Subtheme 7: Inquality And Social Justice

DEVELOPMENT MODEL FOR SUSTAINABLE RUBBER PLANTATION SMALL HOLDERS IN RIAU PROVINCE

Nurhamlin

Abstract

Natural rubber has an important role in the life of human beings. Besides maintaining the functions of environmental life, (carbon producer, land and water conservation, and fauna habitat), natural rubber can also provide socio-economic benefits to the village community as a source of living and income. However, in the past decade, the price of natural rubber in international market has declined very significantly which has badly affected the life of the small holders. In fact, the government of Indonesia has increased its development programs for the welfare of the small holders, but to this end this effort has not yet yielded optimum results. Based on the results of the analysis of Multi Dimentional Scalling (MDS), the index of ecology sustainability is 52,96%, technology sustainability is 62,35%, economy sustainability is 60,18%, social sustainability is 53,62%, and institution sustainability is 20,73%. Therefore, the structuring of the small holders institution is expected to be able to empower them to compete so that they can improve their welfare sustainably in the future.

Keyword: Rubber of people, sustainable

INTRODUCTION

Various development programs for small holders to improve their welfare have been executed since 1977 such as the so called *Perusahaan Inti Rakyat* (PIR). In its edevelopment, PIR has been applied in transmigration areas popularly known as *PIR Trans* that is suitable especially in the opening of new land.

The revitalization of small holder rubber plantations called PPKR (Peremajaan Kebun Karet Rakyat) has been made. This revitalization is

considered as the partnership in developing rubber plantations, processing and marketing. This program is aimed at accelerating the development of rubber plantations through expansion, revitalization and rehabilitation of the plantations backed up by banking investment credit and interest subsidy provided by the government of Indonesia involving enterprises operating in rubber plantations. To improve the quality of the small holders, *Unit for Cultivation and Marketing of Cup lamps* (UPPB, Unit Pengolahan, dan Pemasaran Bokar) has been developed. This unit was established by two or more farming groups as a place for conducting technical guidance, cultivation, and temporary storage and marketing of cup lamp.

Although a number of development patterns have been practiced to develop the small holders, their welfare has so far shown no much change. Therefore, appropriate strategies to solve this problem need to be found for the improvement of their welfare in order that the small holder plantations can be sustained. In conjunction with the backround of the problem, intergrative and collaborative approaches such factors as ecology, economy, social and institution need to be put into consideration towards the small holder plantation ecosystem.

The problem of the research is formulated in the following research questions:

a. How is the condition of small holder rubber plantations in Riau province viewed from five sustainable dimensions?
b. What is the most determining dimension among the five sustainable dimensions that support the development of sustainable rubber palantation small holders?

The findings of the study are expected to find the appropriate models and strategies for developing small holders in an efffort to speed up sustainable economic development in villages. The findings of the study are also expected to be useful for agribusiness practitioners and the governemnt as the decision maker in developing rubber plantations with the hope that the small holders can increase their income and welfare.

REVIEW OF LITERATURE

Sustainable development is the concept of development that has been practiced in many countries in the world. This concept endeavours to provide optimum solutions of different interets in the implementation of the national development. The concept of sustainable development was initially introduced by *the World Commission of Environment and Development* (WCED) in 1987 with its report entitled *'Our Common Future'* (Kay and Alder, 1999). This concept is simple and complex so that the meaning of sustainability is muli-dimensional and multi-interpretative, including the application of the concept towards sustainable rubber plantations. Damanik (2012) offers eight strategic factors that affect the development of the sustainability of rubber plantations; namely, the avaibilty technology, trainers, training for small holders, policy support, the size of plantation, amall holders skills, small holder institutions, production and productivity. Of the eight factors, there are four strategic factors, i.e. the availabiulty of technology, trainers, training for small holders, and policy support that are categorized as the determining factors or inputs in agribusiness system as these factors are very influential towards other factors but their dependency is relatively weak. On the other hand, such factors as the size of the

plantation, small holders skills, small holder institution, production and productivity are determining factors in rubber agribusiness system as they have a strong influence and dependency on other factors.

A number of studies have been undertaken to study the relationship between the development of small holders and the level of the family income as conducted by Goswani *et al*., (2007), Septianita (2009), Tarumun (2012) and sania (2013). A study on the impacts of the development of rubber plantation on the socio-economic life of the small holders was conducted by Myria (2002, Liu *et al*., (2006), Haryono (2008 and Sadikin (2012). Previous studies concluded that majority of small hoders in many areas in Indonesia including Riau were categorized *poor*. Nurhamlin (2012) concluded that the income of the small holders in Kampar district was only 2,5 million monthly with the average family members of 5 people. When compared to the 2016 *Provincial Minimum Pay (UMP)* of Rp 2.266,722,53, their income was categorized *low*. The research findings in other areas also indicated that similar condition was also felt as reported by Sadikin et al (2010) saying that the development of rubber plantations in Riau province did not yet reach small holders.

Husinsyah (2009) who carried out a study in Kutai Barat District, East Kalimatan province also concluded that the average income of rubber plantation small holders was only Rp 14.909.608,70 anually or Rp 1,187.609.50 monthly or very far lower comnpared to the 2017 *Provincial Minimum Pay* of Riau province. Similar condition was also reported by the *Agricultural Service* of Riau province in 2013 stating that the average annual income of the small holders was Rp 14,251,314.00 or Rp 1.187,609,50 monthly (Agricultural Service of Riau province 2013).

The findings of a study carried out by Kurniawan *et* al., (2012) concluded that the average income of the rubber tappers in Pangkal Baru Village, Tempunak sub-district, Sintang district, West Kalimantan province was Rp 2.800,000 with the average plantation size of 1 hectare being categorized *medeocre*. Accoding to Kurniawan *et al*., (2012) the factors that influeced their income was the buyers, climate and temprature and the quality of rubber. The effort to increase their income besides taping rubber was by way of agricultural intensification and extensification in the form of maintenance and fertilizing rubber trees and extending the areas of taping at other places.

According to Hermanto (2005) in Sannia *et al*., (2012) income is a form of compensation for management services by making use of land, labours and finacial capital in farming. The welfare of small holders will improve when they can reduce the expense and balance it with higher production and good price. The influence of price and fluctuation of productivity may cause the small holders' income to change as well. Price and productivity become factors of uncertainty in farming business activities (Soekarwati, 1994). Based on the 2015 Gapkindo Riau data, the price of the small holders' rubber at the rubber factories was Rp 13,000 per kg for 100 % kilogram of *dried rubber* (KKK, Kilogram Karet Kering) and even if the rubber was sold on the spot, the price was ranging from Rp5000 up to Rp 6,000 per kg which was a bit far different in comparison.

As aresult of the low prices, many small holders left their plantations and they looked for other jobs which were more profitable. If this situation lasts long, the rubber production of small holders will decline dramatically and will affect the operation of rubber factories in Riau province which may

consequently reduce the export of non-oil and gas in Riau especially in agricultural sector. The influence of price and fluctuating productivity will also cause their income to change. In fact, price and productivity are the factors of uncertainty in farming businesses (Soekarwat, 1994).

Based on those considerations, it was necessary to conduct a study to find a model for developing small holders to improve their welfare so that rubber plantations could remain sutainable.

RESEARCH METHOD

This research was carried out in the form of a survey using both quantitative and qualitative methods. The instruments used to gather the data were structured questionnaire and interview. The location of the research was determined purposively based on the size of the rubber plantation areas and the number of households of the small holders. On the basis of these considerations, three districts were selected as the locations of the research; namely, Kuantatn Singingi, Kampar and Pelalawan districts.

Primary and secondary data were needed for this research. The secondary data was obtained from the department concerned and private sectors as well as rubber plantation associations, whereas the primary data was gained from an interview conducted towards experts and from a set of questionnaire towards the small holders. In order to find out the sustainability level of the small holder plantations, *Multi-Dimensional Scalling* (MDS) with RapEst software was applied. The sustainability decision of each dimension is presented in the form of a kite diagram to see the trade-off sustainability of the rubber palantation management. The value of the

sustainability index of each dimension can be seen in Figure1.

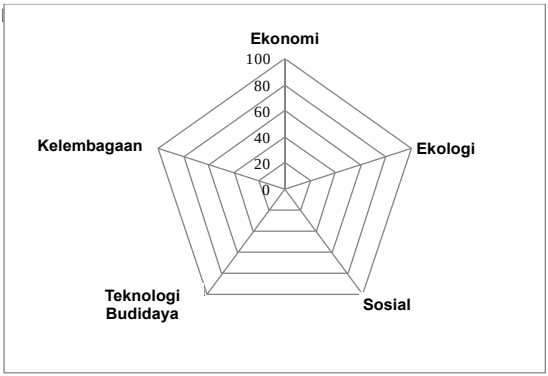

Figure 1. The illustration of kite diagram sustainabilty index

To find out the most determining attribute in each dimension, a prospective analysis was employed aiming at determining the position of the supporting attributes so that the key attribute or the determining factor (driving variable) could be obtained in the management of the rubber plantation covered by the research. Using the prospective analysis, the output of four quadrants were obtained as the positions of the supporting attributes as can be seen in Figure 2 below:

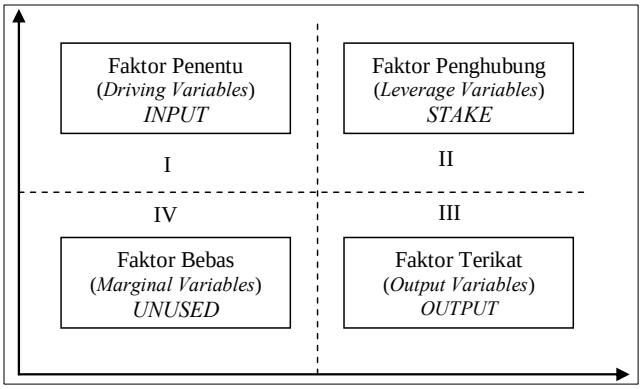

Figure 2. The graph of the effect and dependency of variables

1. Findings and discussion

1.1. Findings

1.1.1. Ecology Dimension

The results of the ecology parameter at small holders plantations found that there were seven attributes that influenced the sudtainability of ecology dimension; namely, (1) type of rubber seeds, (2) number of tapping days, (3) rain fall, (4) land administration status, (5) size of land, (6) land fertility and (7) type of land. The results of *Multi Dimensional Scalling* (MDS) of ecology dimension is presented in Figure 3.

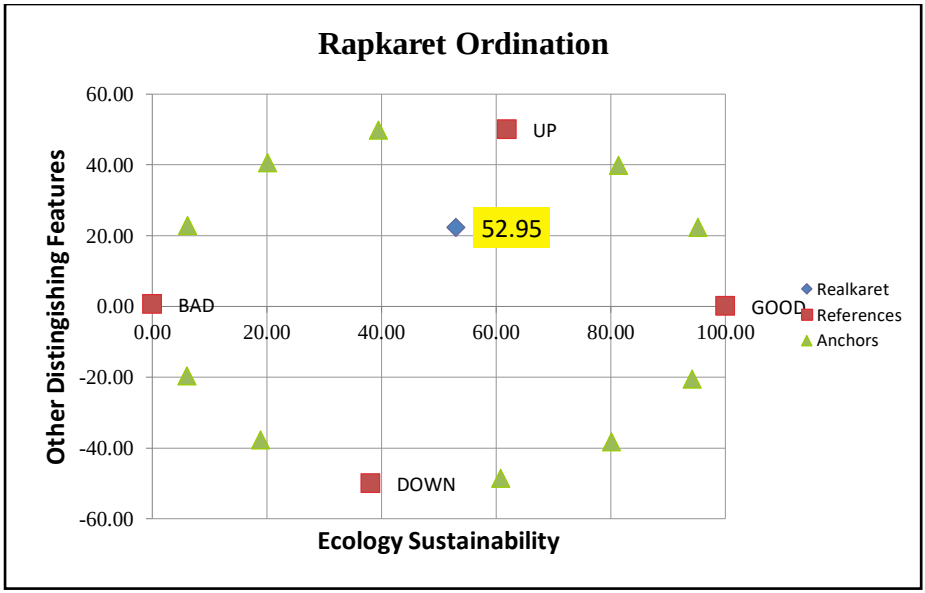

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Figure 3. Sustainability index of ecology dimension of small holder plantations

The MDS analysis towards ecology dimension attributes shows the index value of 52,95 % which means *sustainable enough*. The role of each attribute at ecology dimension was then analyzed using *leverage* analysis aiming at seeing the sensitive attributes in giving contributions to the sustainability of ecology dimension. The results of the *leverage* analysis were gained from *Root Mean Square* (RMS) at the respective attribute. The results of the leverage analysis of ecology dimension are shown in Figure 4.

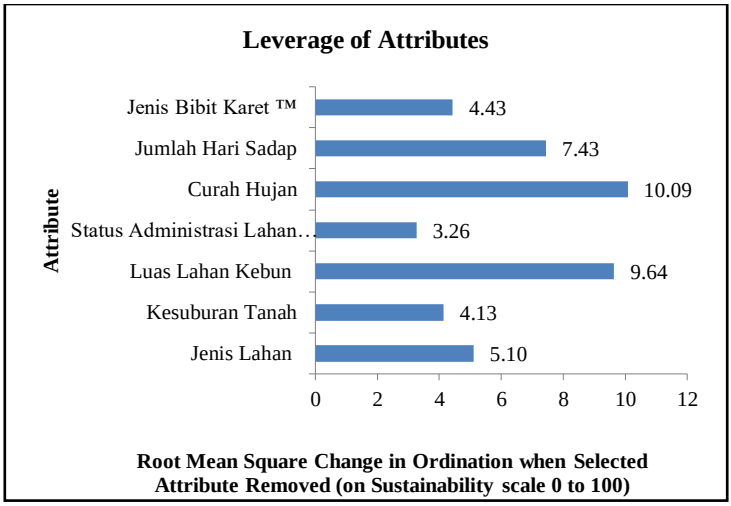


Figure 4. The role of each attribute influencing the sustainability of ecology dimension of small holder plantations

To determine the sensitive attributes that influence ecology dimension sustainability, *leverage* analysis and *Pareto* analysis were used in combination (Kusbimanto *et al*., 2013). Pareto analysis was applied by listing the RMS values obtained from the leverage analysis from the biggest value to the smallest which were then presented in the form of percentages and commulated until the maximum commulative values of 75 % was reached. The percentages of the RMS values to determine the sensitive attributes of ecology dimension are displayed in Table 1.

Tabel 1, The percentages of RMS values to determine the sensitive attributes of ecology dimension.

No	Attributes	RMS values	Percentages
1	Rain fall	10,09	22,32
2	Size of plantations	10,04	22,14
3	Number of taping days	7,43	16,97
4	Type of land	5,10	11,36
	Total Percentage		**72,80**
5	Types of rubber seeds	4,43	10,37
6	Fertility of land	4,13	9,27
7	Status of land administration	3,26	7,55
	Total	**21,28**	**100,00**

Table 1 shows that four sensistive attributes that influence the sustainability of small holders are obtained. The sensitive attributes were obtained from the commulative total of RMS percentage that is 72,80 %. If the number of the attributes was added, it would exceed the result of 93.07 % which is the boundary of the miximum commulative value of 75 %. Those sensitive attributes are (1) rain fall, (2) the size of land, (3) number of taping days and (4) type of land, These four ecology dimensions become the considerations for the next step to develop the models for developing sustainable small holders in Riau province.

1.1.2. Technology Dimension

The results of the technology parameter measurement shows 14 attrubutes might influence the sustainabilty of technology dimension; that is, (1) the frequency of TM fertilization, (2) the frequency TM maintenance, (3)

the fequency of TM pest prevension, (4) the attitude of the small holders towards clean cup lamp (bokar), (5) the knowledge of clean cup lamp, (6) the knowledge of coagulant, (7) the knowledge of taping techniques, (8) the knowledge of maintenance technique, (9) the distance of TM planting, (10) the knowledge of planting distance, (11) the origin of rubber seeds, (12) the knowledfge of prime seeds, (13) terrace construction and (14) the knowledge of gardening. The results of Multi Dimensional Scalling (MDS) at the technology dimension are shown in Figure 5.

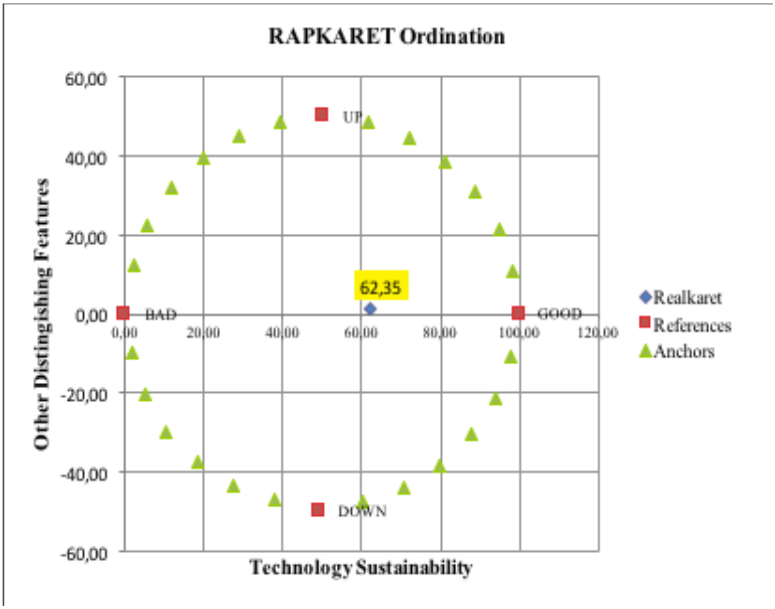


Figure 5. Sustainabilty index of technology dimension of small holders

The MDS analysis towards technology dimension attributes indicates the index value of 62,35 which means *sustaibale enough.* The role of each attribute of technology dimension was then analyzed using *leverage* analysis aiming to see the sensitive attributes in giving contributions to the

sustainability of technology dimension. The results of the leverage analysis were obtained from the value of *Root Means Square* (RMS) at each attribute. The results of the leverage analysis of the technology dimension are presented in Figure 6.

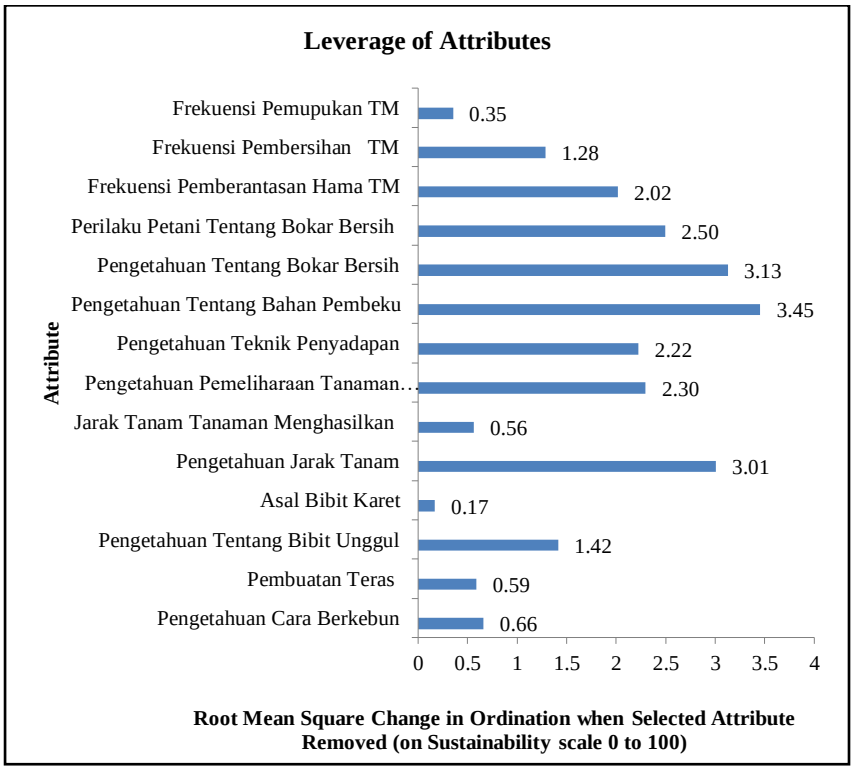


Figure 6. The role of each attribute influencing the sustainability of technology dimension of small holder plantations.

To determine the sensitive attributes that influenced the sustainability of technology dimension leverage analysis and Pareto analysis were employed in combination (Kusbimanto et al; 2013). Pareto analysis was applied by putting in order the RMS values resulted from the leverage analysis from the biggest value to the smallest one and then put them in the form of

percentages and then were commulated until the of maximum value of 75 % was reached. The percentage of the RMS values to determine the sensitive attributes of ecology dimension can be seen in Table 2. At technology dimension 6 sensitive attributes were gained that influenced the sustainability of the small holder rubber plantations.

The sensitive attributes were obtained from the total of the RMS commulative percentage of 70,20 %. If the attributes were added the total would axceed the limit (78,74 %) that is the maximum commulative limit of 75 %. Those sensitive attributes are (1) knowledge of coagulant, knowledge of clean cup lamp, (3) knowledge of planting distance, (4) the small holders' attitudes towards clean cup lamp, (5) knowledge of maintenance and (6) knowledge of taping technique. The six technology dimension attributes become a consideration for the next step to develop the development model of sustainable small holder rubber plantations in Riau province.

No	Atribut Teknologi	Nilai RMS	Persentase
1	Knowledge of coagulant	3,45	14,58
2	Knowledge of clean cup lamp	3,13	13,23
3	Knowledge of planting distance	3,01	12,72
4	Small holders's attitudes towards clean cup lamp	2,50	10,57
5	Knowledge of TM maintenance	2,30	9,72
6	Knowledge of taping technique	2,22	9,38
	Total		**70,20**
7	Frequency of TM pest prevention	2,02	8,54
8	Knowledge of prime seeds	1,42	6,00
9	Frequency of TM maintenance	1,28	5,41
10	Knowledge of gardening	0,66	2,79
11	Terrace construction	0,59	2,49
12	TM planting distance	0,56	2,37
13	Frequency of TM fertilizing	0,35	1,48
14	Origin of seeds	0,17	0,72
	Total	**23,66**	**100,00**

Tabel 2. The percentages of RMS values to determine the sensistive attributes of technology dimension

4.1.3. Economy Dimension

The results of the measurement of economy parameter showed that there were 12 attributes that might have influenced the sustainability of economy dimension; namely, (1) perception towards the price of rubber, (2) perception towards the availability of main commodities, (3) access to the information of rubber price, (4) access to capital, (5) access to transportation, (6) access to clean water, (7) constraints in selling the produce, (8) access to the market, (9) marketable right, (10) debts, (11) savings and (12) household

income. The results of *Multi Dimensional Scalling* (MDS) of the economy dimension are shown in Figure 7.

The MDS analysis towards economy dimension attributes indicates that the index value is 60,08 which is categorized *good* or *sustainable enough*. The role of each attribute of economy dimension was then analyzed using leverage analysis intended to see the sensitive attributes in giving contributions to ecology dimension. The results of the leverage analysis were gained from the value of *Root Means Square* (RMS) of each attribute. The results of the leverage analysis of ecology dimension can be traced in Figure 8. To determine the sensitive attributes that influenced the sustainability of economy dimension, leverage analysis and Pareto analysis were used in combination (Kusbimanto et al., 2013). Pareto analysis was applied by putting into the right order the RMS values obtained from the leverage analysis from the biggest value to the smallest one and then were put in the form of percentage and then were accumulated until the miximum commulated value of 75 % was reached. The percentage of the RMS values to determine the sensitive attributes of the economy dimension can be seen in Table 3.

At the economy dimension, six sensitive attributes were obtained that influenced the sustainability of small holders plantations. The sensitive attributes were gained from the RMS total of commulative percentage that was 67, 29 %. If attributes were added it would exceed the limit of 75, 59 % as the limit of the maximum communlative value. Those sensitive attributes include (access to clean water, (2) accsess to transportation, (3) debts, (4) constraints in selling the produce, (5) perception towards the availability of daily needs and (6) access to the information of rubber price. The six economy dimension attributes become the consideration for the next step in

developing the development model of the small holders' sustainability in Riau province.

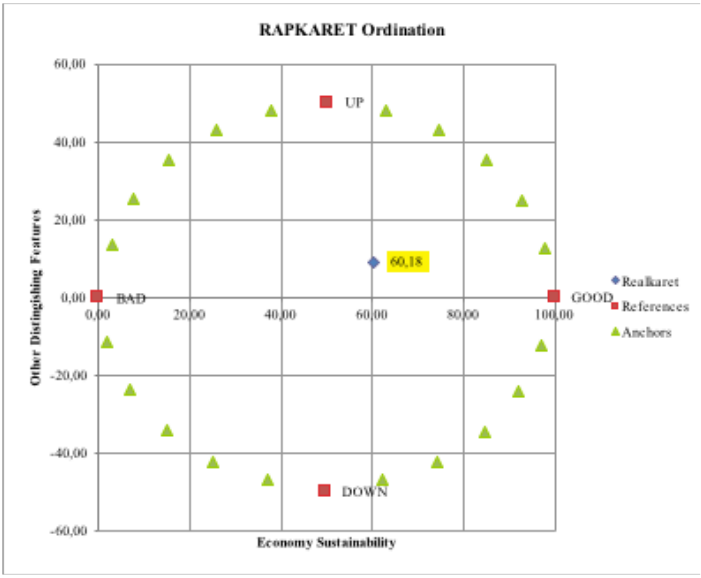


Figure 7. Sustainability index of economy dimension of small holder plantations

Tabel 3. Percentages of the RMS values to determine the sensitive attributes of economy dimension

No	**Economy Attributes**	**RMS values**	**Percentages**
1	Access to clean water	3,70	15,49
2	Access to transportation	3,46	14,49
3	Debts	2,81	11,77
4	Constraints in selling the produce	2,06	8,63
5	Perception towards the availability of food	2,05	8,58
6	Access to the information of rubber price	1,99	8,33
	Total		**67,29**
7	Access to the market	1,98	8,29
8	Access to capital	1,86	7,79
9	Household income	1,79	7,50
10	Marketable right	1,47	6,16
11	Perception towards rubber price	0,63	2,64
12	Savings	0,08	0,34
	Total	**23,88**	**100,00**

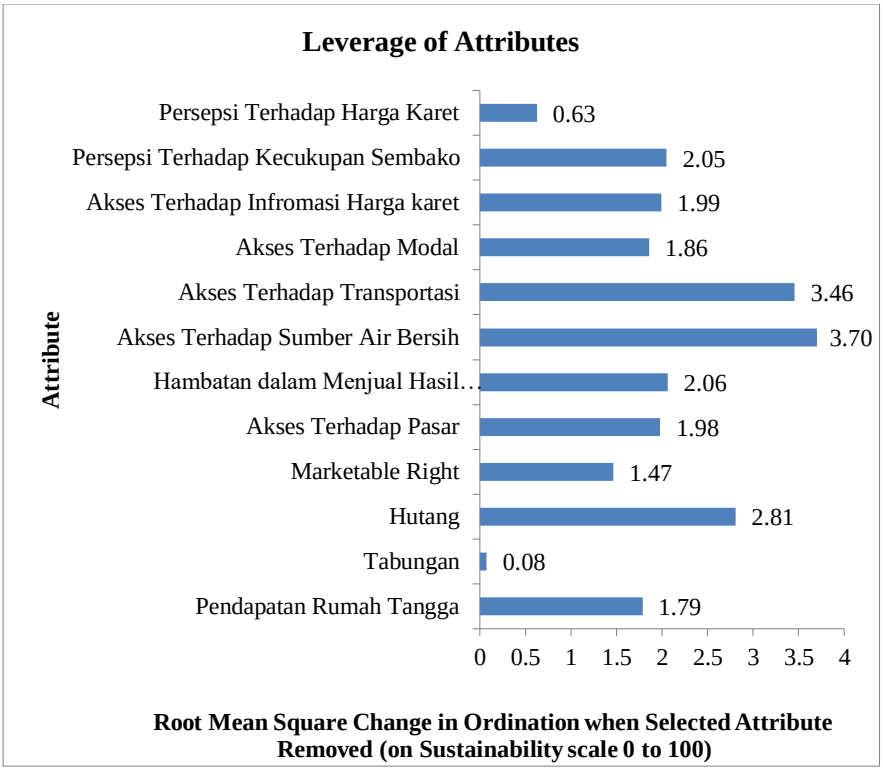


Figure 8.The role each attribute influencing economy dimension sustainability of small holder plantations

4.1.4. Sosial Dimension

The results of the social dimension measurement shows that ten attributes influenced the sustainability of social dimension; that is, (1) the pattern of social relationships in the community, (2) the pattern of the relationships between the small holders and their bosses, (3) the level of labor absorption, (4) wisdom and local knowledge, (5) population density, (7) level of social conflict, economic facilities (8) education facilities, (9) social facilities,

and (10) level of community participation. The results of *Multi Dimensional Scalling* (MDS) of economy dimension are shown in Ficture 9.

MDS analysis towards social dimension attributes indicates the index value of 53, 62 being categorized *sufficient* (sustainable enough). The role of each attribute of economy dimension was then analyzed using leverage analysis aiming at seeing sensitive attributes in giving contributions to the sustainability of ecology dimension. The results of the leverage analysis were obtained from *Root Mean Square* (RMS) value of every attribute. The results of the leverage analysis of ecology dimension are presented in Figure 10.

To determine the sensitive attributes influencing the sustainability of social dimension, leverage analysis and Pareto analysis were applied in combination (Kusbimanto *et al*., 2013). Pareto analysis was employed by putting into order the RMS analysis values starting from the biggest value to the smalled one and then put them in the form of percentages and they were then communlated until the maximum commulative value of 75 % was reached. The percentage of the RMS values to determine the sensitive attributes of social dimesion are displayed in Table 4.

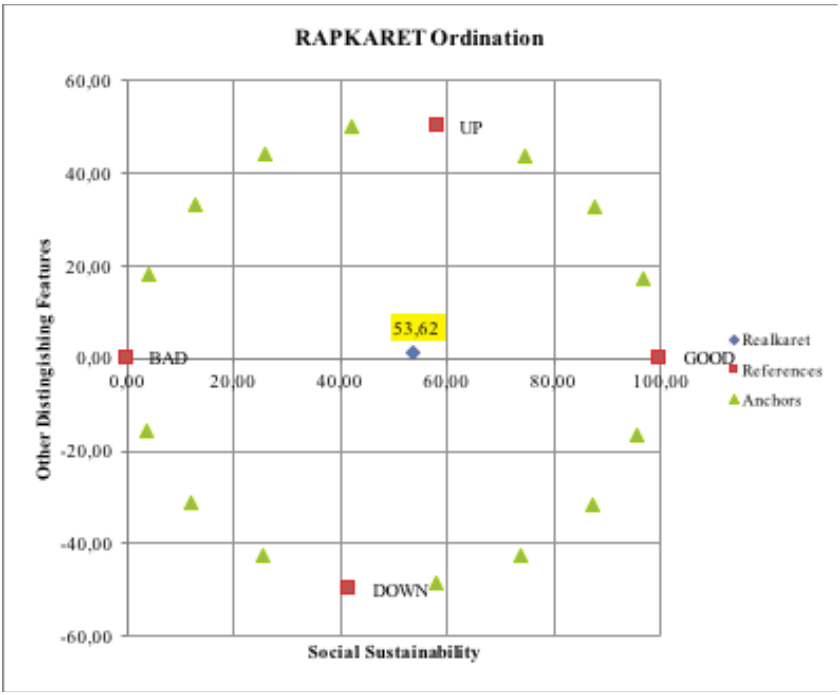
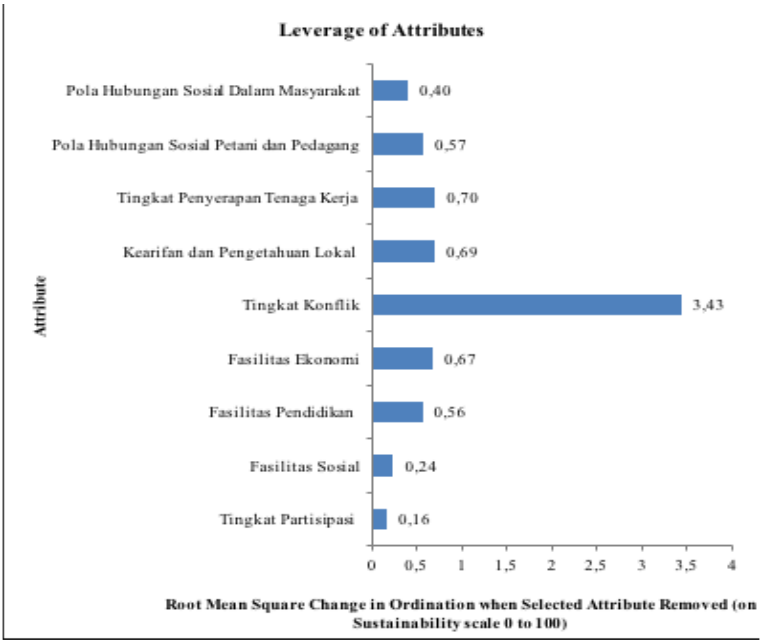


Figure 9. Sustainability index of social dimension of small holder plantations



Fugure 10. The role of each attribute influencing the sustainability of social dimension of small holder plantations

No	Social Attributes	RMS Values	Percentages
1	Level of conflict	3,43	46,23
2	Level of labor absorption	0,70	9,43
3	Wisdom and local knowledge	0,69	9,30
4	Economic facilities	0,67	9,03
	Total		**73,99**
5	Social relationship between small holders and their bosses	0,57	7,68
6	Health facilities	0,56	7,55
7	Social relationship in the community	0,40	5,39
8	Social facilities	0,24	3,23
9	Level of participation	0,16	2,16
	Total	**7,42**	**100,00**

Tabel 4. The percentages of RMS values to determine the sensitive attributes of social dimension

In terms of social dimension, four sensitive attributes were obtained that influenced the sustainability of the small holder plantations. These sensitive attributes were gained from the total of RMS commulative values that was 73,99%. If attributes were added it would exceed the mixiumum value of 82,67 %, the limit of the maximum commulative value of 75 %. The sensitive attributes are (1) level of conflict in society, (2) level of labor absorption, (3) wisdom and local knowledge and (4) social facilities. These four social dimension attributes become the consideration for the next step in developing the model of sustainable small holders development in Riau province.

4.1.5. Institutional Dimension

The results of the institutional parameter measurement showed eight attributes that influenced the sustainability of institution dimension; that is, (1) the role of seedlings cultivation institute, (2) the role of government departments in developing rubber plantations, (3) the role of rubber employers, (4) the role of ouction market, (5) the role of UPPB, (6) the role of plantation cooperative, (7) the role of small holder groups, and (8) the availability of regulations. The results of *Multi Dimension Scalling* (MDS) of economy dimension can been in Figure 11.

The MDS analysis towards the institutional dimension attributes indicated the index of 20,73 and categorized *bad* (unsustainable). The role of each attribute of the institution dimension was then analyzed using leverage analysis that aimed to to see the sensitive attributes in giving contributions to the sustainability of ecology dimension. The results of the leverage analysis were gained from *Root Mean Square* (RMS) at each attribute that are presented in Figure 12.

To determine the sensitive attributes that influenced the sustainability of institution dimension leverage analysis and Pareto analysis were used (Kusbimanto *et al*., 2013). Pareto analysis was employed by putting into order the RMS values of the leverage analysis beginning from the biggest value to the smallest one and then they were put into percentages and communlated until the limit of maximum communlative value of 75 % was reached. The percentages of RMS values to determine the sensitive attributes of institutional dimension are displayed in Table 5.

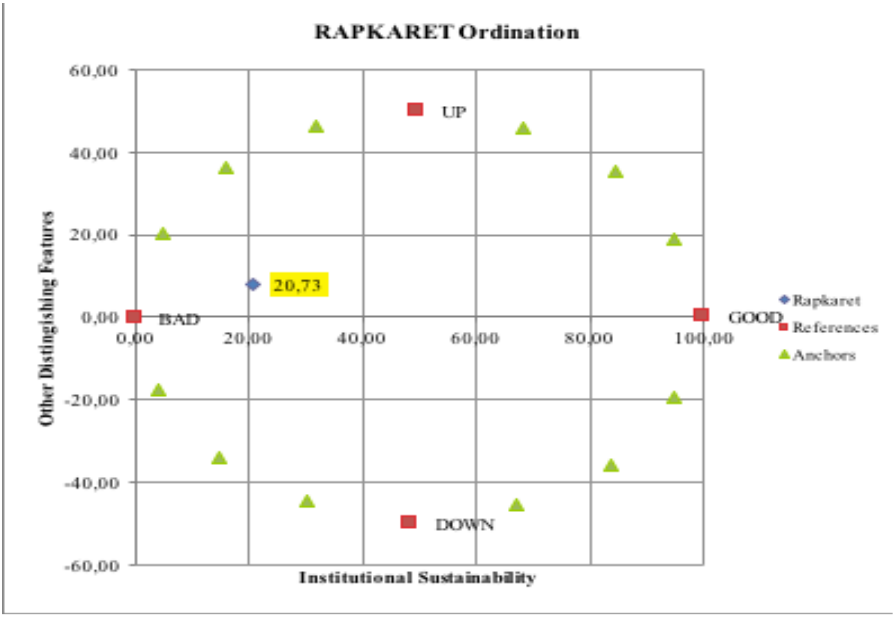


Figure 11. Sustainabilty index of institution dimension of small holder plantations

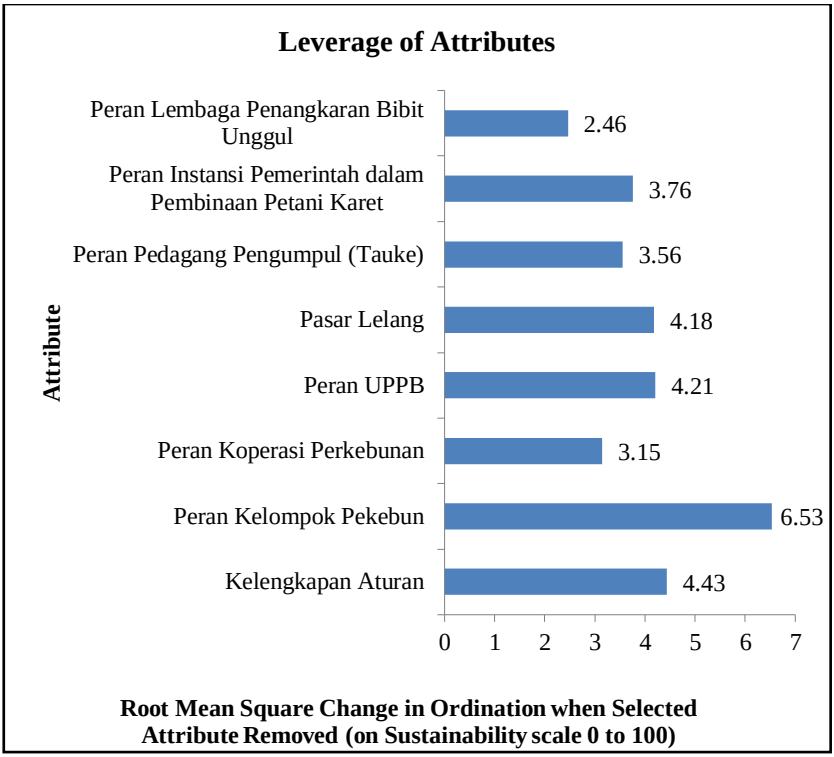


Figure 12. The role of each attribute influencing the sustainability of institution dimension of small holder plantations

Tabel 5.The percentages of RMS values to determine the sensitive attributes of institution dimension

No	Institutional attributes	RMS values	Percentage
1	The role of small holder groups	6,53	20,23
2	The availability of regulations	4,43	13,72
3	The role of UPPB	4,21	13,04
4	Auction market	4,18	12,95
5	The role of government towards the small holders	3,76	11,65
	Total		**71,59**
6	The role of employers	3,56	11,03
7	The role of the small holder cooperatives	3,15	9,76
8	The role of prime seeds cultivation institution	2,46	7,62
	Total	**32,28**	**100,00**

Five sensistive attributes were obtained at the institution dimension that influenced the sustainability of the small holder plantations. The sensitive attributes were gained from the total commulative percentage of RMS that was 71,59 %. If attributes were added it would exceed the value of 82,63 %, the limit of the maximum commulative value of 75 %. These sensitive attributes are (1) the role of small holder plantations, (2) the avalabilty of regulations, (3) The role of UPPB, (4) auction market and (5) the role of government departments towards the development of the small holders. These five institution dimensions become the consideration for the next step in developing the model for sustainable plantations of small holders in Riau province.

4.1.6. The level of sustainability of small holder plantations

A partial analysis towards the sustainability of small holder plantations for every dimension whereby the five dimensions had sustainable values of about 52,95 to 60,35 except the institution dimension that was only 20,73, whereas the average stress value was 15 %. The determination coefficient values (R2) are shown in Table 6.

Tabel 6. Sustainability values, stress values, and correlation coefficient values (R2)

Dimensions	Sustainability values (%)	Stress values (%)	Determination coefficient values (R^2)
Ecology	52,95	13,73	94,60
Technology	62,35	13,10	95,47
Economy	60,18	13,64	95,30
Social	53,62	15,40	94,55
Institution	20,73	13,75	95,25
Small holders estates	53,73	12,90	95,77

Source: MDS Calculation

Table 6 shows that the sustainability index of the small holder plantations are categorized *suatainable enough* with the value of 53,73 or > 50 %. The stress value towards the model is only 12,90 % or <20 %, whereas the determination coefficient value (R2) reaches 95,77 % which means only 4,23% cannot be explained by way of model. On the whole, the results of MDS analysis towards the five dimensions of small holder plantations can be seen in Figure 13.

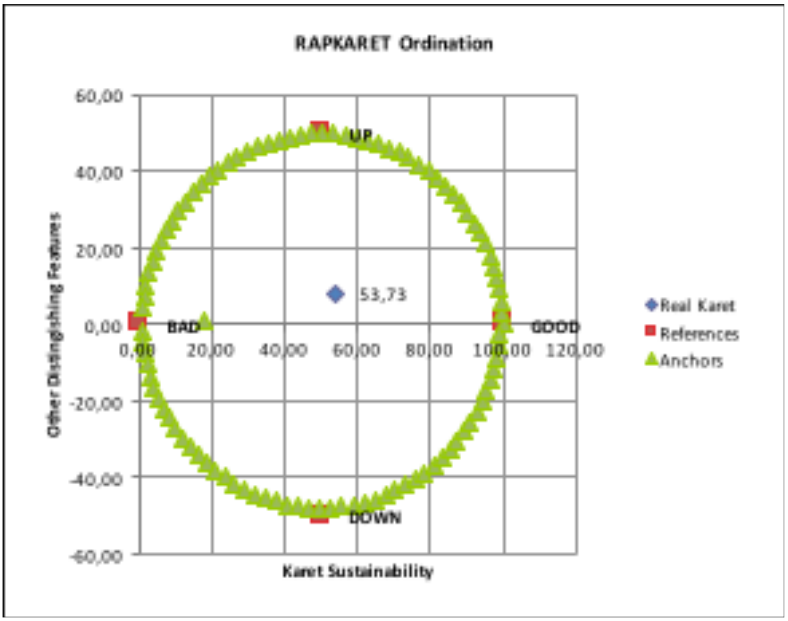


Figure 13. Sustainability index of multi dimension of samll holder plantations

Although the sustainability index of small holder plantations is categorized *sustainable enough* whereas the sustainability values of institutional dimensions is not *sustainable enough* when viewed from the five dimensions which can be seen in Figure 14.

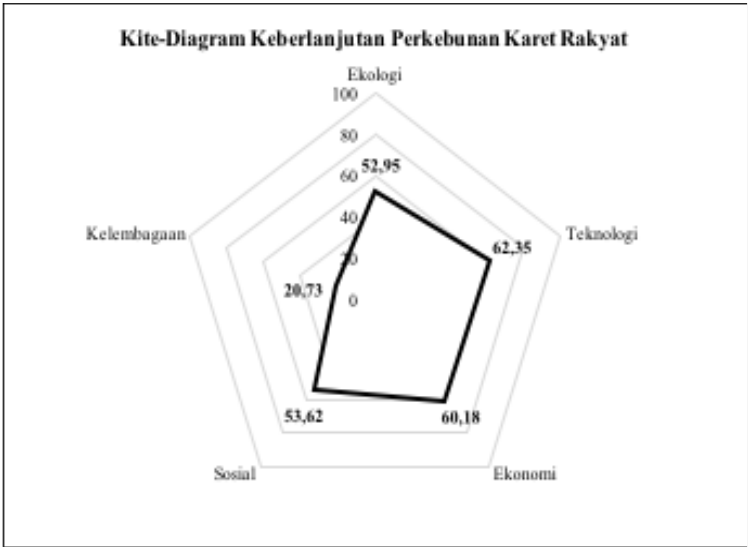


Figure 14. Five-Dimension Sustainability Analysis of small holders estates

4.2. Discussion

4.2.1. Key attributes of the sustainability of small holder plantations in Riau province

The key attributes that influenced the sustainability of the small holder plantations in Riau province viewed from the development of the small holders based on leverage analysis are shown in Table 7.

Tabel 7. Recapitulation of the key attributes influencing the sustainability of small holder plantations in Riau province

No	Dimensions	Attributes	*Leverage*	*MDS*
1	Ecology	Raining days	10,09	52,95
		Size of plantations	10,04	
		Number of taping days	7,43	
		type of land	5,10	
2	Technology	Knowledge of coagulant	3,45	62,35
		Knowledge of clean cup lamp	3,13	
		Knowledge of planting distance	3,01	
		Small hoders attitudes towards clean cup lamp	2,50	
		Knowledge of TM maintenance	2,30	
		Knowledge of tapping techniques	2,22	
3	Economy	Access to clean water	3,70	60,18
		Access to transportation	3,46	
		Debts	2,81	
		Constraints in marketing	2,06	
		Perception on the availability of commodities	2,05	
		Access to price information	1,99	
4	Social	Level of resourses conflict	3,43	53,62
		Level of labor absorption	0,70	
		Wisdom and local knowledge	0,69	
		Economic facilities	0,67	
5	Institution		6,53	20,73
		The role of small holder groups		
		The availability of regulations	4,43	

The role of UPPB	4,21
Auction market	4,18
The role of government towards small holders	3,76

There are 25 attributes being identified influencing the ecology dimension, technology dimension, social and institution dimensions that influenced the ssustainability of the small holder plantations in Riau. The next step is identifying the key attributes of the 25 attributes that would be used as the consideration in deciding the step for arranging the model of developing the small holders in rubber plantations in Riau. To determine the key attributes Prospective Analysis was employed.

4.2.2. Prospective Analysis

The next step Prospective Analysis was used to identify the position of supporting attributes so that the key attributes or determining factors (driving variables) would be obtained in developing the small holders in an effort to sustainably manage the small holder plantations. The prospective analysis outputs obtained four quadrants which are the positions of the supporting attributes as shown in Figure 15.

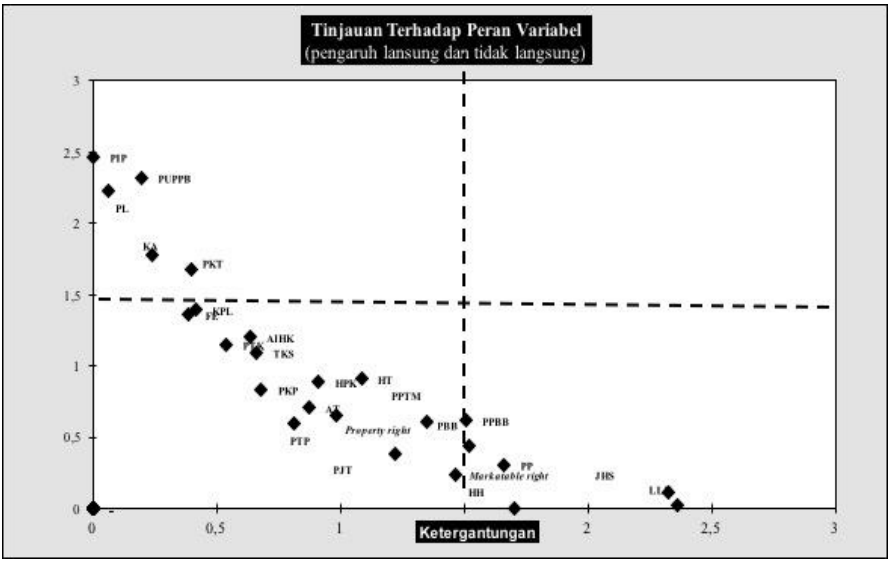


Figure 15. The graph of the influence and dependency of variables

Based on the participative perospecive analysis, the determining factors of developing small holders in sequence can be seen in Table 15.

1. Improvement of the role of government departments
2. Improvement of the role of the Unit for Cup Lamp Processing and Marketing
3. Improvement of the role of rubber auction market
4. Improvement of the availability of regulations
5. Empowerment of small holder groups

2. CONCLUSIONS

On the basis of the discussion in the previous chapter, the following conclusions can be drawn:

a. Based on Multi Dimensional Scalling (MDS) method, on the whole small hoder rubber plantations were categorized *sustainable enough* with the index value of 53,73. Of the five dimensions, institution dimension was unsustainable with the index value of 20,73, whereas technology dimension was *the most sustainable*. Therefore, in order to produce sustainable small holder rubber plantations, institutional management is a must.

b. Based on leverage analysis, 25 supporting attributes were obtained of 50 attributes which influenced the sustainability of small holder plantations. In addition, on the basis of the participative prospective analysis, of the 25 supporting attributes, 5 attributes were categorized as the determining factors (driving variables) ; namely, improvement of the government role, improvement of UPBB, improvement of rubber auction market, improvement of the availability of regulations, and empowerment of small holder groups.

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