Factors affecting farmers' satisfactions with mechanized rice harvesting in Malaysian paddy fields: A case study of hiring custom operators

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Abstract: Shortage of labor during the harvest season is one of the problematic situations for farmers in the Malaysian paddy fields. Thus, combine harvester has been utilized massively in Malaysian paddy field for the purpose of assisting the farmers to overcome the problems. Majority use of combine harvesters in the country was provided by the state farmers' organization that offers custom operators to be hired by the farmers during harvesting seasons. A case study was conducted to identify and rank the factors that affect farmers' current satisfactions with mechanized harvesting using combine harvesters that offered by custom operators. A group of farmers comprising of 336 respondents at rice granaries in Tanjung Karang district, Selangor, Malaysia was chosen as the samples for this case study. The respondents were asked 20-items of questionnaire through face-to-face interviews in a survey method. Five-point Likert scale analysis was used to scales the responses. All the responses were then analyzed using the Statistical Package for Social Science (SPSS) version 21.0 software. Meanwhile, the significance level of each factor affecting the farmers' satisfactions was determined by factor analysis approach. General comments from respondents with regard to services given by the custom operators were also evaluated qualitatively in this study. The findings of study have completely admitted 4 out of 8 factors as the most significant factors in affecting farmers' satisfactions with mechanized rice harvesting by hiring custom operators in Malaysian paddy fields. Such factors could be refereed by custom operators to improve their services. Generally, these findings could enrich the knowledge of farm machinery management, and particularly in managing the harvesting operation with custom operators to achieve satisfactory field operations both from economics and quality of work aspects.

Keywords: rice, combine harvester, farmers' satisfaction, mechanization, custom operator

Citation: Adam, N. S., D. E. Pebrian. 2017. Factors affecting farmers' satisfactions with mechanized rice harvesting in Malaysian paddy fields: A case study of hiring custom operators. Agricultural Engineering International: CIGR Journal, 19(2): 120–128.

1 Introduction

Rice is one of the most important major crops in Malaysia and the staple food of the people in the country (Ramli et al., 2012). In year 2011, Malaysian farmers supply 1.69 million metric ton rice that harvested from 675000 hectares of rice granaries throughout the country, with an average yield of 2.50 metric ton per hectare (Wailes and Chaves, 2012). However, due to the total domestic consumption of rice is estimated to be around 2.3 million ton yearly, thus the current rice self-sufficiency level (SSL) in Malaysia is only fulfilling 73% of the target (Raziah et al., 2010). This had caused this country still needs to import the rice from other countries, such as Thailand, Vietnam and India.

Harvesting is the most important activity to sustain the productivity and quality of rice. This operation is known as a labor-intensive operation in the process of rice cultivation. Like any other country that had transformed the economy from agriculture to industry, Malaysia's agriculture sector also faces the labor

Received date: 2016-09-14 **Accepted date**: 2017-05-29

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shortages problem due to the difficulty of getting people who are willing to work in the sector. Currently, only 40% of 300000 paddy farmers in Malaysia are working as full-time farmers (Alam et al., 2011). A similar trend also happened in Pakistan, whereby the shifting of labor from rural areas to the cities is the major reason for the labor shortage at the time of rice harvesting (Tahir et al., 2003). Having no other choice, combine harvester has been introduced to mechanize rice harvesting system in an effort to fight the labor shortage situation in Malaysia.

Nowadays, the combine harvesters are being employed massively and continuously in harvesting rice in Malaysia. All the combine harvesters operated in Malaysian paddy fields were originally imported from overseas such as European countries and USA. Originally, these combine harvesters were designed for harvesting wheat. Thus, the harder structure of rice stem than that of the wheat had reduced the efficiency of combine harvester when it operates in Malaysian paddy fields. Other than that, high price of the imported combine harvester, limited capital expenditure and uneconomic size of paddy fields in most rice granaries in the country had inhibited the farmers from purchasing the combine harvester.

The above-mentioned conditions had caused hiring custom operators is the best alternative for the farmers in Malaysia to utilize mechanization in their paddy fields in the harvest seasons. This implementation takes advice from the theory of Siemens and Bowers (2008), who stated that hiring custom operators is one important alternative to owning machinery. In fact, Siemens and Bowers (2008) mentioned, in some cases, hiring custom operator can complete the work faster, provides the least-cost method, and does not require the capital needed for owning farm machinery.

Normally, the custom operators in Malaysian paddy fields are provided by the states farmers' organization. Concerning that matter, it is a considerable need to investigate the factors that affect the farmer's current satisfactions with mechanized rice harvesting by hiring custom operators. The accurate answer with respect to this matter is very crucial for sustaining the economics of mechanized rice harvesting in Malaysian paddy fields. In particular, it would help the custom operators to develop the successful strategic planning for growing their business.

Until to date, no study has been published looking at the factors affecting farmers' satisfactions with mechanized rice harvesting by hiring custom operators in Malaysian paddy fields. The relevant previous published studies only reported about the farmers' satisfactions with the use of farm machinery in other countries, such as USA, China, India and Sweden. Reyken et al. (1994), for example, studied the farmer satisfactions with hay and forage equipment in Allamakee and Mahaska counties in Iowa, USA. In general, they concluded that the farmers were satisfied with their hay and forage equipment, however they were dissatisfied with large round bale. Meanwhile, Feng et al (2011) investigated on the farmers' perception toward the brand of agricultural machinery in China. They found that the national tractor brand gains more attention from the customers in China, rather than the foreign brand due to the price of the foreign brand tractor is more expensive. The farmers care so much about the price of combine harvester since almost 80% of the farmers buy farm machinery with their own money rather than using financial assistance from the government subsidy. In India, Verma (2006) claimed that the farmers were satisfied with the timeliness of operations of the tractors having a better control system. Another study in Sweden conducted by Toro and Hansson (2004), who reported that the farmers were satisfied with the performance of combine harvester operators with work experience more than 3 years.

Theoretically, findings of the previously published studies could not be practiced to identify the factors that affect Malaysian farmers' satisfactions with mechanized rice harvesting by hiring custom operator. The reasons are that the socio-economy, demography, adoption and adaptation of technology, crop cultivation practices and farmland characteristics of Malaysia are extremely different with the respective countries reported in the previously published studies. These situations may give different perceptions or views on the factors that affect farmer's satisfactions with mechanized rice harvesting by custom operators in Malaysian paddy fields. Actually, the

previously published studies were also not specifically focused on the farmers' satisfactions with the custom operators.

Thus, this study was initiated to identify and rank the factors that affect the farmers' satisfactions with custom operators in mechanized rice harvesting by hiring custom operators in Malaysian paddy fields. Others general comments from respondents with regard to the custom operators' services were also investigated qualitatively in this study. The findings of this study would offer a significant improvement to the body of knowledge in the field of farm machinery management, particularly in managing good harvest practices with a custom operator to achieve satisfactory field operations both from economics and quality of work aspects.

2 Materials and methods

2.1 Population and sample

This study was carried out at two areas of paddy fields, comprising of Kg. Sawah Sempadan and Sg. Burong in the district of Tanjung Karang, Selangor state, Malaysia from the month of August 2013 to December 2013. Recently, a total of 22 combine harvesters along with the operators were provided by the Selangor State Farmers' Organization (SSFO) to carry out custom operator to the farmers in the study area. The rice granaries produce an average of 3.8 ton yields per hectare per year and have planted areas of 14848 acres that operated by 2217 families of farmers. It is also recorded as the largest paddy areas in Selangor state and listed in the top three of the main producer paddy areas in Peninsular Malaysia (Fuad et al, 2012). The paddy fields areas were installed with proper irrigation system. Besides well-known as a rice bowl in the state, the areas were purposely chosen is just simply because 100% of rice harvesting activities in this area had employed the combine harvester.

The target population was the farmers, who hired custom operator that provided by the SSFO. In this system, the farmers hire the combine harvester along with the operator to perform custom harvesting on their paddy fields. The samples size was 336 out of 2217 farmers, who registered under the membership of SSFO. They were randomly selected in order to represent the real situation of population and also avoid bias sampling. The number of respondents had met the requirement of samples size of 333 respondents as suggested by Krejcie and Morgan (1970) for a total population size of 2500.

2.2 Data Collection

A survey questionnaire method through face-to-face interview was carried out to collect the data and other relevant information from the respondents. The questionnaire items were compiled from the previously published studies (Ryken et al, 1994; Roy et al, 2003; Toro and Hansson, 2004; Veerangouda et al, 2010; Hassani et al, 2011; Feng et al, 2011; Mastura et al, 2011; Bockari et al, 2011) and personal communication with local agricultural officers. Five-point Likert scale analysis based on Oppenheim (1992) were used to scale the responses from the respondents. The scales were anchored at '1' for strongly dissatisfied, '2' for dissatisfied, '3' for neutral or undecided, '4' for satisfied and '5' for strongly satisfied for positive statement and a reverse system of scoring for negative statement. Prior to distributing the questionnaire items, the respondents were clearly briefed about the questions so that they understand and give a clear answer during the interview. At the beginning of the survey, the respondents also were asked about their demographics data. Meanwhile, at the end of the survey, the respondents were asked to give general comments to improve the services of the custom operators in the future.

A pilot test was conducted to assess the reliability of the questionnaire items prior to using it to collect the data. This test is considered a small scale preliminary study and designed to identify the items of question that don't make sense to the respondents. A total of 36 samples from target group took part in the pilot test. This amount fulfilled the range of samples number of 20-40 as recommended by Kieser and Wassmer (1996). The questionnaire for the pilot test was a set of 100 items of question, which are grouped 8 into main factors. As mentioned earlier, these items were assembled from the previously published studies and personal communication with local agricultural officers. The collected data was analyzed to assess the reliability levels of the

questionnaire based on the Cronbach's alpha values. By means of the calculation of Cronbach's alpha values, the output of pilot test had shown only 20 out of 100 items of questionnaire were reliable for determining the factors affecting the respondents' satisfactions (Table 1), while 80 items must be deleted from the questionnaire since their Cronbach's alpha values were found to be less than 0.5. By deletion of these items, finally the alpha values increase to 0.56 and meet the recommended reliability levels by Nunnally (1967), who mentioned that the reliability levels of more than 0.5 are acceptable.

Table 1 List of questionnaire items considered in identifying factors that affect farmers' satisfactions

No.	Questionnaire item
1	Grain losses should not be greater than 2%.
2	Unstripped paddy.
3	The presence of immature grain within the harvested grain.
4	Percentage of cracked grain in the harvested grain.
5	Degree of purity of harvested grain.
6	The speed of combine harvester follows the standard operating speed.
7	Preference for small size combine harvesters rather than the big ones.
8	Service of combine harvester provided by the SSFO is timely.
9	The operator makes adjustment on combine harvester before going to the field.
10	The operator cleans mud stained out of combine harvester tires after harvesting.
11	The operator performs harvesting works orderly.
12	The government assistances on mechanized rice harvesting program is very helpful.
13	The place for receiving the harvested grain is appropriate
14	The operator can prolong harvesting works until night-time if necessary.
15	Feeling cared about the purchase price of combine harvester.
16	Location of awaiting lorry for transporting the grain to the collection point is proper and does not disturb the villagers' traffics.
17	Preference for owning combine harvesters rather than hiring the custom operator.
18	Financial assistance from government subsidy makes the combine harvester affordable.
19	Custom operator charge for harvesting is reasonable.
20	Feeling concerned about the usage of combine harvester can lead the soil compaction in paddy field.

2.3 Data Analysis

The collected data from the respondents were analyzed by using the Statistical Package for Social Science (SPSS) version 21.0 software. The demographic data of the respondents were presented in tabular form to describe the characteristics of the respondents. Since the samples size of this study was 336 respondents and was considered as a huge samples size, thus, it should be preferable for the factor analysis. A list of 20 reliable questionnaire items as results of the pilot test was used to measure construct underlying the data. These items were rated by Likert scale.

Factor analysis was then performed to summarize and classify large a number variables in order to be an interpretable and manageable into a set of factors and detect structure relationship between the variables with in a factor. A factor analysis procedure developed by Hair et al. (2006) was adopted in performing the factor analysis. The procedure consisted of four steps, i.e. computing the correlation matrix for all variables, extracting a set of initial component from the correlation matrix, rotating the initial components to make them more interpretable, and lastly, grouping the scores for each factor.

The techniques of Measures of Sampling Adequacy (MSA) using Kaiser-Meyer-Olkin (KMO) and Bartlett's test were carried out prior to assessing the suitability data for the factor analysis. The KMO statistics varies between 0 and 1, and the values of more than 0.6 were acceptable for factor analysis. The preliminary results of Bartlett's test of sphericity show the correlation matrix was at an appropriate level and satisfactory to perform factor analysis on the collected data. This is because all scales have achieved a highly significance level at $p < 0.001$, and also the value of KMO was 0.632 or higher than that of 0.6.

The Principal Component Analysis (PCA) was used to describe the variation in a set of multivariate data in terms of a set of uncorrelated data. The PCA extracts the most significant factors from the collected data, reduces the complexity, and explains the variances in the variables. Any factors with Eigenvalues value of 1 and greater should be included as the significant factors, while the factors with values of less than 1 should be excluded. Lastly, the varimax rotation method was used to summarize and classify the number of components with a high factor loading, thus, enhance the interpretability of the factors.

Variables within any factors with factor loading values of 0.80 or greater was considered highly factor loading (Guadanogli and Velicer, 1988; Asnawi et al 2012), and should be classified as the highly significant factors in affecting the farmers' satisfactions.

3 Results and Discussion

3.1 Demographic Characteristics

The demographic characteristics of farmers are presented in Table 2. In this study, the respondents were Malay ethnic groups only. The overall age of the respondents was the adult, in which about 44.94% or almost half of the respondents were aged 44 to 61 years. Approximately 88.99% of the respondents were married. Larger involvement of old generation in the ages 40 and above in the study areas is agreeing with Mohammad and Sarjiman (2007), who said that the agricultural areas the Malaysia were lacking with the young generation. On the basis of education levels, the percentage of respondents had passed primary and secondary school with Malaysian Certificate of Education (MCE) qualification were 29.76% and 29.47%, respectively. Their main occupations were basically commercial rice farmers. However, they earned income ranges from RM 1,000 (USD272) to RM 2,000 (USD544) monthly. By gender, majority of the respondents were male, which accounts about 67.86% of the respondents, while the rest were female.

Table 2 Demographic data of respondents

Demographic characteristics	Total	Percent, %
Age		
26 - 43 years old	84	25.00
44 - 61 years old	151	44.94
62 - 79 years old	93	27.68
80 - 97 years old	8	2.38
Gender		
Male	228	67.86
Female	108	32.14
Marital status		
Married	299	88.99
Single	16	4.76
Widow/Divorced	21	6.25
Education level		
Primary school	100	29.76
Lower Secondary Evaluation	27	8.04
Malaysian Certificate of Education	99	29.47
Malaysian Higher School Certificate/Diploma	39	11.61
Skill certificate	16	4.76
Degree and above	11	3.27
Non-school	33	9.82
Religious school	11	3.27
Land size		
1 - 9 acres	306	91.07
10 acres and above	30	8.93
Monthly income)*		
RM 1,000 and below	16	4.76
RM 1,001 - RM 2,000	142	42.26
RM 2,001 - RM 3,000	83	24.70
RM 3,001 - RM 4,000	74	22.02
RM 4,001 - RM 5,000	18	5.36
RM 5,001 and above	3	0.90
Farmers' work status		
Commercial farmer	154	45.83
Half commercial farmer	53	15.78
Heritage farmer	129	38.39

Note: *) The exchange rate for 1.00 USD is equal to 3.69 MYR during the study conducted.

3.2 Effective factors affecting the farmers' satisfactions

The output of factor analysis has successfully summarized and grouped the variables into 8 factors that can be used to interpret the factors that affect farmer's satisfactions (Table 3). Based on the significance levels, the output shows 4 out of 8 factors i.e., 'quality and quantity of harvested grain', 'operating method, size of machine and services', quality of pre- and post-harvest works 'and 'custom operator charge' having the variables with highly factor loading, which are greater than 0.80.

However, overall, all the factors listed in Table 3 affects the farmers' satisfactions with mechanized rice harvesting by hiring custom operators in Malaysian paddy fields. This is because almost all factors have the variables with factor loading are greater than 0.30 or judged as significant (Nunally, 1978; Tabachnick and Fidell, 1996; Gustafson et al., 2011). The exception is only found in a variable in factor 5, namely 'preference for owning combine harvester rather than hiring the custom operator ", which has a factor loading of 0.12. Although with a low factor loading, this variable still has correlations with the others within the same factor, thus, it should be retained within the factor. This is because three (3) other pertinent variables in the same factor have loadings of 0.686, 0.559 and 0.333 (Table 3), which are greater than 0.30 and considered significant. According to Pasta el al (2004), a factor also can be reliable and has good interpretability if it has at least 3 items of variable with high loading (>0.30).

The study has also successfully ranked the significance levels of each variable within each factor based on its factor loading. 'Grain losses should be not

greater than 2%' with the highest loading of 0.832 was considered as a highly significant variable in factor 1, followed by 'unstripped paddy' (0.808), 'the presence of immature grain within the harvested grain' (0.764), 'percentage of cracked grain in the harvested grain' (0.656), and 'purity of harvested grain' (0.372). This is agreeing with Roy et al. (2003), who indicated the grain losses is an important element to be paid attention during harvesting. The maximum percentage of grain loss of 2% was reasonable in rice harvesting. Fulfilling the standard amount of grain losses should be prioritized by the SSFO since it relates to the expectations of respondents, and it will affect their satisfactions. This is in line with Anderson et al (1994), who stated that the overall quality of goods or services and price for customers' satisfactions is also affected by their expectations.

Table 3 Summary of factor analysis of farmers' satisfactions with mechanized rice harvesting by custom operators

No.	Factor	Variable	Factor loading	Variance explained
1	Quality and quantity of harvested grain	Grain losses should not be greater than 2%.	0.832	12.952
		Unstripped paddy.	0.808	
		The presence of immature grain within the harvested grain.	0.764	
		Percentage of cracked grain in the harvested grain.	0.656	
		Degree of purity of harvested grain.	0.372	
2	Operating method, size of machine and services	The speed of combine harvester follows the standard operating speed.	0.874	11.286
		Preference for small size combines harvesters rather than the big ones.	0.851	
		Service of combine harvester provided by the SSFO is timely	0.773	
3	Quality of pre- and post-harvest works	The operator makes adjustment on combine harvester before going to the field.	0.864	8.024
		The operator cleans mud stained out of combine harvester tires after harvesting.	0.840	
4	Good availability of other supporting activities for the harvesting works	The operator performs harvesting works orderly.	0.741	7.107
		The government assistances on mechanized rice harvesting program is very helpful.	0.565	
		The place for receiving the harvested grain is appropriate.	0.541	
5	Fieldwork arrangement and cost of machine ownership	The operator can prolong harvesting works until night-time if necessary.	0.686	6.580
		Feeling cared about the purchase price of combine harvester.	0.559	
		Location of awaiting lorry for transporting the grain to the collection point is proper and does not disturb the villagers' traffics.	0.333	
		Preference for owning combine harvester rather than hiring the custom operator	0.12	
6	Government subsidy	Financial assistance from government subsidy makes the combine harvester affordable	0.587	6.003
7	Custom operator charge	Custom operator charge for rice harvesting is reasonable.	0.806	5.946
8	Soil compaction	Feeling concerned about the usage of combine harvester can lead the soil compaction in paddy fields.	0.798	5.721

'The speed of combine harvester follows the standard operating speed' with the highest loading of 0.874 was noted as a highly significant variable in factor 2. The subsequent variables were 'preference for small size combine harvesters rather than the big ones' (0.851), and 'service of combine harvester provided by the SFO is timely' (0.773). The ASABE (2011) has recommended the operating speed of self-propelled combine harvester should be within the ranges of 3 to 6.5 km/h. Meanwhile, according to Veeragouda et al. (2010), operating combine harvester in paddy fields with recommended speed can offer a good effective field capacity and minimize grain losses due to effect of machine.

'The operator makes adjustment on combine harvester before going to the field' with the highest loading of 0.864 was quantified as a highly significant variable in factor 3. This is consistent with Siemens and Bowers (2008), who mentioned that the combine harvester has to be adjusted before going to field for its maximum field performances. Meanwhile, 'the operator cleans mud stained out of combine harvester tires after harvesting" (0.840) was the subsequent variable in factor 3. In the study areas, the respondents suggested improvement on the quality of pre- and post-harvest works provided by the custom operator of SSFO since it would influence the amount of grain losses in the field. Roy et al. (2003) stated that the amount of grain losses could be reduced by making adjustment and servicing the machine regularly.

'The operator performs harvesting works orderly' with the highest factor loading of 0.741 was measured as a significant variable in factor 4, and followed by 'the government assistances on mechanized rice harvesting

program is very helpful' (0.565), and 'the place for receiving the harvested grain is appropriate' (0.541). Performing works orderly is important to eliminate the lost-time and achieve the fullest possible field capacity of the machine as suggested by Siemens and Bowers (2008).

'The operator can prolong harvesting works until night-time if necessary' with the highest factor loading of 0.68 and was recorded as a significant variable in factor 5, followed by 'feeling cared about the purchase price of combine harvester' (0.559), 'location of awaiting lorry for transporting the grain to the collection point is proper and does not disturb the villagers' traffics' (0.333), and 'preference for owning combine harvester rather than hiring the custom operator' (0.120). Practicing two times paddy planting seasons per year by the Malaysian rice farmers, as reported by the Department of Agriculture Peninsular Malaysia (2015) have caused some operators of the combine harvesters must continue their works until the night time to complete their works. The respondents believed this situation have made the variable was greatly crucial.

'Financial assistance from government subsidy makes the combine harvester affordable' with a factor loading of 0.587 is the only one and significant variable in factor 6. Through personal interviews, the respondents delivered their wishes to have their own combine harvester if the government are willing to give them a financial assistance. They prefer to perform harvesting works on their paddy fields by themselves in order to optimize the utilization of combine harvester, thus, maximize the paddy collected by reducing the amount of grain losses. Financial assistance is the backbone for supporting the mechanization program in rice harvesting because the cost of owning and operating farm machinery takes the large portion of farm business investment. This is agreeing with Najim et al. (2007), who stated that purchasing and operating farm machinery requires about 21% of the total expenditure on rice production, excluding the operator wages, maintenance and other facilities needed for the machinery.

Similarly, 'custom operator charge for rice harvesting is reasonable' (0.806) was the single and highly significant variable in factor 7. Most of the respondents claimed the charge of custom operator established by the SSFO could be further reduced in the future with regard to the relevant economics considerations. According to Siemens and Bowers (2008), size of fields, travel distances from base or last job, difficulties to crop or field conditions, labor cost and maximum profit-and-risk margins of 50% of total cost should be considered in establishing the custom operator charge. Lastly, 'feeling concerned about the usage of combine harvester can lead the soil compaction in paddy fields' (0.798) is also the single and significant variable in factor 8. Generally, the respondents declared the soil compaction occurred when harvesting operation was conducted after rainy days and on a high moisture soil condition. Under this condition, they prefer the custom operators use the small size of combine harvesters rather than the big ones so that it can reduce the effect of soil compaction.

3.3 General Comments

Some general comments of the respondents were recorded through personal interviews for improving mechanized rice harvesting by custom operators. The respondents were asked to evaluate qualitatively some important aspects concerning the services given by the custom operators in mechanized rice harvesting. They concern about quality of harvested grain to assure better income from the paddy production. However, generally, the respondents in the study areas complained about the amount of harvested grain losses due to the current operation of combine harvester.

Almost half of the harvested grains were spilled out from the collecting tank in the field when the combine harvester operator drives the machine faster than that of the recommended speed. Normally, the motive of increasing speed of combine harvester is just simply because they want to gain more profits by finishing a job earlier, thus, they can offer the same services to other customers. Moreover, the respondent also concerned with the size of combine harvester. Some of the respondents claimed that the smaller size combine harvesters would not be able properly harvest the paddy as good as the big ones did. However, most of the respondents prefer having smaller size combine harvester to reduce soil compaction effect if harvesting operation must be performed after

rainy days. Limited size of combine harvester provided by the SSFO had made the respondents do not have much options to select the combine harvester during harvesting seasons.

The respondents also suggested the SSFO instruct its technicians to make a regular adjustment and service on the combine harvester prior to going to the field in order to maintain the machine reliability and to keep the machine performing its job properly. All these things would indirectly increase the yield through eliminating machine breakdown in the field and minimizing grain losses.

The SSFO also needs to assign a supervisor to watch their operators during harvesting in the field. The supervisor should be given a responsible to inspect the whole process of harvesting operations in the field. This is because majority of the operators drive the combine harvesters with the standard operating speed only when their customers are watching the operation. Once the customers had gone out from the fields, the operators drive the machine faster. Besides, the respondents also advised the SSFO to train the operators before serve. They said only skillful operators should be permissible to perform harvesting duties on customers' paddy fields.

Furthermore, the respondents also advocated the relevant government agency to regulate the placement of combine harvesters at rice granary areas. This regulation is important to control the charge of custom operator in order to be always reasonable. In addition, the respondents also hoped the government subsidizes them purchase the combine harvester. By having the subsidy, the respondents believed that they feel free in choosing the type of combine harvester and no longer highly dependence on the services by the SSFO, particularly during peak harvesting season.

4 Conclusions

The factors affecting farmers' current satisfactions with mechanized rice harvesting by hiring custom operators in Malaysian has been studied. The findings have successfully identified 8 factors that affect the farmers' satisfactions with mechanized rice harvesting through hiring custom operators in Malaysia. However, 4 out of 8 factors were only considered to be highly significant factors in affecting the farmers' current satisfactions since they variables with factor loading, which are greater than 0.80. The four factors i.e. factor 1 'quality and quantity of harvested grain', factor 2 'operating method, size of machine and services', factor 3 'quality of pre- and post-harvest works 'and factor 4 'charge for custom operator'.

Qualitatively, it is admitted that the output of custom operators' offered by the SSFO is far from the respondents' expectation. In other words, they are less satisfied with the performance of custom operator provided by the SSFO. As remarked, the respondents complained about the amount of harvested grain losses, quality of harvested grain, operating speed of combine harvester, regular service and maintenance of combine harvester. The respondents believed that the SSFO can give much better services by improving their current training for the operators and maximizing their quality awareness in doing their works. The respondents also suggested the charge of custom operators should be reasonable to help the farmers. Generally, the findings of study give contributions in improving the body knowledge in the area of farm machinery management, particularly in implementation of good management of harvesting with custom operators.

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