

**PROCEEDINGS**  
**THE INTERNATIONAL SYMPOSIUM ON**  
**AGRICULTURAL AND BIOSYSTEM ENGINEERING**



“Improving The Role of Agricultural and Biosystem Engineering Toward Food  
and Energy Self-sufficiency and Sustainable Agriculture”

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PERTETA  
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Telephone/fax : +62-274-563542

*E-mail : tep\_ftp@ugm.ac.id*

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## MESSAGE FROM THE CHAIRPERSON OF ISABE 2013

It is my honor to welcome you to the International Symposium on Agricultural and Biosystem Engineering 2013. Thank you all for gather here today at the Faculty of Agricultural Technology for attending this important meeting. The ISABE 2013 is held in August 28-29 organized by Department of Agricultural Engineering, Faculty of Agricultural Technology, Universitas Gadjah Mada and the Indonesian Society of Agricultural Engineering (PERTETA). The theme of ISABE 2013 is “Improving the role of agricultural and biosystem engineering toward food & energy self-sufficiency and sustainable agriculture”. The objectives of the symposium are to disseminate knowledge, to promote research and development, to obtain the latest information, as well as to exchange technical information in agricultural and biosystem engineering innovation. Moreover, the symposium will provide opportunity to strengthen networking among Indonesia and international academia, government and industries. The meeting will feature a series of keynote speech in plenary sessions, presentations in technical sessions, poster sessions, cultural night, as well as excursion.

I am very pleased to welcome all the guest speakers: Prof. Dongil Chang (Chungnam National University, Korea), Dr. Takashi Okayasu (Kyushu University, Japan), Prof. Vinod Jindal (Mahidol University, Thailand), Ir. Patrick van Schijndel (Eindhoven University of Technology, Netherlands), Prof. Kenan Peker (Selcuk University, Turkey), Prof. Fajrettin Korkmaz (Ataturk University, Turkey), as well as Dr. Lilik Sutiarto (Universitas Gadjah Mada, Indonesia). And joining us to deliver a congratulatory speech is Prof. Seung-Je Park (President of Korean Society for Agricultural Machinery, KSAM). Thank you very much for all of you for your contribution in this symposium.

I am also pleased to greet participants of 92 selected papers, among them are 8 papers from Korea, 6 from Japan, 1 from Taiwan, 1 from Austria, 1 from Thailand, and the remaining 75 papers are from Indonesia, as well as 3 posters. For delegates who do not present papers, thank you for your participants. I hope you can enjoy all the agenda.

I would like to express my sincere gratitude to all colleagues, sponsors, organizing committee, steering committee for their support and cooperation for making this event successfully performed.

Finally, thank you again for your participation and welcome to the ISABE 2013 meeting.

Chairperson of ISABE 2013  
Dr. Rudiati Evi Masithoh

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## The Role of Seed Producer in Maintaining Corn Production Sustainability

Winda Amilia<sup>1</sup> Didik Purwadi<sup>2</sup> and Henry Yuliando<sup>2</sup>

<sup>1</sup>Faculty of Agricultural Technology, Jember University

<sup>2</sup>Faculty of Agricultural Technology – Universitas Gadjah Mada

### Abstract

Farmers are entrepreneurs who are realistic about the economic value of products their grown. Food sustainability could be achieved through farmers participation in corn cultivation. The commodities economic value supported by the quality of seeds which suitable to farmers' wants and needs. One commodity that has a high economic value is corn used for staple food for some society of Indonesia and developed as an alternative fuel. Success factor in corn cultivation is the participation of seed producers and farmers. The producers' ability in producing good seeds could motivate farmers to cultivate corn. Based on the research is known that farmers' satisfaction factor of seed is 1). Affordable prices, 2). Products available in the market, 3). Good ability to grow, 4). Producers quickly response of the consumers' complaint. The farmers' contribution to the seed producers is a). Sustainable purchase b). Good benefits, c). Mouth to mouth promotion, d). Cultivating as direction . Based on company's business objective, there formed 4 Key Performance Indicators that asses company's availability to fullfil farmers' wants and needs. The KPIs is the percentage of defective products, the number of complaints, the sales volume, and the time needed to response the consumers' complaints. Using Performance Prism can be known that the company's performance have not achive the expected targets. The company need a continuous improvement to achieve the performance targets and fulfill farmers' wants and need.

*Keywords: farmer, producer, seed, performance, performance prism*

### Introduction

Human beings as one of God's creatures have basic needs referred to food, clothing, and shelter. World population growth, including Indonesia, have pushed the food needs of a large explosion. Conditions in the world shows that the largest increase in food demand will occur in developing countries, while the increase in world food production will be sourced from developed countries (Per Pinstруп-Andersen et al, 1999 in Bayu Krisnamurti, 2003). World demand for food is increasing from time to time require compliance strategy that not only will fulfill quantity aspects but also quality. The compliance strategy requires a synergy of many parties to contribute based on it stability and power.

Agriculture revitalization conducted to support the achievement of the target job creation, especially in rural areas, and help the poor, and support economic growth. Revitalizing agriculture as a means of awareness to put back the importance of the agricultural sector in proportion and context. This means that revitalization is refreshing capabilities, the ability to empower and improve the performance of agriculture in development without ignoring other sectors. The agricultural sector also plays a major role in the provision of food to achieve food security in order to fulfill the right to food.

History has proven that food security is closely related to social security, economic stability, political stability and security or national defense. In addition, food security in terms

of affordability of food is also closely related to improving the quality of human resources in Indonesia through poverty alleviation. Without the support of enough food, Indonesia may not be produced great human resources. Therefore, building a robust system of food security is a necessary condition for the implementation of national development, it is in accordance with Government Regulation Indonesia no. 68 of 2002 on Food Security (Atmanti, 2010).

Animal feed industry use corn as their staple and the number is growth every year. As an effort to meet the needs of the national corn consumption, the ministry of agriculture needed improving productivity and the expansion of planting area. Corn planting center in Indonesia is the province of East Java, Central Java, Lampung, South Sulawesi, East Nusa Tenggara and West Java. Nationally, the needs and corn production in the year 2012 is as shown on figure 1 below.

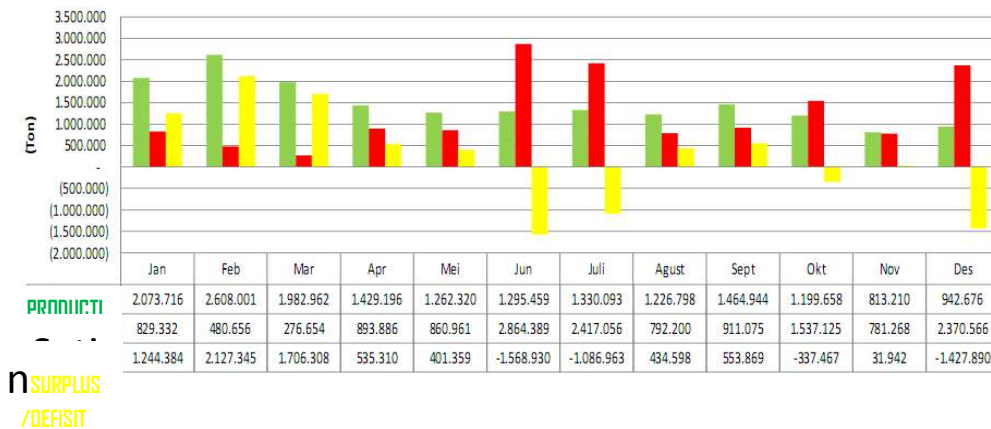


Figure 1. National Corn Production and Needs

In the chart shown the national corn production and need, it is known that there are corn production deficit that occurred in June, July, October, and December. Thus, increasing corn production does need to be done. Efforts to increase production with the expansion of planting area can be carried out in areas with a high level of land availability. However, for areas with limited land area, the efforts to increase the amount of production is done by increasing the corn productivity.

The objectives of this study to determine the satisfaction attributes of farmers and seed producers to achieve higher synergy to increase food productivity. Through the satisfaction on the two player who have an important role in the corn cultivation, the sustainability of food production will be reached. By this sustainability, Indonesia could fulfill the food needs which is increasing every year by itself.

## Materials and methods

### Sample

The research was conducted in Jember, East Java Province. Selection of the study area based on data that Jember is one of the largest corn producing areas in East Java. East Java province is the largest corn producer in Indonesia. The object of this study is PT. Jagung Hibrida Sulawesi which is one of the largest corn seed producer in Indonesia. Data collection was conducted in 5 districts in Jember, namely Wirolegi, Mayang, Mumbulsari, Tanggul, and

Ajung. Selection of the study area based on the greatest sales number of PT. Jagung Hibrida Sulawesi seed in Jember.

The proportion sample of P is unknown so P(1-P) is also not known. When the proportion sample of P is unknown P uses the value 0.5. Maximum off (P) is  $P(P-1) = 0.5 (1-0,5) = 0.25$ . Soif the sample size used level of confidence (confidence level) 90% and errors that occurred not more than 0.1 (10%) are:

$$N = \frac{(Z\alpha/2)^2 - P(1-P)}{E^2} = \frac{(1,64)^2 - 0,25}{(0,1)^2} = 67,24 \approx 70 \text{ sample or respondents}$$

By this equation, the number of respondents on this study is 70 farmers. Selection of the respondents was conducted using accidental sampling. Accidental sampling means every farmers who was buying corn seed PT. Jagung Hibrida Sulawesi on agricultural shop can be chosen as the respondents.

## Methods

This study using survey methods to gain the satisfaction attributes on farmers and PT. Jagung Hibrida Sulawesi. Questionnaire with like rt scale are using to get the quantitative answer. Focus Group Discussion (FGD) methods also using in this study to gather a variety opinions. Data validation using SPSS 17.0 as a tool to obtain valid and reliable data.

## Data Analysis

Based on preliminary survey to obtain all satisfaction attributes, showed that there were 6 farmers' satisfaction attribute. On the validation process using SPSS 17.0 known that not all of this attributes are valid and reliable. Validity testing is comparing the test results with 'table r'. When the count value of r is greater than 'table r' then the item is declared valid. And if the value is less than the value of 'count r' to the 'table r', then the item is declared invalid. The number of respondents in the questionnaire (n) is 70. Desired significance level is 90%, with degrees of freedom (df) =  $n-k-1 = 70-1-1=68$ , the obtained results table r is equal to 0.1982. By comparing the results of the 'count r' to the 'table r', then the item is declared as valid statement item number 1, 4, 6, and 7. The 'count r' as shown on figure 2.

Item	Farmers' Satisfaction Attributes	Count r
Q1	Good ability to grow	0.461
Q2	Variety products depends on climate and land condition	0.051
Q3	Seed resistant to pest	0.146
Q4	Affordable price	0.604
Q5	Seeds grown uniformly	0.181
Q6	Quick response to the costumers' complaint	0.449
Q7	Products available in the market	0.551

Figure 2. Count r result

## Results and discussion

In an effort to improve food security, development of corn plants should be increased from the upstream (pre-cultivation), middle (culture) and downstream (harvesting, processing and marketing). This efforts in order to maintain food security towards food self-sufficiency and improve the incomes and livelihoods. In achieving these objectives, the support of all stakeholders is necessary, because the development of cereals is very complicated and a lot of

challenges that come from a variety of both technical aspects, social, cultural, financial, climate, disturbance and other organisms (Directorate General of Food Crops, 2012). On improving farmers' welfare program established by the Government of East Java in 2009, an increase in productivity can be achieved by improving the quality seeds, production capacity, and the development of high-value agricultural commodities, and highly competitive.

Seeds are derived from a fertilized ovule, used by humans for the purpose of planting, as a means to achieve maximum and sustainable production through crop genetic identity clear and homogeneous performance stamina (Sadjad, 1993). The seeds are multifunctional as well as the preservation of species characteristic of the nature of the species and can be directed to achieve certain goals for both production as well as quality of results (Fahmi, 2008). Quality seed should meet the appropriate 6 criteria of good varieties, the right quality, right quantity, right time, right place, right price and right service (Sadjad, 1993). Role of seed industry to produce seeds that do not change in the form of processing. This processing called industry because the process begins with products that are not ready-made to ready to use products. It can be concluded that the synergy between farmers and seed companies providers very closely to the success of the program increased food productivity.

Increased synergy between farmers and seed companies will be achieved when both parties equally benefit and satisfaction of doing business. Customer satisfaction is the feeling of pleasure or disappointment as the result of comparing customer expectations with products offered (Kotler, 2002). This shows that consumers has an emotion when buying a product that they want (Nature, 2010). Meanwhile, according to Dutka (1994) costumer satisfaction was associated with the degree which there is a fit between product and consumer expectations. Similarly, customer satisfaction according to Anderson, et al (1994) is an costumers experience when purchasing a product to the company. From the costumers experience, the costumers that satisfied will be intend to re-purchase (Nature, 2010). However, when consumers were not satisfied with the products, there some tendency to not make a more purchase.

Farmers is entrepreneur, they have an economical views to calculate benefits that they will get from one commodities. Farmers know their fields and know their self-interest in increased income and productivity, better allocation of labor, time and resources, and safer practices and products for themselves and the environment. Farmers plant genetically modified crops depending upon the access to seeds that are suitable for the agro-ecological conditions of their particular fields (Kershen, 2010). As the seed costumer, farmers have the rights to choose which seed to grow.

Corn farmers as seed consumers have several considerations in selecting seed corn that their grown. The criteria used to select the corn seed is the wants and needs of farmers, here in after referred to customer satisfaction attributes. Based on these attributes then performed to determine the validity of the test items are valid attributes of satisfaction, and obtained results that are valid items are good ability to grow, affordable prices, products available in the market, the quick response to the complaint. The ability to grow is a percentage that indicates the ability of the seeds to grow compairing to the specifications promised. Prices area ttributes that influence the selection of quality seed by farmers. According to Kotlerand Armstrong(2003) the price is a value/money that can be redeemed for products or services to earn a profit of products/services. Price is a factor that can influence the consumer in buying a product/service that people want. The first attributes that costumers see from the products is price, because before buying consumers are thinking about the right-efficient system. Costumers think how price could buying the specification of the product. The costumers' opinion is important for consumers to make a consideration in buying (Schiffman & Kanuk, 2006).

In a previous study conducted by Manullang(2003) says that there is a relationship between service quality to customer satisfaction. PT. Jagung Hibrida Sulawesi able to satisfy its customers and have a loyalty costumers when the company know what their business objectives from costumer satisfaction. Customer satisfaction attributes used to formulate business objectives to be achieved by the company. By focus group discussions with the company management its find the company's business objective is to improve the quality products, expanding market share, and increase costumers trust. Business objective is used as the basis for obtain key performance indicators (KPI). KPI are made through a series of processes, which compose all possible KPI, conduct Focus Group Discussion, and filling the questionnaire tos elect KPI valid. By this processes the valid KPIs are as shown in figure 3.

Farmers' satisfaction attributes	Business objectives	Performance Indikator
Good ability to grow	Improve the quality products	1. Percentage of defective products 2. Number of costumers complaint
Products at reasonable prices Products available in the market	Expanding market share	1. Sales volume
Producers quickly response of the costumers' complaint	Increase costumers trust	1. Number of costumers complaint 2. Response time to complaints

Figure 3. Key Performance Indicators

Fulfillment of wants and needs of farmers will encourage farmers to provide positive returns to the company or the so-called farmers' contribution. Through questionnaires obtained results that farmers' contribution is sustainable purchase, good benefits for the company, mouth to mouth promotion, and cultivating as direction. Relations between farmers' satisfaction attribute, farmer contribution, and business objectives can be described as follows on figure 4:

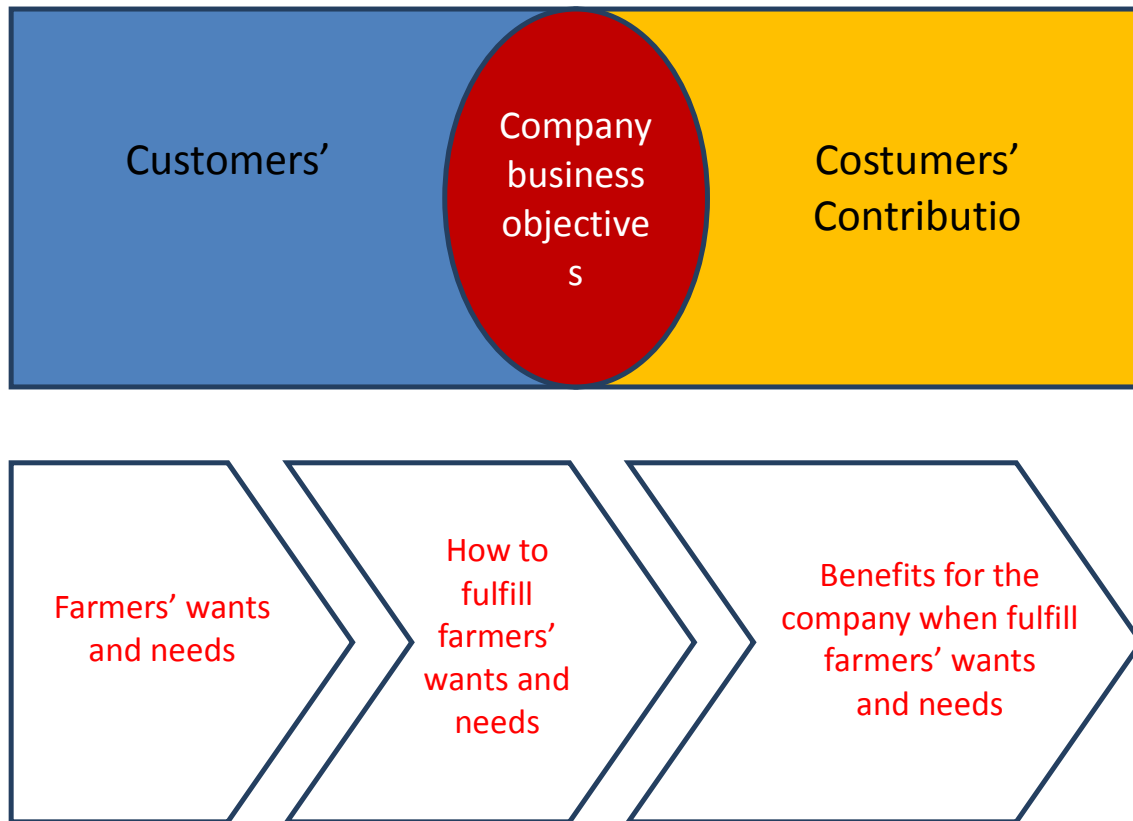


Figure 4. Relations between satisfaction attribute and farmers' contribution

On figure 4, we can explain that every company should identification their costumers' satisfaction factors, costumers' satisfaction factors arrange from the costumers' wants and need. Company business objectives is the answer how to fulfill costumers' wants and need, and in this case the costumer is farmers. To fulfill their costumers' wants and needs, company have to compile KPI which is a path to meet the costumers' wants and needs. KPI is the tools to measure company target to the business objectives. Measuring indicator using KPI should do periodically to shown company position on fulfill farmers' satisfaction. Costumers' contribution is what will the company get for the efforts to fulfill their costumer's wants and needs.

In this study, the KPI measuring are shown on Objective Matrix. Based on the objective matrix is known that the performance of this percentage of the defective product at the level of 8 of the 10 existing levels. It can be concluded that the achievement of performance has been achieved by the company to minimize the percentage of defective products almost reach the set targets. Strategies that can be used to achieve the target of 0% is a manufacturing defect with continuous improvement (continuous improvement) that starts from the preparation stage of seed breeders who bred by growers, breeders seed planting stage, through to production in the factory. The objective matrix is shown on figure 5.

Percentage of defective products	Number of costumers complaint	Sales Number	Response time to complaints	Criteria	
0.02%	1	7,270,350	4	Performance	
0.00%	0	9,000,000	1	10	Level
0.01%	0.08	8,376,665.43	1.55	9	
0.03%	0.17	7,753,330.86	2.10	8	
0.04%	0.25	7,129,996.29	2.64	7	
0.05%	0.33	6,506,661.71	3.19	6	
0.06%	0.42	5,883,327.14	3.74	5	
0.08%	0.50	5,259,992.57	4.29	4	
0.09%	0.58	4,636,658.00	4.83	3	
0.11%	1.06	3,951,238.67	5.56	2	
0.14%	1.53	3,265,819.33	6.28	1	
0.16%	2.00	2,580,400.00	7	0	
8	2	7	4	Score	
0.098	0.042	0.1734	0.042	Weight	
0.786	0.084	1.2138	0.168	Value	
<b>2.252</b>					

Figure 5. Objective Matrix

Based on the matrix of unknown number of complaints received by the company from the consumer at the level 1 of the 10 existing levels. That is, the achievement of the company against the set target is still far from expectations. Target set by the company that no longer complaints received by the company from consumers, so that consumers are satisfied with the products and services provided by the company.

The company's success in meeting customer satisfaction obviously will encourage consumers to contribute to the company expected. Contribution expected by the company from consumers is an attribute that can move its financial. Expected contribution to the fulfillment of the company, then the company can continue to do the production that can meet the needs of consumers. From this relationship will create sustainable agriculture because of the emergence of security on both PT. Jagung Hibrida Sulawesi and Farmers as the costumers. The relationships can be illustrated in Figure 6 as follows.



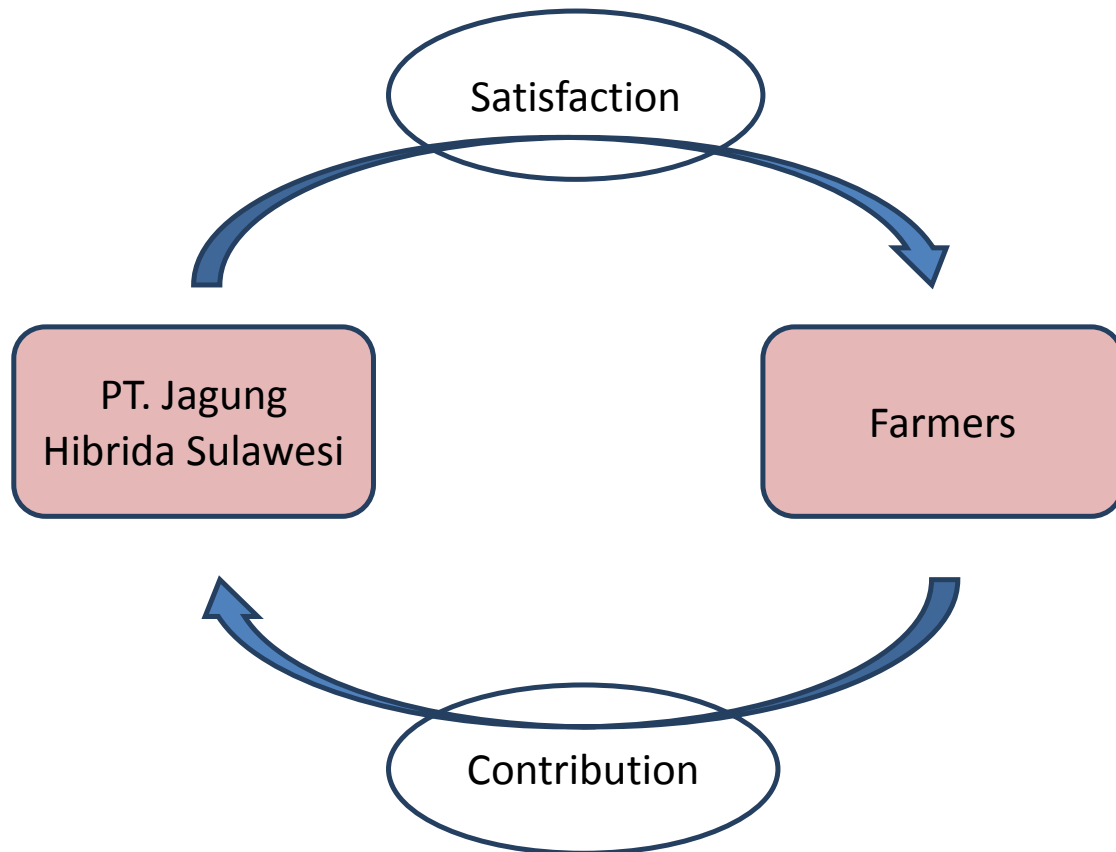


Figure 6. The Sustainable Relationship

## Conclusion

Increased synergy between farmers and seed companies will be achieved when both parties equally benefit and satisfaction of doing business. This is very clear that the role of seed company to succeed the sustainable agriculture program by provides seed quality, price, and services in accordance with the wants and needs of farmers. The company's ability to meet the wants and needs of farmers will encourage farmers to continue to plant the seeds that are produced by the company. However, the role of company in fulfill the needs of farmers must be supported by a policy of price stability farmer selling at a reasonable price so that farmers can reap the benefits. Without the advantages that can meet the needs of farmers, although seeds supplied have good quality then farmers can change to grow other commodities that have better economic value.

## Reference

1. Alam, Syed S., Y asin M (2010 ). "In Investigation into the Antecedents of Costumer Satisfaction of Online S hopping": Findings from Malaysia Journal Of Marketing Development and Co mpetitiveness 5(1). Retrieved June 15, 2011, from <http://www.na-businesspress.com/JMDC/AlamWeb.pdf>
2. Anderson, Eugene W., Claes Fornell, and Donald R. Lehmann. (1994). " Customer Satisfaction, Market Share, and Pr ofitability: Findings from Sweden." Journal of Marketing vol 58 53-66 .Diunduh pada 15 Jun i 2011, dari



<http://web.itu.edu.tr/~elmadaga/MKT/Principles%20of%20MKTmaster%20articles/Anderson%201994.pdf>

3. Dutka, Alan, 1994, AMA Hand book Costumer Satisfaction: A Complete Guidance to research, Planning, and Implementation, Lincolnwood, Illinois, NTC Bussiness Books.
4. Kotler, Philip, and Gary Armstrong (2002). Dasar-dasar pemasaran (jilid 2). Jakarta: Prenhallindo
5. Manullang, Ida. 2003. Pengaruh Kualitas Pelayanan Terhadap Kepuasan Pelanggan Jasa Penerbangan PT. Garuda Indonesia Airlines di Bandara Polonia Medan. Thesis. Universitas Sumatera Utara.
6. Schiffman, L.G. & Kanuk, L. L. (2006). Consumer Behavior (7th ed.). Prentice Hall, Inc
7. Sudaryanto, T. and I.W. Rusastra. 2006. *Kebijakan Strategis Usaha Pertanian Dalam Rangka Peningkatan Produksi dan Pengentasan Kemiskinan. Jurnal Litbang Pertanian* Volume 25. Page 115-122.

## Non Destructive Measurement of Catechin Content in Gambir (*Uncaria gambir Roxb.*) Using NIR Spectroscopy

Andasuryani<sup>1</sup> Y.A. Purwanto<sup>2</sup> I W. Budiastira<sup>2</sup> K. Syamsu<sup>3</sup> and Lady C.E.Ch.Lengkey<sup>1</sup>

<sup>1</sup>PhD student at Department of Agricultural Engineering, Faculty of Agricultural Technology and Engineering, Bogor Agricultural University, Bogor, Indonesia, Email: [andasuryani@gmail.com](mailto:andasuryani@gmail.com).

<sup>2</sup>Department of Mechanical and Biosystem Engineering, Faculty of Agricultural Technology and Engineering, Bogor Agricultural University, Bogor, Indonesia.

<sup>3</sup>Department of Agro industrial Technology, Faculty of Agricultural Technology and Engineering, Bogor Agricultural University, Bogor, Indonesia.

### Abstract

Gambir is one of Indonesian export commodities. Catechin content is main determinant of gambir quality. In traditional market, determining of the gambir catechin content is conducted qualitatively based on experience of the assessor which led to subjective measurement. Chemical method to determine catechin content of gambir quantitatively. This method is not efficient since it requires expensive chemical reagents, takes a long time, and destructive. Near infrared (NIR) spectroscopy is one of the non destructive techniques which can inform gambir quality. The objective of this study was to demonstrate of NIR spectroscopy to measure of catechin content in gambir. Partial Least Square (PLS) method by combination pre-treatment between normalization between 0 and 1 (n01), and first derivative Savitzky-Golay 9 points (dg1) was used to develop calibration model. Value of consistency and V-Set PRESS was used to determine the optimum number of PLS factors. The result showed that calibration model with 6 PLS factors was the best predictive models for catechin content since it provided a high accuracy as well as precise models. Model for catechin content showed the bias value = 0.10 %, SEC = 3.56 %, SEP = 3.27 %, correlation coefficient ( $r$ ) = 0.95, CV = 4.86 %, and RPD = 3.60. The result demonstrated that NIR spectroscopy might be applied to measure catechin content in gambir accurately.

*Keywords: gambir, catechin, NIR spectroscopy, non destructive measurement, PLS.*

### Introduction

Gambir is an extracted product from the leaves and young twig of gambir (*Uncaria gambir Roxb.*) plant. Gambir is one of the Indonesian export commodities. It contributes to around 80% of the gambir trading in the world (Gumbira-Sa'id, 2009). Some studies related the presence of catechin in gambir revealed that it is usually the most abundant bioactive compound (Taniguchi et al., 2007a; Apea-Bah et al., 2009; Anggraini et al., 2011). It is potential as a raw material in various industries, particularly pharmaceutical and cosmetic industries. Catechin content in gambir is used as one of the quality parameters of gambir in accordance with the Indonesia gambir trading standard, SNI01-3391-2000. Traditionally, determining of the gambir catechin content is conducted qualitatively based on experience of the assessor which led to subjective measurement. Meanwhile, there is chemical method to determine catechin content of gambir quantitatively. However, this method is not efficient since it requires expensive chemical reagents and takes a long time. In addition, this method