Original Article | Journal of Biosystems Engineering

J. of Biosystems Eng. 39(4):261-266. (2014. 12)
http://dx.doi.org/10.5307/JBE.2014.39.4.261

eISSN : 2234-1862
pISSN : 1738-1266

Satisfaction with the Quality of Agricultural Machinery and the Propensity for Replacement Purchases

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Received: September 30th, 2014; Revised: November 4th, 2014; Accepted: November 17th, 2014

Abstract

Purpose: This study was conducted to serve as a basis for strengthening policy support and R&D to improve the domestic and international competitiveness of domestic agricultural machinery. Levels of satisfaction among farmers and service engineers were analyzed regarding the current quality of agricultural machinery and the primary consumers' propensity for replacement purchases. **Methods:** A survey was carried out targeting farmers in over 150 townships and 300 villages in South Korea who collectively used 711 tractors, 286 rice transplanters, and 221 combine harvesters. Furthermore, agricultural machinery service engineers from 20 different after-services were surveyed regarding the quality of main components in domestic agricultural machinery versus those in imported agricultural machinery. **Results:** The farmers' overall quality satisfaction ratings for tractors, rice transplanters, and combine harvesters ranged from 57.1% to 62.6% in consideration of operating performance, failure rate, and durability. Compared with imports, satisfaction ratings for domestic agricultural machinery were 19.1%p to 38.1%p lower for quality. Regarding engines, transmissions, hydraulics, planters, reapers, threshers, and electrical components, only 5.3% to 25.0% of service engineers indicated that domestic agricultural machinery was higher in quality compared with imports. By contrast, 33.3% to 78.9% of those surveyed indicated that domestic components were lower in quality compared with imports. Intent to purchase replacement agricultural machinery at the end of their respective products' lifecycles was indicated that they planned to purchase imported tractors, rice transplanters, and combine harvesters comprised 25.2%, 46.9%, and 43.9%, respectively. This clearly shows that a very high percentage of farmers were satisfied, particularly for transplanters and combine harvesters. **Conclusions:** The level of desire for purchasing imported agricultural machinery was very high among those who expressed intent to purchase replacement machinery. Therefore, strong policy support and R&D for domestic agricultural machinery is critical for improving competitiveness on the domestic and foreign markets.

Keywords: Combine harvester, Quality and level of satisfaction, Replacement purchase, Rice transplanter, Tractor

Introduction

An increase in large, high-performing agricultural machinery and a decrease in farmers (the main clients of domestic agricultural machinery) due to aging have contributed to a recent declining trend in supplies of domestic agricultural machinery. This phenomenon is expected to continue into the near future. The market share of imported agricultural machinery is continually increasing and recent pricing trends, in which certain imported machinery products are priced more competitively than their domestic counterparts, are compounding the difficulties faced by the domestic agricultural machinery industry.

Expanding domestic market share and increasing exports are imperative for revitalizing an agricultural machinery industry facing a decreased demand for domestic products and a need for securing quality and price competitiveness. However, if the supply of imported products continues to expand in the domestic agricultural machinery market, the potential for exporting domestic products could be limited due to a weakening industrial base.

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An examination of supply numbers for domestic agricultural machinery showed that 12,246 units of tractors were supplied in 2012; this number has stalled near 13,000 units since 2008. In 2012, 3,810 units of rice transplanters and 2,490 units of combine harvesters were supplied, but these numbers were down 15.6% and 20.0%, respectively, compared with 2003 (MAFRA, 2013). In 2012, the domestic market share for imported agricultural machinery (finished products) was 13.2% for tractors, 57.5% for rice transplanters, and 27.3% for combine harvesters. Compared with 2003, the share for tractors decreased by 4.4% whereas that of rice transplanters and combine harvesters increased by 31.5% and 20.2%, respectively (Shin et al., 2013). Korean agricultural machinery exports reached $100 million (USD) in 2000 and have continued to increase at an average annual rate of 16.4%. In 2012, 61.9% of the $750 million in exports was concentrated in the U.S. (43.5%) and Asia (18.4%) and tractors accounted for 57.2% of total agricultural machinery exports (Korean Society for Agricultural Machinery, 2013).

Therefore, this study was conducted to serve as a basis for policy, distribution, export, and research and development (R&D) to improve the competitiveness of domestic agricultural machinery. Levels of satisfaction among farmers and service engineers were analyzed in relation to the current quality of agricultural machinery and primary consumers' propensity for replacement purchases.

Materials and Methods

Local interviews and questionnaire surveys targeting farmers and service engineers were conducted from August 2013 to July 2014 to evaluate the level of satisfaction and propensity for replacement purchases regarding domestic agricultural machinery.

A survey was carried out targeting farmers in over 150 townships and 300 villages in South Korea who used 705 tractors, 283 rice transplanters, and 217 combine harvesters (Table 1). Levels of satisfaction with quality, operating performance, failure, and durability as well as the propensity for replacement purchases were the primary focus in this study.

In addition, agricultural machinery service engineers from 20 different after-services were interviewed and surveyed regarding the quality levels of main components in domestic agricultural machinery versus those in imported agricultural machinery, including in regard to engines, transmissions, hydraulics, planters, reapers, threshers, and electrical components.

Results and Discussion

Levels of satisfaction regarding agricultural machinery

Levels of satisfaction regarding quality

The farmers' overall satisfaction ratings in consideration of operating performance, failure rate, and durability were 72.1% for rice transplanters, 62.6% for tractors, and 57.1% for combine harvesters, the lowest rating of the three (Table 2). Compared to domestic agricultural machinery, the levels of satisfaction with imports were higher across the board, with 19.1%p for tractors, 19.7%p

Table 1. Survey sampling of agricultural machinery users (unit: number of farmhouses)

Type	Tractor	Rice transplanter (Riding Type)	Combine harvester (Head-feed Type)
Domestic	618	175	181
Imported	87	108	36
Total	705	283	217

Table 2. Levels of satisfaction of domestic and imported agricultural machinery (unit: percentage)

Type	Tractor			Rice transplanter			Combine harvester		
	Total	Domestic	Import	Total	Domestic	Import	Total	Domestic	Import
Satisfied	62.6	60.2	79.3	72.1	64.6	84.3	57.1	50.8	88.9
Neutral	31.2	33.2	17.2	24.0	30.3	13.9	32.7	37.6	8.3
Dissatisfied	6.2	6.6	3.4	3.9	5.1	1.9	10.1	11.6	2.8
Total	100	100	100	100	100	100.0	100	100	100

Table 3. Levels of satisfaction regarding operating performance and efficiency (unit: percentage)

Type	Tractor			Rice transplanter			Combine harvester		
	Total	Domestic	Import	Total	Domestic	Import	Total	Domestic	Import
Satisfied	76.3	74.3	90.8	81.6	78.3	87.0	75.6	72.4	91.7
Neutral	15.5	16.7	6.9	15.2	17.7	11.1	16.1	18.8	2.8
Dissatisfied	8.2	9.1	2.3	3.2	4.0	1.9	8.3	8.8	5.6
Total	100	100	100	100	100	100	100	100	100

Table 4. Failure rate of agricultural machinery (unit: percentage)

Type	Tractor			Rice transplanter			Combine harvester		
	Total	Domestic	Import	Total	Domestic	Import	Total	Domestic	Import
Low	60.0	57.7	76.4	64.3	57.1	75.9	52.6	45.6	80.6
Equal	23.8	25.0	15.5	23.9	28.9	15.7	25.0	27.9	6.9
High	16.2	17.3	8.0	11.8	14.0	8.3	22.4	26.5	12.5
Total	100	100	100	100	100	100	100	100	100

Table 5. Levels of satisfaction with the durability of agricultural machinery (unit: percentage)

Type	Tractor			Rice transplanter			Combine harvester		
	Total	Domestic	Import	Total	Domestic	Import	Total	Domestic	Import
Satisfied	67.8	65.0	87.4	76.0	70.9	84.3	63.6	58.6	86.1
Neutral	25.0	27.5	6.9	19.4	23.4	13.0	26.7	30.4	5.6
Dissatisfied	7.2	7.4	5.7	4.6	5.7	2.8	9.7	11.0	8.3
Total	100	100	100	100	100	100	100	100	100

for rice transplanters, and 38.1%p for combine harvesters, indicating a significant difference between domestic and imported machinery. This survey result showed that the domestic market share of imported agricultural machinery is expected to continue to increase.

Levels of satisfaction in operating performance

The farmers' overall satisfaction ratings for operating performance and capacity were 76.3% for tractors, 81.6% for rice transplanters, and 75.6% for combine harvesters, respectively. A generally low percentage of farmers expressed dissatisfaction, ranging from 3.2% to 8.3% (Table 3). However, the levels of satisfaction among farmers using domestic agricultural machinery were lower than among those using imported agricultural machinery, ranging from 8.7%p to 19.3%p.

Feedback regarding failure rates

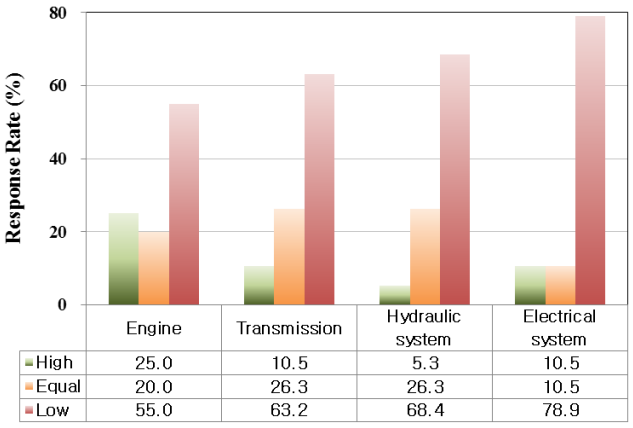
Farmers expressed satisfaction with respect to work interference or the degree of repair costs due to a low occurrence of equipment failures were 60.0% for tractors, 64.3% for rice transplanters, and 52.6% for combine harvesters, and those who expressed dissatisfaction were 16.2%, 11.8% and 22.4%, respectively (Table 4). The response rates for high occurrences of failure were on average twice as high for domestic agricultural machinery compared with imports, indicating that the failure rates are much higher for domestic machinery.

Levels of satisfaction regarding durability

We investigated levels of satisfaction regarding durability, which directly impacts the quality and usage costs of agricultural machinery; 63.6% to 76.0% of respondents expressed satisfaction with agricultural machinery durability and less than 10% of those surveyed expressed dissatisfaction (Table 5). However, levels of satisfaction for domestic agricultural machinery durability were 13.4%p to 27.5%p lower than were those for imports, indicating that it is necessary to develop better materials for agricultural machinery.

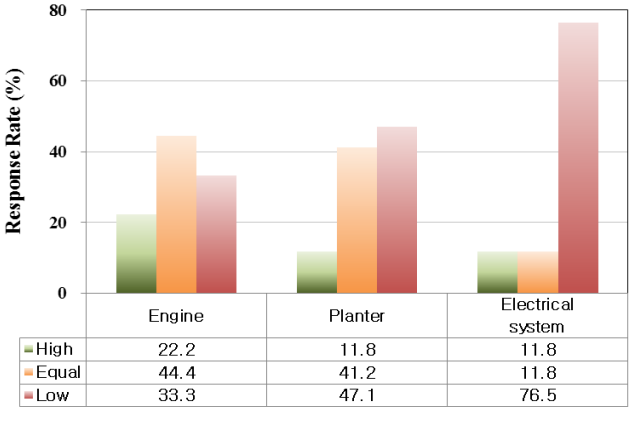
Quality levels by main agricultural machinery components

According to the results of a survey of 20 service



	Engine	Transmission	Hydraulic system	Electrical system
High	25.0	10.5	5.3	10.5
Equal	20.0	26.3	26.3	10.5
Low	55.0	63.2	68.4	78.9

Figure 1. Quality levels regarding domestic versus imported tractors.

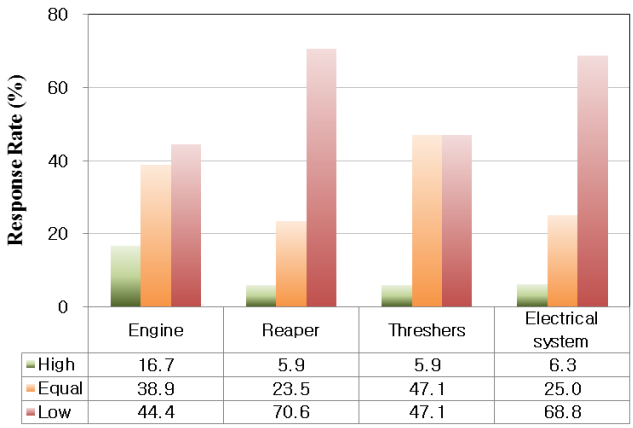


	Engine	Planter	Electrical system
High	22.2	11.8	11.8
Equal	44.4	41.2	11.8
Low	33.3	47.1	76.5

Figure 2. Quality levels regarding domestic versus imported rice transplanters.

engineers, the quality of main components in domestic agricultural machinery was considered significantly lower than was that of imports. Only 5.3% to 25.0% of respondents indicated that domestic agricultural machinery was of greater quality compared with imported machinery, by contrast, 33.3% to 78.9% of respondents indicated that imported machinery was of greater quality compared with domestic agricultural machinery (Figures 1 through 3). Similar levels of satisfaction were reported regarding the engines and planters of domestic and imported rice transplanters as well as the engines and threshers of domestic and imported combine harvesters.

The prevailing complaint pertaining to the low levels of satisfaction regarding the engine quality of domestic tractors was that compared with their imported counterparts, actual engine performance seemed to be lower during operation than the nominal horsepower. One of the reasons for this perception was determined to be that domestic tractor manufacturers increased engine output to obtain



	Engine	Reaper	Threshers	Electrical system
High	16.7	5.9	5.9	6.3
Equal	38.9	23.5	47.1	25.0
Low	44.4	70.6	47.1	68.8

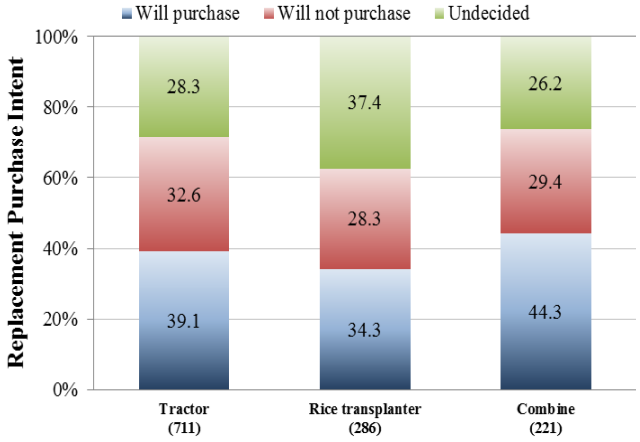
Figure 3. Quality levels regarding domestic versus imported combine harvesters.

identical displacements by merely modifying fuel-injection properties to artificially create expensive models. Quality discrepancies in level-control systems and quick-turn systems in domestic agricultural machinery were also identified as other primary reasons. The fluctuations in quality levels were determined to be caused by a lack of effort toward improvement among domestic manufacturers despite continual problems as well as frequent changes in small- and medium-sized manufacturers that rely on outsourcing for production. The waterproofing in wire connectors for rice transplanters was determined to be inadequate and an unstable micro computer unit (MCU) controlling the electrical components in combine harvesters was considered to affect the entire system.

Given the assessment of quality levels in domestic agricultural machinery by service engineers, the market share of imported agricultural machinery is expected to increase even more. To improve the competitiveness of domestic agricultural machinery in terms of quality, manufacturers must conduct adequate field testing and address any inadequacies prior to releasing new machinery. Furthermore, components and devices of questionable quality must be produced directly by the manufacturer and R&D support must be provided to subcontractors to control and stabilize quality. Strategic policy support for R&D in key areas and cooperation with relevant manufacturers, academia, and research institutions were determined to be in need of improvement.

Propensity for replacement purchases

Relatively few farmers indicated an intent to purchase replacement agricultural machinery at the end of their



Note: The figures inside the parentheses are numbers of respondents.

Figure 4. Farmers' plans for replacement purchases.

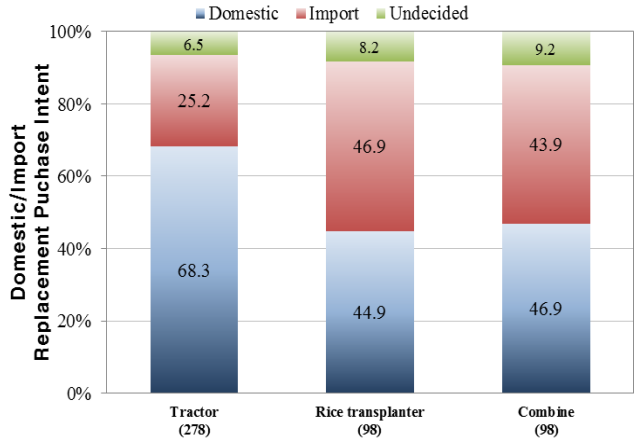


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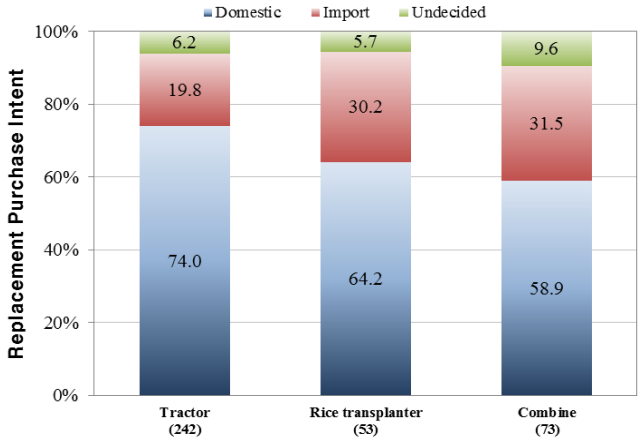
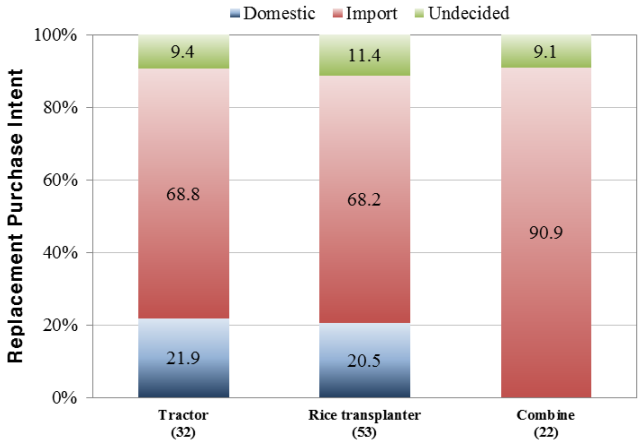
Figure 5. Intention to purchase either domestic or imported machinery for replacement.



Note: The figures inside the parentheses are numbers of respondents.

Figure 6. Purchasing plans among users of domestic agricultural machinery.



Note: The figures inside the parentheses are numbers of respondents.

Figure 7. Purchasing plans among users of imported agricultural machinery.

respective products' lifecycles; 39.1%, 34.3%, and 44.3% of farmers indicated that they would purchase replacement tractors, rice transplanters, and combine harvesters, respectively. Approximately 30% of respondents had decided not to purchase replacement machinery, whereas 26.2% to 37.4% were undecided (Figure 4). Among farmers who intended to purchase replacements, 68.3%, 44.9%, and 46.9% planned to purchase domestic tractors, rice transplanters, and combine harvesters, respectively. Among farmers who planned to purchase imports, 25.2%, 46.9%, and 43.9% planned to purchase imported tractors, rice transplanters, and combine harvesters; in particular, a very high percentage of farmers intended to purchase replacement rice transplanters and combine harvesters (Figure 5).

Among farmers who had decided to purchase replacement machinery, a percentage of respondents had decided to purchase imported machinery; 19.8%, 30.2%, and 31.5% of farmers opted to purchase replacement tractors, rice transplanters, and combine harvesters, respectively (Figure 6). A very high percentage of current users of imported machinery intended to replace their current machinery using imported machinery: 68.8%, 68.2%, and 90.9% of farmers indicated that they would purchase replacement imported tractors, rice transplanters, and combine harvesters, respectively (Figure 7). In particular, the discrepancy in quality satisfaction was highest between domestic and imported combine harvesters (Table 3). Although imported combine harvesters are expensive, the high quality and low failure rate of such products, shortening the harvest time, was attributed as the primary factor in users' affinity toward imports.

Conclusions

The levels of satisfaction among farmers and service engineers as well as consumers' propensity for the replacement purchases regarding tractors, rice transplanters, and combine harvesters were analyzed to improve the competitiveness of domestic agricultural machinery.

(1) With respect to operating performance, failure rate, and durability, overall levels of satisfaction regarding the quality of tractors, rice transplanters, and combine harvesters ranged from 57.1% to 62.6%. Overall levels of satisfaction among farmers regarding specific categories ranged from 75.6% to 81.6% for operating performance, 52.6% to 60.0% for failure rates, and 63.6% to 70.9% for durability.

(2) Compared with imports, the satisfaction ratings for domestic agricultural machinery were 19.1%p to 38.1% p lower for quality, 8.7%p to 19.3%p lower for operating performance, and 13.4%p to 27.5%p lower for durability. Regarding failures, satisfaction ratings for domestic agricultural machinery were 18.8% to 35.0% higher than were those for import machinery.

(3) In regard to engines, transmissions, hydraulics, planters, reapers, threshers, and electrical components, only 5.3% to 25.0% of service engineers indicated that domestic agricultural machinery was higher in quality compared with imports. By contrast, 33.3% to 78.9% of those surveyed indicated that domestic components were of lower quality compared with imports.

(4) Regarding the intent to purchase replacement agricultural machinery at the end of their respective products' lifecycles, 39.1%, 34.3%, and 44.3% of farmers indicated that they would purchase replacement tractors, rice transplanters, and combine harvesters, respectively. Among farmers who intended to purchase replacements, 25.2%, 46.9%, and 43.9% of farmers indicated that they planned to purchase imported tractors, rice transplanters, and combine harvesters, respectively. Thus, a very high percentage of farmers intended to purchase imported machinery, rice transplanters and combine harvesters in particular.

(5) The results of a survey of farmers and service engineers indicated that the current quality of domestic agricultural machinery is largely inadequate compared with imported agricultural machinery. In particular, the number of farmers who expressed a desire to make replacement purchases of imported agricultural machinery is increasing. Current trends indicate that the demand for domestic agricultural machinery will continue decrease and the market share for imported agricultural machinery will continue to increase, leading to the difficulties in the domestic agricultural machinery industry.

(6) The expansion of exports is necessary to revitalize the agricultural machinery industry. However, if the supply of imported agricultural machinery continues to increase on the domestic market, the potential for exporting domestic products will be limited due to weakened infrastructure. Strong policy support and enhanced R&D for domestic agricultural machinery is critical to improve its competitiveness on both the domestic and foreign markets.

Conflict of Interest

The authors have no conflicting financial or other interests.

Acknowledgements

This study was supported by the Research Program for Agricultural Science and Technology Development (Project No. PJ00980601), National Academy of Agricultural Science, Rural Development Administration, Republic of Korea.

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