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Demand and Supply Trend of Agricultural Machinery

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Abstract

Purpose: This study was performed in order to obtain basic data for policy development and R&D to sharpen competitiveness in domestic agricultural machinery industry by analyzing the recent status of demand and supply for tractor, rice transplanter(riding type), and combine. **Methods:** Basic data from 199,275 units of tractor, rice transplanter (riding type), and combine was offered by the National Agricultural Cooperative Federation and Korea Agricultural Machinery Industry Cooperative. Those agricultural machines were supplied by the government's loan support from 2003 to 2012. **Results:** Recent supply of tractor is only 13,000 units or so per annum, thereby being stagnated. Rice transplanter and combine in 2012 corresponded to 3,810 units and 2,490 units, respectively. The domestic market share of the imported agricultural machinery accounted for 60.0% in tractor, 99.5% in saddle rice transplanter, and 80.9% in combine, thereby having been sharply increased 33.1%p, 42.0%p and 53.6%p compared to the ones in 2003. Life spans of tractor, combine and saddle rice transplanter are 3.7, 3.7 and 4.2 years, respectively. Among the discontinued models, the one less than 300 units supplied was occupied up to 70~85%. **Conclusions:** The domestic demand and the export expansion are needed through developing a model of agricultural machinery of having competitiveness to domestically activate agricultural machinery industry.

Keywords: Agricultural machinery, Demand & Supply, Domestic & Imported product, Life span

Introduction

Agricultural machinery has played an important role in Korea's agricultural production. The decline in a base for agricultural machinery industry makes it difficult to implement smooth supply and follow-up service and causes difficulties in farming activities. In addition, the use of expensive imported agricultural machinery may lead to the increased burden of operating expenses on farmhouses and rise in rise in agricultural prices.

In recent years, the demand for domestic agricultural machinery has been stagnant. A look at the demand for combines, rice transplanters (riding-type) and tractors which account for 75% of sales revealed that the demand for tractors has been stagnant, and that of rice planters and combines has shown significant decreasing trend with an annual average of 9.3% and 5.0% respectively sind 2000s. To make matters worse, the continued increase in domestic market share of foreign agricultural machinery from other countries, including Japan has contributed to the weakening of Korea's agricultural industry.

The decline in domestic agricultural machinery is expected to continue for the time being with the aging of drivers, provision of large agricultural machinery and imported agricultural machinery market share growth. Accordingly, there is a need for the expansion of domestic agricultural machinery market share in the domestic agricultural machinery market, along with a more aggressive effort to expand exports.

Korea's agricultural machinery exports recorded an average annual increase of 16.4% after achieving 100

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million dollars of exports in 2000. The Unites States (43.5%) and Asia (18.4%) constituted 61.9% in exports of 750 million dollars in 2012, and tractors accounted for 57.2% of total exports (Korean Society for Agricultural Machinery, 2012)

The amount of world trade in agricultural machinery is expected to be 132.8 billion dollars in 2017. Looking at it by region, Asia/Pacific region accounted for 44.8%, Europe 27.0%, and North America 19.0%, and tractors constituted 28.5%, working machines 16.9%, and harvesting machinery 16.0% in terms of the kind of agricultural machinery. The average annual growth rate since 1997 turned out to be highest in Asia/Pacific region with 5.7%, followed by Africa/Middle East (5.3%), and Latin America (4.1%) in order (The Freedonia Group, Inc,. 2008).

In 2010, Japan's agricultural machinery exports recorded 213.2 billion yen, showing a 69% increase from 2001, and the amount of imports was 42.3 billion yen, which constitutes only 19.8% compared to that of exports. In addition, 136 countries are included in its world export market, and 89% of exports come from tractors (64.3%), bush cutters (10.3%), sowing·transplantation·transplanters (5.7%), chain saws (3.5%), combines and parts (5.1%) (Shin-norinsha, 2011).

This study was carried out to obtain the basic data for policy development and R&D to improve the competitiveness of domestic agricultural machinery industry by analyzing the status of demand and supply for tractors, riding-type rice transplanters and combines supplied by the government's loan for the past 10 years.

Materials and Methods

Database of agricultural machinery by loan support

DB data related to agricultural machinery by loan support was offered by the National Agricultural Cooperative Federation and Korea Agricultural Machinery Industry Cooperative for an analysis. The scope of analysis was limited to 199,275 units of agricultural machinery such as tractors (112,207), riding-type rice transplanters (51,369) and combines (35,699) supplied by the government's loan support in the recent ten years (2003-2012).

The main content of the analysis includes the number of units by agricultural machinery, specification and model, segment and number of units of domestic and imported models, and discontinued models and number of the total units supplied (Table 1).

Data collection for domestic and imported agricultural machinery by model

For investigation on the domestic and imported status (finished products, imported engines) by model of agricultural machinery, data contained in the Annual Report on the Agricultural Machinery Test and Evaluation (FACT, 1992~2012) was utilized, and data on the models which are not included in the Annual Report on the Agricultural Machinery Test and Evaluation was collected by contacting the Practical Agricultural Technology Foundation and manufactures.

Results and Discussion

Distribution and number of domestic and imported agricultural machinery

A look at the number of tractors, riding-type rice transplanters and combines supplied for the past 10 years showed that the number of tractors increased by 51% with 12,246 units in 2012 compared to the one in 2003, but it has shown a recent decline from the peak of 13,985 units in 2010. The number of riding-type rice transplanters and combines was 3,810 and 2,490 in 2012, showing a 15.6% and 20.0% decrease, respectively compared to the one in 2003 (Table 2). Thus, a decline in demand for agricultural machinery is expected to continue for the time being with the increased number of retired households of old farmers who drive agricultural

Table 1. No. of supplied agricultural machinery and model by loan support of Government

Class.	Tractor	Rice transplanter (riding type)	Combine	Total
No. of supplied agri. machinery	112,207	51,369	35,699	199,275
No. of model for supplied agri. machinery	296	55	70	421

Table 2. Number of loan support for agricultural machinery by Government and ratio of the imported agricultural machinery (unit number)

Class.		'03	'04	'05	'06	'07	'08	'09	'10	'11	'12
Tractor		8,059	8,195	10,121	10,350	11,085	12,894	12,381	13,891	12,985	12,246
Imported	Finished[a)]	(17.6)	(11.5)	(22.0)	(23.1)	(28.5)	(29.5)	(22.8)	(15.2)	(13.4)	(13.2)
	Engine[b)]	(8.9)	(7.7)	(17.3)	(21.9)	(17.8)	(19.7)	(31.5)	(46.2)	(47.6)	(44.8)
Rice transplanter		4,514	4,666	5,080	5,351	6,338	6,691	5,630	5,074	4,215	3,810
Imported	Finished[a)]	(26.0)	(47.7)	(60.6)	(60.8)	(50.8)	(66.6)	(52.2)	(49.6)	(52.1)	(57.5)
	Engine[b)]	-	-	-	(4.1)	(31.6)	(22.5)	(35.1)	(46.6)	(45.8)	(42.0)
Combine		3,099	3,638	3,804	3,669	4,291	4,309	3,842	3,565	2,992	2,490
Imported	Finished[a)]	(7.1)	(6.9)	(14.4)	(17.3)	(23.2)	(27.7)	(15.8)	(18.5)	(23.6)	(27.3)
	Engine[b)]	-	-	(0.1)	(0.2)	(8.9)	(43.0)	51.6)	(53.2)	(56.7)	(53.6)

Notes, a) Imports of Finished products (%), b) Imported engine (%)

Table 3. Sales of agricultural machinery by year (Based on the agricultural machinery with the government's loan support)

Class.		'03	'04	'05	'06	'07	'08	'09	'10	'11	'12
Sales(100 million won)		4,903	5,906	6,191	6,614	7,652	9,155	9,358	10,233	9,627	9,118
Distri-bution (%)	Tractor	38.4	38.6	42.7	43.4	41.5	43.3	45.7	49.1	50.0	51.3
	Rice trans-planter	11.7	11.7	12.0	12.1	12.5	12.1	10.5	8.9	8.1	8.4
	Combine	21.5	22.6	22.7	21.3	15.3	21.4	19.8	17.5	16.9	15.5
	etc.	28.4	27.1	22.6	23.2	30.7	23.2	24.0	24.5	25.1	24.8

machines and expanded supply of large agricultural machinery.

As for the domestic market share of imported agricultural machinery (finished products), tractors decreased by 4.4%p from 17.6% in 2003 to 13.2% in 2012, but riding-type rice transplanters and combines increased by 31.5%p and 20.2%p, respectively during the same period. In addition, a look at the share of agricultural machinery equipped with imported engines (finished products assembled in Korea or equipped with imported engines) apart from the finished products revealed that tractors increased by 33.1%p from 8.9% in 2003 to 42.0% in 2012, and riding-type rice transplanters and combines significantly increased by 42.0%p and 53.6%p, respectively during the same period.

As a result, the proportion of imported agricultural machinery (finished products, assemblies, engines, etc.) was very high in domestic market with 58.0% (tractors), 99.5% (riding-type rice transplanters) and 80.9% (combines), and the problem is that the domestic market share of imported agricultural machinery increases over time. In recent years, domestic agricultural machinery industry has suffered from difficulties due to the reduction in domestic demands and expanded supply of imported machinery, so there is an urgent need for measures to enhance the competitiveness of domestic agricultural machinery industry.

Looking at the agricultural machinery sales (loan + self-funded) based on the number of units supported by government loan, it increased from 490.3 billion won in 2003 to 911.8 billion won in 2012 after reaching its peak in 2010 with 1,023.3 billion won. The distribution of agricultural machinery sales in 2012 showed that three kinds of machinery such as tractors (51.3%), riding-type rice transplanters (8.4%) and combines (15.5%) accounted for 75.2% of total sales (Table 3).

Distribution of the supplied number of units by specification of agricultural machinery

A look at the distribution of the supplied number of units by specification of tractors showed that the small size (less than 29 kW) and middle size (less than 29~44 kW) of tractors constituted 5.1% and 46.9% in 2012, but they decreased by 18.1%p and 10.6%p respectively compared to the ones in 2003. However, the large size (less than 44~74 kW and more than 74 kW) of tractors constituted 40.2% and 7.8% in 2012, showing a 23.2%p and 5.4%p increase respectively in 2012 compared to the ones in 2003 (Figure 1). That is, demand for small and middle size (less than 44 kW) of tractors decreased,

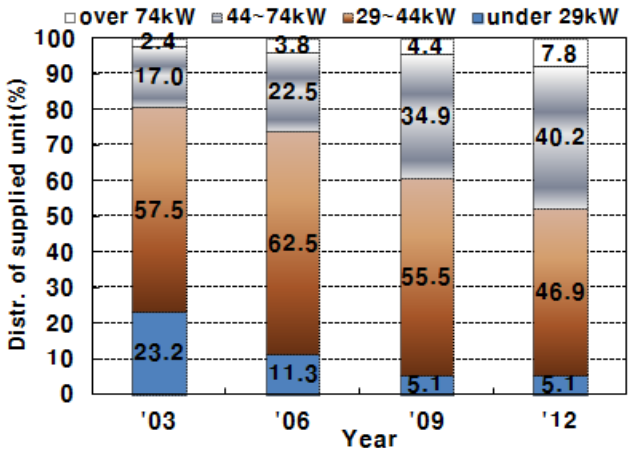

Figure 1. Distribution of supplied unit number by specification of Tractor.

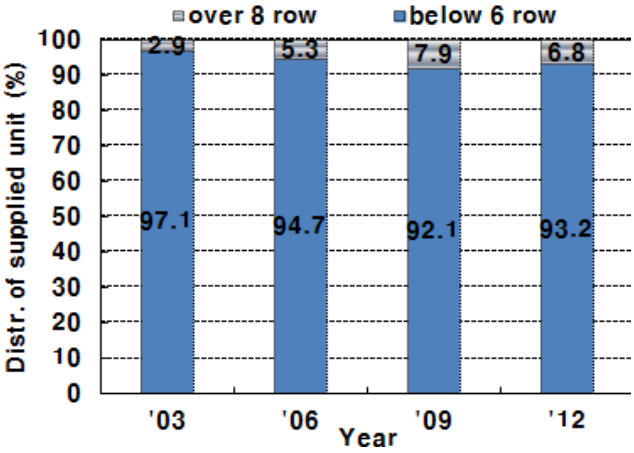

Figure 2. Distribution of supplied unit number by specification of Rice Transplanter.

and that of large-size tractors increased, reflecting polarization between them.

In recent years, there has been higher demand for riding-type rice transplanters, and the distribution of the number of riding-type units by specification showed that the unit with more than 6 rows accounted for 93.2% in 2012, showing a slight decrease compared to the one in 2003, but it still constitutes the majority of the number of supplied riding-type rice transplanters (Figure 2). In the case of combines, the unit with less than 4 rows was mostly supplied in 2003 with 89.2%, but the number of the unit with more than 5 rows increased by 49.6%p to 60.4% in 2012, reflecting a recent large-scale trend in agricultural machinery, which is attributed to the expansion of business scale resulting from the abandonment of purchasing agricultural machinery of framing operation due to the aging population, large

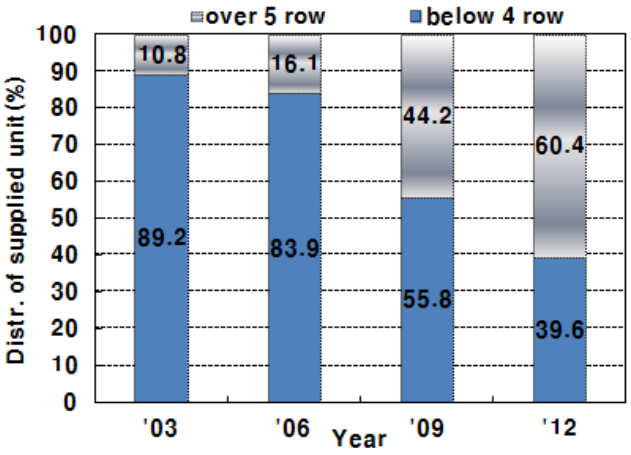

Figure 3. Distribution of supplied unit number by specification of Combine.

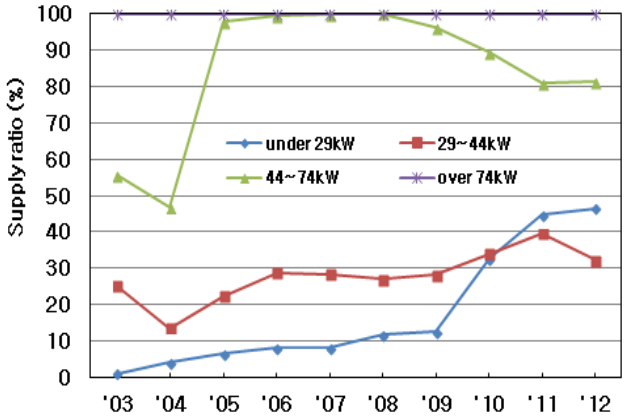

Figure 4. Supply ratio of imported tractor.

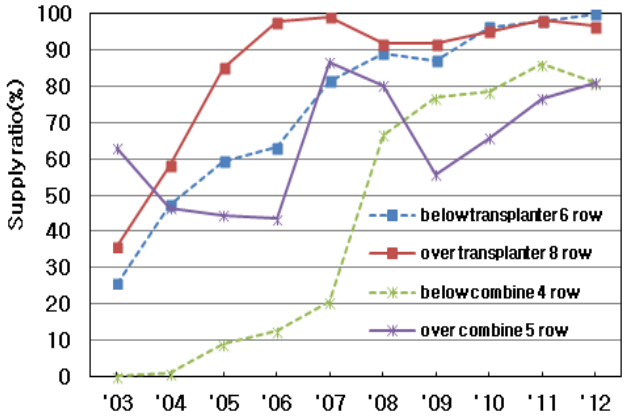

Figure 5. Supply ratio of imported Rice- transplanter and Combine.

size of attached working machines, and ease of operating performance and handling operations (Figure 3).

Looking at the supply ratio of imported agricultural machinery (finished products, assemblies or units equipped with imported engines) by specification, the supply ratio

of imported tractors with less than 29 kW was 46.5%, that of less than 29~44 kW 32.3%, that of less 44~74 kW 81.4%, and that of more than 74 kW 100%, showing a higher supply ratio of imported tractors in middle and large size with more than 44 kW. As a result, the supply ratio of domestic tractors tends to increase in units with less than 29~74 kW. However, those with less than 29 kW greatly decreased, and those with more than 74 kW turned out to be 100% dependent on imported tractors (Figure 4). In addition, the market share of imported riding-type rice transplanters and combines was 96.6~99.7% and 81% respectively in 2012, showing a growing dominance of the domestic agricultural machinery market (Figure 5)

Number of supplied agricultural machinery models

In 2012, the total number of supplied tractor models was 148, which was increased by 33% compared to the one in 2003. Looking at it by specification, The model with less than 29 kW decreased, but large model with more than 44 kW showed a significant increase. In the case of riding-type rice transplanters, the number of supplied models was 32 in 2012, which was increased by 88% compared to the one in 2003, and the number of models with less than 6 rows and more than 8 rows were all significantly increased. However, the number of supplied modes for combines was 24, which was increased by 33% compared to the one in 2012. In particular, the number of models with more than 5 rows significantly increased, whereas a 69% decrease was found in the unit with less than 4 rows that has a large number of models (Table 4).

Number of models by supplied unit of agricultural machinery

Looking at the distribution of models by supplied unit of agricultural machinery in 2012, that of models with which less than 20 units were provided was 45.9% in tractors, 31% in riding-type rice transplanters, and 33.3% in combines. The proportion of models with which less than 100 units per year was 66~74%, and that of models with which more than 300 units was slightly higher with 21.9%. However, the proportion of tractors and combines turned out to be only 7~8% (Table 5). In other words, the number of models are

Table 4. Unit number of supply model with a loan support by government

Class.	Scale	Number of supply model with a loan support by government									
		'03	'04	'05	'06	'07	'08	'09	'10	'11	'12
Tractor	Total	111	111	114	111	133	147	152	157	152	148
	Under 29 kW	19	21	17	18	16	14	15	16	14	15
	29~44 kW	44	45	43	39	47	51	48	52	50	50
	44~74 kW	31	34	43	35	44	47	55	57	52	50
	More than 74 kW	17	11	11	19	26	35	34	32	36	33
Rice transplanter (riding type)	Total	17	19	19	22	23	24	29	27	28	32
	Under 6 row	13	14	14	15	16	15	17	17	18	21
	Over 8 row	4	5	5	7	7	9	12	10	10	11
Combine	Total	36	32	31	31	30	29	27	22	26	24
	Under4 row	29	24	24	22	20	18	15	11	14	9
	Over 5 row	7	8	7	9	10	11	12	11	12	15

Table 5. Unit number of supplied agricultural machinery (in 2012)

Class.	Number of agricultural machinery(unit number, %)						
	Under 20 units	~ 50	~100	~200	~300	Over 300	Total
Tractor	68 (45.9)	20 (13.5)	22 (14.9)	17 (11.5)	11 (7.4)	10 (6.8)	148 (100)
Rice transplanter (riding type)	10 (31.3)	6 (18.8)	5 (15.6)	3 (9.4)	1 (3.1)	7 (21.9)	32 (100)
Combine	8 (33.3)	5 (20.8)	3 (12.5)	3 (12.5)	3 (12.5)	2 (8.3)	24 (100)

Table 6. Life span of agricultural machinery

Class.	Tractor			Rice transplanter			Combine		
	Domestic	Imported	Avg.	Domestic	Imported	Avg.	Domestic	Imported	Avg.
No. of model	26	48	74	4	6	10	7	4	11
Life span (year)	3.7	3.7	3.7	2.8	5.2	4.2	3.8	3.5	3.7

Table 7. No. of model and supply by discontinued agricultural machinery

Class.		No. of model and average supply by agricultural machinery					
		Under 50 units	~100	~200	~300	Over 300	Total
Tractor	No. of model for dis-continued agri. machinery	34	9	13	7	11	74
	No. of Average supply per model	14.3	70.2	136.7	251.3	610.2	153.6
Rice trans-planter	No. of model for dis-continued agri. machinery	3	3	0	1	3	10
	No. of Average supply per model	20.7	70	0	201	1,554	513.6
Combine	No. of model for dis-continued agri. machinery	5	1	2	0	3	11
	No. of Average supply per model	11.2	94	130	0	658.3	216.8

adjudged to be excessive compared to the size of domestic agricultural machinery market in consideration of post-management, including parts supply according to the number of supplied agricultural machinery.

Life span and number of supplied units by agricultural machinery

An analysis was conducted with 74 models of tractors, 10 models of riding-type rice transplanters and 11 models of combines whose supply was started from 2013 and completed by 2012 among models of agricultural machinery. The analysis results showed that the average life span of th models was 3.7 years in tractors, 4.2 years in riding-type rice transplanters and 3.7 years in combines. Looking at the life span of domestic and imported agricultural machinery models, there was little difference between tractors and combines, but the life span of imported riding-type rice transplanters was about two times longer than that of domestic ones (Table 6).

Overall, the life span of domestic agricultural machinery turned out to be shorter, and it can lead to great concern about supply of spare parts for repair of agricultural machinery, which in turn can cause the reduction in life span for agricultural machinery replacement and increase in the cost of using agricultural machinery due to the rise in prices of parts for repair.

Looking at the average number of discontinued models supplied, tractors constituted 46% of 74 discontinued models with 34 models (less than 50 units), and the average number of supplied units by model was about 14. The number of models with more than 300 units in the total number of supplied units was 11 (15%) whose average number of supplied units turned out to be about 610. In the case of riding-type rice transplanters, the average number of supplied units from 10 discontinued models was 513, and 6 models had less than 100 units with average supply of 45 units. As for combines, the average number of supplied units from 11 discontinued models was about 217, and 6 models were found to have the number of supplied units with less than 200 (Table 7).

In general, agricultural machinery manufactures estimate the minimum number of supplied units to prevent economic damages due to the development of new modes to be 300 to 400 for tractors and riding-type rice transplanters, and 600 to 700 for combines. However, since the total number of discontinued agricultural machinery models is less than 300 in most cases, there is a need to develop competitive models suitable for the agricultural field.

Conclusions

This study analyzed the status of demand and supply status for tractors, riding-type rice transplanters an combines supplied by the government's loan support in the recent 10 years to obtain the basic data for improving the competitiveness of domestic agricultural machinery industry.

(1) Looking at the number of supplied agricultural machinery, the number of tractors was 12,246 in 2012, which has been stagnant since 2008 with less than 13,000, and that of riding-type rice planters and combines was 3,810 and 2,490 in 2012, which decreased by 15.6% and 20.0%, respectively compared to the one in 2003.

(2) A look at the distribution of supplied units by specification (2012) showed that small size of tractors with less than 29 kW was 5.1%, and middle size of tractors with less than 29~44 kW was 46.9% in 2012, which was decreased by 18.1%p and 10.6%p respectively compared to the one in 2003. However, large size of tractors with less than 44~74 kW and more than 74 kW was 40.2% and 7.8% respectively, which was increased by 23.2%p and 5.4%p compared to the one in 2003.

(3) The market share (2012) of imported agricultural machinery (imported finished products, assemblies, units equipped with engines) was 60.0% for tractors, 99.5% for riding-type rice transplanters and 80.9% for combines, which was significantly increased by 33.1%p, 42.0%p, 53.6%p, respectively compared to the one in 2003.

(4) The number of domestic agricultural machinery models supplied in 2012 was 148 for tractors, 32 for riding-type rice transplanters and 24 for combines, which was increased by 33% and 88% compared to the one in 2003 as for tractors and riding-type rice transplanters but decreased by 33% in the case of combines. In addition, it turned out that the number of models for small size decreased, wheres that of large-size agricultural machinery increased.

(5) The life span of discontinued models supplied from 2003 to 2012 was 3.7 years for tractors and combines, and 4.2 years for riding-type rice transplanters. The total number of models with total number of supplied units of less than 300 accounted for 70 to 85% among discontinued models of agricultural machinery.

(6) In recent years, demand for agricultural machinery has decreased, whereas the market share of imported agricultural machinery has shown a increasing trend over time, which poses a difficulty in domestic agricultural machinery industry. In addition, the life span of agricultural machinery models is short, and the total number of supplied units by model is less than 300 in most cases, which makes it hard to meet the economic efficiency standards and poses a burden on the post-management.

(7) Accordingly, there is a need for expansion of exports and domestic market to activate domestic agricultural machinery industry. Towards this end, it is required for manufactures to make efforts for research and development to develop competitive models of agricultural machinery, and the government, academia and research institutions to provide active support for collaboration.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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