diet programs.
Corn rice markets have a broad segment

Table V. Opportunities

Threats
Competition and traffic of food and beverage products will occur due to the existence of the Asean Economic Community (MEA).
The role of banking institutions in rice and corn agribusiness is low
Competition from vegetable materials
Uncertain global economic conditions will affect raw material prices
Society could consider that corn is such a 'twopenny' food
Lack of society's interest in consuming corn rice
Limited supply of raw materials
Lack of knowledge in society about the nutritional value of corn rice
Plagiarism of corn rice products

**B. Vision and Mission of the Company**

The vision and mission of Beras Jagung Nusantara company are as follows: Beras Jagung Nusantara company's Vision: "To be the best company on a national scale in the corn rice food industry". While the company's Missions are as follows: 1) Providing natural products by

utilizing modern and hygienic technology; 2) Maintain and enhance employee potential by developing science and technology; 3) Maintaining the integrity of the company's chain.

**C. Strategy Formulation**

Strategy formulation involves setting a series of actions that are appropriate to achieve company goals [10].

Table IV. Competitive Profile Matrix of PT. Beras Jagung Nusantara

Important Success Factors	Weight	PT. Beras Jagung Nusantara		SAKURA		Reteja	
		Rank	Score	Rank	Score	Rank	Score
1. Price	0,25	4	1	4	1	3	0,75
2. Taste	0,2	4	0,8	3	0,6	4	0,8
3. Distribution	0,3	3	0,9	3	0,9	4	1,2
4. Shape	0,09	2	0,18	2	0,18	3	0,27
5. Technology	0,08	3	0,24	3	0,24	2	0,16
6. Package	0,08	3	0,24	3	0,24	2	0,16
Total	1		3,36		3,16		3,34

The scores obtained from the results of EFAS (3.03) and IFAS (3.4), therefore the position is in quadrant I (Growth).

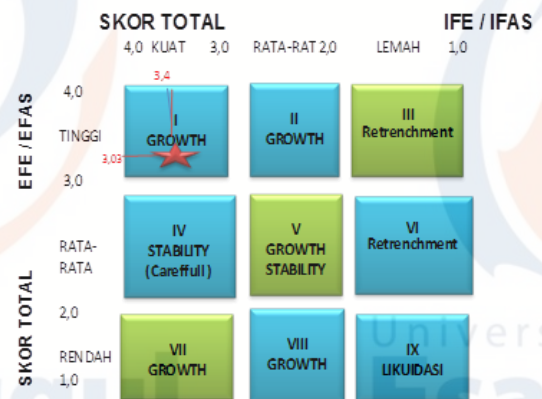


Figure 2. Internal – External (IE) Matrix

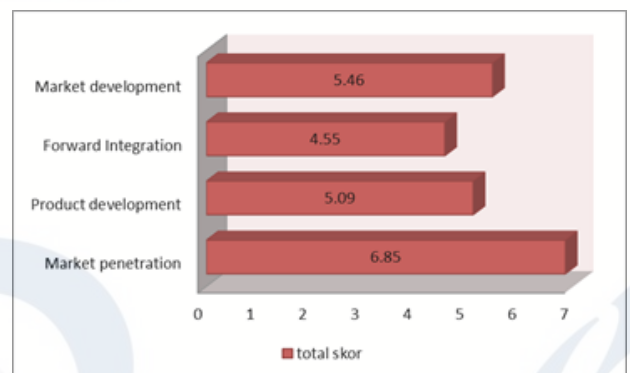


Figure 3. Company Strategy Formulation

Market Penetration, is a business effort to increase sales of products and markets that have been available through more aggressive marketing efforts. Based on the results of the above table, the calculations obtained are; Market Development (5.46), Forward Integration (4.55), Product Development (5.09), and Market Penetration (6.85).

Therefore, the strategy chosen by Market Penetration is 6.85

**3. RESULT AND DISCUSSION**

The six sigma implementation strategy is referred as a Six Sigma Breakthrough Strategy. This strategy is a systematic method that uses data collection and statistical analysis to determine sources of variation and ways to eliminate them (see Table VII).

Table VII. The Relationship between Sigma and DPMO PT. Beras Jagung Nusantara

Month	Total Product	Defective Product (U)	Disability Rate (D)	CTQ (O)	Opportunity Disability Rate	DPMO	Sigma Value
February	82.275	440	0.0053479	6	0.000891319	891.319	4.6
March	82.275	323	0.0039259	6	0.000654309	654.309	4.7
April	164.550	206	0.0012519	6	0.00020865	208.650	4.9
May	164.550	350	0.002127	6	0.0003565602	354.502	4.7
<b>Amount</b>						2108.779	
<b>Average</b>						527.195	4.7

In Table VII shows that the relationship between Sigma and DPMO of PT. Beras Jagung Nusantara, was began in February. The sigma value of 4.6 has increased in May to 4.7 The average value of PT. Beras Jagung Nusantara's sigma from February to May is 4.7 value. Cause & effect diagrams are plotted using logically arrange possible causes for a particular problem or effect, by displaying them graphically and by detailing the cause of the problem. This helps to identify the root of the cause and ensures a general understanding of the causes of the problem. Because the shape resembles fish bones, it is sometimes referred to as the "fishbone diagram". This form allows us to see how is the relationship between each cause and effect; that later could make us able to determine the classification, which related to the impact and ease for handling each cause (see Figure 4).

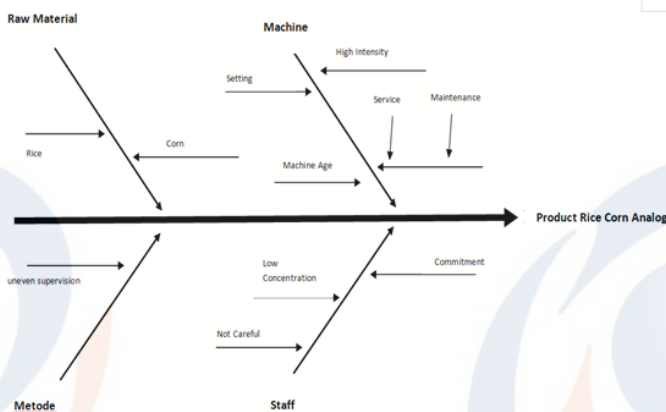


Figure 4. Fishbone diagram

However, Pareto diagrams are very helpful to describe the problems that became the priority attention. The principle is to describe the big / critical problems caused by small causes. In fact, it is called the 80/20 rule - 80% of errors/damages are caused by 20% of causes. Pareto diagram illustrates the frequency of defects / errors that are sorted in the largest order. The axis in the diagram shows the cumulative of the percentage (see Figure 5).

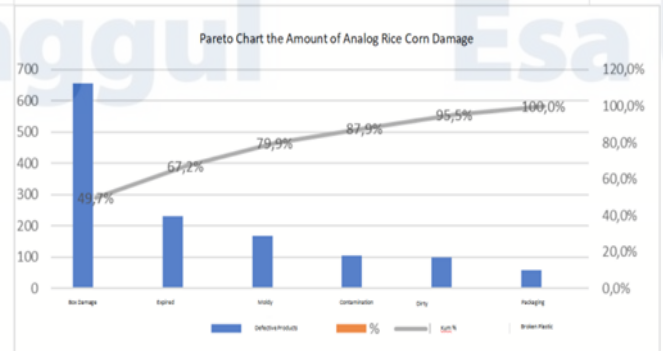


Figure 5. Pareto Chart of Damage in Analog Rice Corn

**4. CONCLUSIONS**

The company can offer more competitive prices compared to the imported products that have entered the market. The relationship between Sigma and DPMO of PT. Beras Jagung Nusantara began in February. The average value of PT. Beras Jagung Nusantara's sigma from February to May is 4.7. In improving its products, PT. Beras Jagung Nusantara must use quality raw materials, Human Resources who are experts in their fields, and more modern machines so that defective products could be reduced.

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