

A Study on Growth Potential and Sales Activation Strategies in the Agricultural Machinery Aftermarket

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Abstract: This study provides an in-depth analysis of the growth potential of the agricultural machinery aftermarket and strategies to revitalize sales. (1) Background/Purpose: The agricultural machinery aftermarket plays a critical role beyond mere parts replacement—it extends machine lifespans, maintains performance, improves agricultural productivity, and increases farm income. As agricultural machinery has become highly complex, incorporating automation, digitization, and precision farming technologies, the need for specialized aftermarket services has intensified. This study aims to analyze the aftermarket structure of domestic and overseas agricultural machinery markets, identify success factors from leading global companies, and propose concrete sales activation strategies for domestic companies. (2) Study Design/Methodology/Approach: The research employs literature review of academic papers, industry reports, government policy documents, and market analyses; case analysis of successful domestic and international aftermarket companies; and quantitative data collection on market size, growth rates, and customer trends. The study also applies 4P marketing analysis and benchmarks John Deere's key business strategies including its Tiered Portfolio and JDLink telematics system. (3) Findings: The agricultural machinery aftermarket is growing steadily driven by smart farming adoption and increasing machine lifespans, but faces challenges including intensifying global competition and technological gaps. Global leaders—John Deere, CNH Industrial, and Kubota—command large market shares through innovative services such as online parts platforms, remote support, customer loyalty programs, and telematics-based data analytics. John Deere's Tiered Portfolio provides customers parts at various price points and quality levels, while its JDLink system enables predictive maintenance, remote support, and customized agricultural consulting. (4) Originality/Value: This study proposes concrete strategies for domestic agricultural machinery companies to strengthen aftermarket competitiveness: adopting a customer-centered 4P strategy (product, distribution, price, promotion), pursuing service innovation through digital technology, applying customer segmentation strategies, building data-driven predictive maintenance systems, and developing strategic alliances. The study introduces a practical aftermarket parts demand forecasting methodology that can be directly applied by domestic manufacturers and dealers.

Keywords: agricultural machinery aftermarket; parts sales activation; 4P strategy; smart farming; John Deere; Tiered Portfolio; JDLink; telematics; predictive maintenance; demand forecasting

1. Introduction

1.1. Key Elements of the Research Background

The research background of the agricultural machinery aftermarket is emerging as an important research topic alongside agricultural mechanization and technological advancement. The agricultural machinery industry plays an important role in improving agricultural productivity, and agricultural mechanization has greatly increased global agricultural productivity. However, as machinery usage cycles lengthen, aftermarket demand arises for regular maintenance, parts replacement, and repairs. The aftermarket encompasses not only parts supply, service, and maintenance activities essential for maintaining and operating existing machinery beyond new machinery sales.

The importance of the agricultural machinery aftermarket is growing according to the characteristics of agricultural machinery and changes in the agricultural environment, which can be explained by four major factors.

First, agricultural machinery is an expensive asset, so farmers use it for long periods after purchase. Rather than periodically purchasing new products like automobiles, it is common to use them as long as possible while replacing or repairing parts as needed. Therefore, aftermarket services for extending machinery life and maintaining performance are essential.

Second, recent agricultural machinery has become very complex with the integration of advanced technologies such as automation, digitization, and precision farming technologies—unlike the past when only mechanical aspects were addressed. Electronic systems, software, and sensors are integrated, making maintenance and repair more difficult and increasing the need for service personnel with specialized knowledge and skills.

Third, agricultural machinery manufacturers recognize aftermarket services as a new revenue generation opportunity. While the past focus was simply on selling machines, recent strategies aim to generate continuous revenue through parts supply, regular maintenance, and service contracts after sales. This also helps build long-term customer relationships and enhance brand loyalty.

Fourth, agricultural producers seek to maximize productivity by increasing machinery operating rates. Because agriculture is greatly affected by seasons and weather, minimizing downtime due to machinery breakdowns is critically important. Therefore, reducing machinery downtime through fast and efficient aftermarket services and quickly resolving problems to ensure uninterrupted agricultural production activities has become essential.

1.2. Research Necessity and Purpose

This study aims to recognize the importance of the agricultural machinery aftermarket and contribute to improving agricultural productivity and developing the agricultural machinery industry by increasing market efficiency. The aftermarket provides stable revenue generation opportunities for manufacturers and service providers, and plays an important role in maintaining machinery performance and improving customer satisfaction. Furthermore, since the quality and availability of aftermarket parts directly affect agricultural productivity, research on market structure and success factors is necessary.

The concrete research objectives are as follows.

1. Analyze the impact of aftermarket parts supply and service provision occurring during the agricultural machinery lifecycle on agricultural productivity and efficiency, presenting the economic value of the aftermarket and its contribution to agricultural productivity improvement.
2. Understand the structural characteristics of the aftermarket supply chain, distribution channels, and service networks, and analyze the roles and interactions of each stakeholder—manufacturers, parts suppliers, service providers, distributors, and farmers—to provide in-depth understanding of market mechanisms.
3. Investigate and analyze the requirements that farmers expect from aftermarket services in terms of service level, parts availability, and information accessibility, and propose customized service strategies and efficient parts supply system development plans to improve customer satisfaction.
4. Analyze how advanced technologies such as precision farming, automation, IoT, and AI are applied to agricultural machinery maintenance and repair services, and identify the opportunities and challenges these technological changes bring to service and parts supply.
5. Present various strategies for competitive enhancement and long-term customer relationship building, including quality assurance programs, regular maintenance contracts, and customer relationship management systems.
6. Present concrete plans for improving aftermarket operational efficiency through supply chain management, inventory management, service process improvement, and IT utilization to reduce service provision costs and improve service quality.

This study aims to analyze the overall structure and trends of the agricultural machinery aftermarket and present strategic directions for strengthening market competitiveness. In particular, it seeks to optimize interactions between manufacturers, service providers, and customers, and derive efficient aftermarket operation plans aligned with agricultural mechanization and technological advancement.

2. Analysis of Domestic and Overseas Agricultural Machinery Market and Aftermarket

2.1. Current Status of the Domestic Agricultural Machinery Market

The domestic agricultural machinery market was approximately KRW 2.3 trillion in 2021, with an annual average growth rate of 1.7% over the past five years. In 2022, the entire industry scale reached approximately KRW 6 trillion, with domestic demand of approximately KRW 3.725 trillion and exports of approximately KRW 2.2506 trillion, with domestic demand having a larger share. Major domestic companies include Daedong (KRW 1.4333 trillion in 2023), LS Mtron (KRW 1.013 trillion in 2023), and TYM (KRW 836.4 billion in 2023), which are smaller in scale compared to global companies such as John Deere, CNH Industrial, and Kubota.

The market is continuously changing under the influence of technological advancement such as automation and smart farming, along with changes in the agricultural environment including aging and population decline. While the domestic agricultural machinery market is facing new growth opportunities in the smart farming era, it also faces challenges of intensifying global competition along with problems of aging and labor shortage. As shown in Table 1, the agricultural population from 1970 to 2021 is decreasing year by year, and it is estimated that approximately 2.2 million people are currently engaged in agriculture. Cooperation and continuous investment between government, companies, and farmers are absolutely necessary for successful market growth.

Table 1. National Cultivated Area by Paddy/Upland Fields / Farm Households and Total Population.

단위 : 1,000명*

항목 Item 연도 Year	총 인 구 Total Population		농 가 인 구 Farm Population			취 업 인 구 Employed Population		농가 가구수 Farm Household
		Inc. Ratio 증가율 %		구성비 Components Ratio %	Inc. Ratio 증가율 %	총취업인구 Total Employed Population	농림취업인구 Population Employed in Agri. & Forestry	
1970	32,241	2.21	14,422	44.7	-7.5	9,617	4,756	2,483
1975	35,281	1.70	13,244	37.5	-1.6	11,692	5,041	2,379
1980	38,124	1.57	10,827	28.4	-0.5	13,683	4,429	2,155
1985	40,806	0.99	8,521	20.9	-5.5	14,097	3,554	1,926
1990	42,869	0.99	6,661	15.5	-1.8	18,085	3,100	1,767
1995	45,093	1.01	4,851	10.8	-6.1	20,432	2,419	1,501
2000	47,008	0.84	4,032	8.3	-4.0	21,061	2,203	1,383
2005	48,185	0.21	3,434	7.1	0.6	22,831	1,819	1,273
2010	49,554	0.50	3,063	6.2	-1.7	24,033	1,586	1,177
2011	49,937	0.77	2,962	5.9	-3.3	24,527	1,563	1,163
2012	50,200	0.53	2,912	5.8	-1.7	24,955	1,531	1,151
2013	50,429	0.46	2,847	5.6	-2.2	25,299	1,513	1,142
2014	50,747	0.63	2,752	5.4	-3.4	25,897	1,446	1,121
2015	51,015	0.53	2,569	5.0	-6.6	26,178	1,337	1,089
2016	51,218	0.40	2,496	4.9	-2.8	26,409	1,273	1,068
2017	51,362	0.28	2,422	4.7	-3.0	26,725	1,279	1,042
2018	51,585	0.43	2,315	4.5	-4.4	26,822	1,340	1,021
2019	51,765	0.35	2,245	4.3	-3.0	27,123	1,395	1,007
2020	51,836	0.14	2,314	4.5	3.1	26,904	1,445	1,035
2021	51,745	-0.18	2,215	4.3	-4.3	27,273	1,458	1,031

Source: Statistics Korea, Cultivated Area by Province and Field Type / Farm Households and Total Population.

As shown in Table 2, tractors, rice transplanters, and combine harvesters are the main products. Demand for large-scale, automated, and smart agricultural machinery is increasing due to the decline and aging of the rural population. The integration of advanced technologies such as autonomous driving tractors, drones, and robots is also active. Although exports are on an increasing trend, the trade balance is in deficit as imports are also large, with particularly high import dependence on large agricultural machinery from John Deere and CNH Industrial. As shown in Table 3, imported agricultural machinery still accounts for a high proportion dependent on imports, and the direction must be set toward future localization. While the technology gap with imported agricultural machinery is rapidly narrowing, differences in durability, precision, and fuel efficiency still exist.

Table 2. Status of Major Agricultural Machinery Supply.

단위 : 대

주요기종명	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
경운기	326	287	232	165	180	86	72	76	52	17	15
트랙터	12,992	12,246	11,688	10,548	11,338	10,662	8,933	9,811	10,618	11,380	10,402
콤바인	2,992	2,490	2,682	2,761	2,998	2,672	2,228	2,074	2,149	2,035	1,884
스피드스프레어	1,702	1,787	1,945	1,940	2,073	1,985	1,724	1,607	1,505	1,622	1,407
이앙기	4,387	3,921	3,543	3,754	4,315	4,308	3,756	3,482	3,587	3,161	3,104
관리기	1,591	1,253	1,010	645	584	403	345	621	646	228	177
가정용도정기	440	421	308	252	150	113	94	128	70	36	26
곡물건조기	637	544	531	552	454	446	301	288	287	191	125
농산물건조기	16,520	14,830	8,746	3,019	2,081	1,246	743	523	651	523	216
농산물선별기	413	424	423	443	420	348	225	186	177	69	100
농산물저온저장고	497	498	659	998	1,134	1,029	1,016	958	705	680	546
농업용고소작업차	130	344	374	607	672	725	822	660	577	674	664
농업용굴착기	49	66	59	53	111	103	131	82	71	57	34
농업용난방기	542	672	655	553	589	793	749	732	1,189	721	576
농업용동력운반차	561	447	543	585	478	393	381	331	245	313	259
농업용로더	140	94	72	114	121	112	141	135	97	41	34
동력이식기	2	12	37	41	60	65	71	59	29	36	20
동력제초기	203	199	210	257	203	259	238	247	241	256	236
동력파쇄기	168	153	262	229	203	165	224	232	86	57	54
무인항공방제기	2	3	30	16	131	167	153	117	90	174	226
사료배합기	135	83	53	54	75	42	59	43	29	50	48
주행형동력분무기	35	48	38	12	1	3	2	7	15	36	20
트랙터용부속작업기	18,408	17,662	14,360	14,875	14,402	12,692	14,240	14,581	14,332	14,792	13,188
결속기	260	210	134	125	112	152	148	137	161	217	230
로더	6,459	6,067	5,123	5,301	4,954	4,361	4,894	4,648	5,265	5,439	4,936
로타베이터	8,074	7,777	6,428	6,664	6,792	5,858	6,352	6,568	6,545	6,751	5,894
모우어	26	25	21	11	10	19	25	33	32	40	32
무논정지기	807	797	540	564	552	479	516	663	698	738	698
반전집조기	105	76	39	54	42	40	59	72	66	91	111
배토기	47	54	24	27	44	45	47	58	46	65	45
수확기	0	0	0	0	25	26	70	96	35	25	21
퇴비살포기	106	127	98	83	71	50	113	93	59	68	41
파종기	4	7	34	19	21	59	144	60	14	15	36
플라우	1,918	1,933	1,457	1,535	1,337	1,064	936	959	910	819	680
휴림복토기	51	90	54	89	47	79	86	74	56	54	34
기타	551	499	408	403	395	460	850	1,120	445	470	430
기타	2,253	2,256	2,293	2,643	2,717	2,701	6,807	3,712	2,523	2,795	2,899
합계	61,477	53,741	43,678	45,768	43,407	37,645	43,779	42,260	38,287	39,944	36,260

Source: Agricultural Machinery Yearbook 2023.

Table 3. Domestic Market Supply Status of Domestic and Imported Agricultural Machinery.

단위 : 백만 원, %

구분		2012	2014	2016	2018	2020	2022
농용 트랙터	소계	366,262	338,528	402,627	461,531	515,820	532,574
		(100)	(100)	(100)	(100)	(100)	(100)
	국산	287,328	254,330	287,736	326,667	360,981	373,586
		(78.4)	(75.1)	(71.5)	(70.8)	(70.0)	(70.1)
외산	78,934	84,198	114,891	134,864	154,839	158,988	
	(21.6)	(24.9)	(28.5)	(29.2)	(30.0)	(29.9)	
승용 이앙기	소계	69,351	73,794	91,700	80,253	78,272	83,600
		(100)	(100)	(100)	(100)	(100)	(100)
	국산	26,738	25,984	32,973	29,084	31,375	29,254
		(38.6)	(34.7)	(36.0)	(36.2)	(40.1)	(35.0)
외산	42,613	48,888	58,727	51,169	46,897	54,345	
	(61.4)	(65.3)	(64.0)	(63.8)	(59.9)	(65.0)	
콤바인	소계	131,487	163,235	161,516	155,901	177,670	164,911
		(100)	(100)	(100)	(100)	(100)	(100)
	국산	86,981	95,691	93,273	84,042	103,878	72,669
		(66.2)	(58.6)	(57.7)	(53.9)	(58.5)	(44.1)
외산	44,506	67,544	68,243	71,859	73,792	92,242	
	(33.8)	(41.4)	(42.3)	(46.1)	(41.5)	(55.9)	
합계	계	567,100	576,635	655,843	697,685	771,762	781,085
		(100)	(100)	(100)	(100)	(100)	(100)
	국산	401,047	376,005	413,982	439,793	496,234	475,510
		(70.7)	(65.2)	(63.1)	(63.0)	(64.3)	(60.9)
외산	166,053	200,630	241,861	257,892	275,528	305,575	
	(29.3)	(34.8)	(36.9)	(37.0)	(35.7)	(39.1)	

자료 : 한국농기계공업협동조합(KAMCO)

주 : 트랙터, 승용이앙기, 콤바인 구입 용자지원 매출액 기준, 농협임대사업 포함 수치임.

Source: Korea Agricultural Machinery Industry Cooperative (KAMCO).

2.1.1. Market Structure and Key Characteristics

The domestic agricultural machinery market consists of five major entities. First, complete agricultural machinery manufacturers produce finished products—tractors, combine harvesters, rice transplanters—that can be used directly in agricultural fields. Domestic representative companies such as Daedong, LS Mtron, and TYM belong here. Approximate market shares are Daedong approximately 35%, LS Mtron approximately 30%, and TYM approximately 30%. These three companies account for approximately 95% of the domestic agricultural machinery market, with the remaining 5% occupied by small and medium enterprises such as Aceaatec and imported agricultural machinery from John Deere, CNH Industrial, and Kubota.

Daedong maintains its number one position with strength in the tractor segment, particularly continuing high growth with strong sales of small and medium tractors in the North American market. LS Mtron shows balanced market share across various products including tractors, combine harvesters, and rice transplanters, and recently launched the autonomous driving tractor 'LS Smart Rex' to strengthen advanced technology competitiveness. TYM expanded its scale by acquiring International General Machinery and is pursuing aggressive marketing focused on North American and European markets.

Parts manufacturers specialize in producing engines, transmissions, hydraulic parts, and other components for agricultural machinery, supplying them to complete agricultural machinery manufacturers. Distributors serve as bridges between agricultural machinery manufacturers and farmers, selling complete agricultural machinery to farmers through dealers and agencies and providing after-sales service. Importers import overseas-produced agricultural machinery and supply it to the domestic market, particularly focusing on large-scale or specialized agricultural machinery with insufficient domestic production bases. After-sales and service companies handle repairs, maintenance, and parts replacement for agricultural machinery, providing rapid and professional services to maintain farmer work efficiency.

2.1.2. Growth Drivers and Challenges

Growth drivers: First, the spread of smart farming is leading the growth of the agricultural machinery market. Demand for advanced agricultural machinery such as autonomous driving tractors, drones, and robots is rapidly increasing as smart farming utilizing advanced technologies such as precision farming and data-driven agriculture spreads. Second, overseas market expansion is also a growth driver for the domestic agricultural machinery market. Domestic agricultural machinery companies are actively pursuing overseas expansion focused on emerging markets in Southeast Asia, Central Asia, and Africa. Third, the government's active support is also having a positive impact on agricultural machinery market growth through R&D support, agricultural machinery purchase subsidies, and financial support.

Challenges: First, intensifying global competition is a major burden for domestic agricultural machinery companies, as global agricultural machinery companies such as John Deere, CNH Industrial, and Kubota are aggressively entering the domestic market. Second, stagnation of the domestic agricultural machinery market is a challenge to be overcome, as the market shows a tendency toward stagnation or decline due to decreases in the agricultural population, aging, and declining farm income. Third, the technology gap with global companies remains a challenge to be resolved, particularly in advanced technology fields such as autonomous driving, artificial intelligence, and big data.

2.2. Current Status of the Overseas Agricultural Machinery Market

According to Freedonia, which compiles and analyzes statistics related to agricultural machinery, the global agricultural machinery market size was approximately USD 155.1 billion as of 2021, and is projected to reach USD 212.6 billion around 2026—an annual average growth rate of over 6.5%. This growth is attributed to trends including rising agricultural commodity prices, increased farming activities and cultivated land expansion, growth in processed food and beverage markets, increased mechanization rates in developing countries through foreign capital, high-quality machinery development, and government support policies in each country.

By region, the Asia-Pacific region including China and India is projected to occupy approximately 34% of the market by 2026. As shown in Table 4, in the USD 155.1 billion global market of 2021, the market shares of global companies are: US John Deere (Deere) in first place with USD 25 billion (16.1%), UK CNH in second place with USD 14 billion (9.0%), Japan's KUBOTA in third place with USD 12.7 billion (8.2%), US AGCO in fourth place with USD 8.9 billion (5.7%), and Korea's four major companies ((Daedong, TYM, LS Mtron, Aceaatec) are estimated to occupy approximately 1% of the global market with a scale of USD 1.5 billion.

Table 4. Agricultural Machinery Revenue by Country.

단위 : 백만\$

구분	2021		2026	2031
	금액	구성		
북 미	40,730	26.3%	54,630	75,100
중앙&남아메리카	10,900	7.0%	15,860	23,100
서 유 럽	31,450	20.3%	41,880	56,450
동 유 럽	13,180	8.5%	14,970	20,250
아시아/태평양	52,740	34.0%	76,100	109,750
아프리카/중동	6,150	4.0%	9,160	13,050
합 계	155,150	100%	212,600	297,700

Source: World Agricultural Equipment, 2023, Freedonia.

Table 5. Agricultural Machinery Brand Revenue.

단위 : 백만\$

순위	업 체 명	국가명	매출액	점유율
1	DEERE	USA	25,000	16.11%
2	CNH INDUSTRIAL	UK	14,000	9.02%
3	KUBOTA	JAPAN	12,750	8.22%
4	AGCO	USA	8,900	5.74%
5	CLAAS	GERMANY	4,850	3.13%
6	MAHINDRA & MAHINDRA	INDIA	3,800	2.45%
7	YANMAR	JAPAN	3,400	2.19%
8	SAME DEUTZ-FAHR(SDF)	ITALY	1,750	1.13%
9	LOVOL HEAVY INDUSTRIES	CHINA	1,700	1.10%
10	TRACTOR & FARM EQUIPMENT	INDIA	1,550	1.00%
-	Others		77,450	49.92%
	합 계		155,150	100.0%

Source: World Agricultural Equipment, 2023, Freedonia.

The North American market is the world's largest in terms of revenues. Global leading companies such as John Deere and CNH Industrial dominate the market based on high demand for advanced technology adoption and large-scale agriculture. Autonomous driving tractors, drones, and robots are being increasingly integrated, and data-based agricultural solutions and services are spreading. The European market has high demand for high-efficiency, eco-friendly agricultural machinery based on high agricultural technology levels and strict environmental regulations. CLAAS and AGCO show strength in this market. The Asian market is rapidly growing, centered on China and India, driven by rapid economic growth, population increase, food demand increase, agricultural modernization, increased rural income, and government agricultural support policies.

Table 6. Global Agricultural Machinery Industry Status and Agricultural Autonomous Driving and Drone Market Outlook.

Source: Freedonia, Deallab, Korea Rural Economic Institute.

2.3. Definition and Importance of the Agricultural Machinery Aftermarket

2.3.1. Concept of the Aftermarket and Its Business Administration Significance

The aftermarket refers to a market created by demand that additionally arises after companies sell products. Used cars, automobile parts, and printer cartridges are goods traded in the aftermarket; conversely, the market where new cars, printers, and other finished products are traded is called the before market. The representative aftermarket is the automobile market, which includes fuel, parts and accessories, insurance, installment finance, repair and washing, used cars, and leasing. Sales of new products tend to decrease during economic downturns, but since products already possessed require continuous management, the aftermarket responds less sensitively to economic conditions and actually tends to be more active during downturns.

The aftermarket includes the following activities: maintenance activities that keep product performance optimal through regular inspections, consumable replacements, and functional improvements; repair of failed or damaged products; upgrade activities that enhance product functions or add new ones; accessories sales that complement product functions or improve usage convenience; information provision on product usage methods, maintenance tips, and troubleshooting; and recycling and disposal activities to minimize environmental impact at end-of-life.

From an agricultural machinery perspective, the aftermarket is an important sector that generates additional revenue after product sales for manufacturers. In the agricultural machinery industry, there are many cases where more revenue is obtained from the aftermarket than from initial machinery sales. From a business administration perspective, the aftermarket is significant in: continuous revenue generation through parts sales, maintenance services, upgrades, and accessories; building long-term customer relationships; competitive advantage through differentiated after-service; brand image enhancement; and product lifecycle management.

Recently, new aftermarket services such as data-based services, predictive maintenance, and remote support are emerging alongside advances in agricultural machinery technology, further increasing the importance of the agricultural machinery aftermarket.

2.3.2. Current Status and Prospects of Domestic and Overseas Agricultural Machinery Aftermarkets

Domestic status: The domestic agricultural machinery aftermarket is growing due to factors such as increasing parts demand, digitalization, service premiumization, and government policies. Key discussion items can be summarized as follows. First, increasing agricultural machinery usage and aging is promoting aftermarket growth—agricultural machinery ownership rates are continuously increasing, and aging farmers tend to maintain existing agricultural machinery rather than purchasing new ones. Second, increased complexity of high-performance agricultural machinery creates demand for advanced maintenance services. Third, smart farming technology development presents new possibilities for the aftermarket through IoT and big data technologies enabling real-time monitoring and preventive maintenance. Fourth, activation of the used agricultural machinery trading market increases aftermarket parts demand, as used agricultural machinery needs parts replacement and maintenance for lifespan extension. Fifth, government agricultural policies—including agricultural machinery purchase subsidies and leasing businesses—promote agricultural machinery demand increases and contribute to aftermarket market growth.

Overseas status: The overseas agricultural machinery aftermarket is growing rapidly, centered on agricultural advanced countries and emerging agricultural nations. In North America, which accounts for approximately 20% of the global agricultural machinery market (Statista, 2023), advanced and expensive agricultural machinery is used on large-scale farms, leading to high demand for regular maintenance and high-quality parts. Traditional OEM parts have been dominant, but demand for cost-effective replacement and remanufactured parts is also increasing. In Europe, high demand exists for high-efficiency, eco-friendly agricultural machinery, with growth in data-based services including agricultural data analysis, remote monitoring, and predictive maintenance. In emerging markets such as Brazil, India, and China, low-price parts are in high demand due to price-sensitive consumers, and localization strategies are key success factors.

2.4. Domestic and Overseas Aftermarket Case Analysis

2.4.1. Domestic Cases

Significant domestic agricultural machinery aftermarket success cases are still limited. However, some companies are showing meaningful results through online platform building, differentiated service provision, and niche market targeting.

- Daedong: Pursuing a strategy of improving parts accessibility for farmers through the agricultural machinery parts online sales platform 'Daedong Mall.' This supports 24-hour online ordering and delivery, various parts information provision, real-time inventory confirmation functions, maintenance and repair booking inquiries, and customer support services through mobile app launches. In particular, Daedong provides rapid and professional maintenance services based on approximately 150 service networks nationwide.
- LS Mtron: Operating its own parts mall to improve customer convenience through an online parts sales platform, providing convenience through parts search and order function enhancement, online payment system introduction, and delivery tracking services. In particular, it is operating 'LS Mtron Academy' to strengthen communication with customers through agricultural machinery maintenance education programs.
- TYM: Operating a TYM shopping mall to sell various parts through an online parts sales platform, conducting agricultural machinery parts and accessories sales and online promotions. Also expanding TYM service centers to provide professional maintenance services, working to strengthen maintenance technology education, personnel training, and customer satisfaction improvement.
- Nonghyup (National Agricultural Cooperative Federation): Operating NH Nonghyup Agricultural Machinery Centers nationwide, providing comprehensive services including agricultural machinery sales, repairs, and parts supply. Providing agricultural machinery education and consulting for farmers, as well as agricultural machinery rental services.
- Aftermarket specialist company (Agriz): Operating the used agricultural machinery trading platform 'Agriz' to activate used agricultural machinery trading among farmers, with online platform-based used agricultural machinery buying and selling, machinery information provision and price comparison services, and a safe payment system.

2.4.2. Overseas Cases

- John Deere: The John Deere Reman program provides customers with affordable and eco-friendly parts options through a remanufactured parts sales program. Remanufactured parts that pass strict quality standards have high price competitiveness compared to new parts. The JDParts online parts shopping mall provides detailed parts information, real-time inventory confirmation, and fast delivery services. The Expert Connect remote support service supports agricultural machinery problem resolution through real-time connection with experts.
- CNH Industrial: Operating the MyCNHiStore online parts shopping mall to sell parts from various brands including Case IH and New Holland online, providing user-friendly interfaces, various search options, and fast delivery. The Parts & Service mobile app provides various functions including parts search, ordering, delivery tracking, and service reservations.
- AGCO: Operating the AGCO Parts online parts shopping mall to sell parts from its brands including Massey Ferguson and Fendt online. The AGCO Plus+ customer loyalty program enhances customer loyalty through points accumulation and discount benefits on parts purchases and service use. Fuse Connected Services provides remote monitoring, data analysis, and predictive maintenance services.
- Kubota: Securing customer trust by emphasizing the importance of genuine parts and providing quality guarantees. The Extended Warranty Program provides customers with additional safety devices and builds long-term customer relationships, providing rapid and professional maintenance services through its global service network.

2.5. Summary: Analysis of Domestic and Overseas Agricultural Machinery Market and Aftermarket

The domestic agricultural machinery market has growth drivers such as smart farming spread, overseas market expansion, and government support, but also faces challenges including intensifying global competition, domestic market stagnation, and technology gaps. The aftermarket provides opportunities for continuous revenue generation through parts sales, repair and maintenance service provision, accessories sales, and information provision even after agricultural machinery sales; it can improve customer satisfaction and build brand trust through aftermarket services. Differentiated aftermarket services provide greater value to customers and become core differentiators from competitors.

The overseas agricultural machinery aftermarket is continuously growing driven by technological advancement, digitalization, and globalization, playing an important role in improving agricultural productivity and supporting efficient agricultural machinery operation. Both domestic and overseas agricultural machinery markets and

aftermarkets hold growth potential while facing challenges simultaneously. Benchmarking innovative services and technologies from advanced agricultural technologies in North America and Europe is necessary to improve farmer convenience and contribute to agricultural productivity improvement, and strategic and policy support for personnel training, parts localization, and online distribution channel activation is needed.

3. Aftermarket Sales Activation Strategies

3.1. 4P Analysis: Strategic Implications in the Agricultural Machinery Aftermarket

Activating parts sales in the agricultural machinery aftermarket requires a strategic approach beyond simply providing parts. Product, distribution, price, and promotion must be organically connected and constantly innovated to provide customers with optimal value and maximize customer satisfaction.

3.1.1. Product Strategy: Quality Management and Sustainability

Developing products that meet customer needs is most important. The agricultural machinery aftermarket is rapidly changing, and customer requirements are also diversifying. For example, it is necessary to provide practical convenience such as strengthening durability of frequently requested parts or providing parts tailored to specific climate environments. Actively collecting and analyzing actual user feedback and reflecting it in product improvements is important.

Improving parts compatibility is also important. Developing modular-design parts applicable to various machinery models can enhance customer convenience, reduce maintenance replacement time, and bring cost reduction effects in inventory management. Developing smart parts equipped with IoT sensors or remote monitoring functions is an essential element for strengthening future competitiveness. The quality of aftermarket parts is directly related to customer satisfaction, so a strict quality verification process must be applied during manufacturing to minimize defects and provide products with guaranteed durability and performance. Acquiring internationally recognized quality management certifications such as ISO certification can enhance product reliability and serve as a competitive advantage. Quality management must continue after product launch, regularly monitoring quality data to find improvement areas, and constructing a post-management system that can respond quickly and flexibly to quality problems.

3.1.2. Distribution Strategy: Channel Optimization and Logistics Innovation

Providing customers with needed parts in a timely manner is most important. For this, distribution channels must be optimized and logistics management strengthened to improve customer purchase convenience. First, online and offline channels must be operated in an integrated manner. Since agricultural machinery parts may have different demands and preferred channels by agricultural region and major agricultural machinery use areas, regional distribution networks must be optimized. Major agricultural regions should establish parts retail stores or agencies and build partnerships with agricultural machinery parts distributors to improve accessibility for specific regional customers.

Close cooperation relationships with regional agencies are also important. Supporting agencies to have sufficient inventory and sharing the latest parts information allows agencies to recommend appropriate products to customers. Introducing subscription-type services targeting parts requiring regular replacement is also a good method—subscription services help customers replace parts in a timely manner and have the effect of enhancing customer loyalty, while companies can expect regular revenue generation. Building an efficient inventory management system is also essential. Utilizing AI-based demand forecasting technology allows flexible inventory management according to seasonal demand, and optimizing logistics networks to shorten delivery times is important. Simplifying parts return and exchange procedures minimizes customer inconvenience, and building a logistics tracking system allows customers to check delivery status in real-time.

3.1.3. Price Strategy: Price Models and Market Fit

Price strategy for activating parts sales in the agricultural machinery aftermarket is very important. Customer satisfaction can be enhanced and sales promoted through flexible pricing models and discount strategies tailored to various customer needs and purchase patterns.

Cost-Plus Pricing is one of the most basic pricing models, setting prices by adding a certain profit margin to production costs, which maintains price competitiveness since prices are based on manufacturing costs. Value-Based Pricing sets prices based on the value provided by parts, considering durability, quality, and technical excellence that customers value highly—for example, high-end parts with excellent durability and performance can emphasize long-term cost savings. Tiered Pricing provides differentiated prices by setting price tiers for

various customer groups, classifying products as basic, mid-range, and premium parts. Bundling Pricing provides frequently used parts together in packages at discounted prices. Bulk Purchase Discounts are attractive strategies for large-scale farms or agricultural machinery service companies; Seasonal Discounts effectively respond to busy farming season demand; Loyalty Discounts provide benefits to regular customers; Clearance Discounts efficiently handle old inventory; and Early Bird Discounts effectively create demand in the early stages of new product launch.

3.1.4. Promotion Strategy: Integrated Marketing Campaigns

Effective promotion strategies are essential for activating parts sales in the agricultural machinery aftermarket. Online marketing is essential in the digital era—targeted advertising can be executed on social media, online communities, and agriculture-related websites frequently used by agricultural machinery users to effectively reach potential customers. Analyzing customers' regions, interests, and search records to provide customized advertising can increase product awareness on digital platforms and induce purchases.

Offline advertising still plays an important role—advertising on billboards in major agricultural regions, agriculture-related exhibitions, and industry trade shows can attract attention from local customers. Actively utilizing positive testimonials and success cases from existing customers is also essential. Customer education campaigns are important for informing about the importance of parts and the necessity of regular replacement. Agricultural machinery maintenance cycle subscription services can also be effectively promoted—subscription services that automate regular filter and oil replacements reduce customer maintenance burden and contribute to stable revenue generation. Seasonal promotional campaigns can guide customers to purchase needed parts in advance by agricultural season. Introducing trade-in programs allowing customers to return old parts and purchase new parts at discounted prices is also worth considering. Holding demonstration events where customers can directly experience parts and provide feedback, or conducting customer experience programs, are also good approaches.

3.1.5. Sub-conclusion on 4P Strategy

To succeed in the agricultural machinery aftermarket, companies must think of customers as farmers think of their crops, constantly making efforts. The 4P strategy must be organically connected and constantly innovated. Product strategy must be rooted in quality and sustainability. Distribution strategy requires building a fresh and efficient system like agricultural product distribution. Price strategy must be flexible and rational. Promotion strategy must emphasize communication with customers through online and offline channels. In addition to the 4P strategy, customer management and after-service require careful attention—regular educational programs to strengthen customers' self-maintenance capabilities, real-time problem resolution support through online customer support channels, and various after-services for customer satisfaction including free inspection, installation, and on-site services must be provided.

3.2. John Deere's Key Business Strategies and Direction

3.2.1. 4P Analysis: Strategic Implications of John Deere's Aftermarket

John Deere's aftermarket strategy can be briefly analyzed through 4P analysis. Regarding Product strategy, John Deere sells remanufactured parts through the John Deere Reman program—parts that pass strict quality standards with high price competitiveness compared to new parts. These parts can be confirmed through the JDParts online site with detailed parts information, real-time inventory confirmation, and fast delivery services. The Expert Connect remote support service supports agricultural machinery problem resolution through real-time connection with experts.

Regarding Place (distribution) strategy, JDParts online parts shopping mall and mobile app enhance customer accessibility, utilizing its global service network to provide rapid and professional maintenance services. Regarding Price strategy, price competitiveness is secured through remanufactured parts sales, along with customer loyalty program incentives including points accumulation and discount benefits on parts purchases and service use. Regarding Promotion strategy, marketing is conducted connecting the online shopping mall and offline service network, securing customer trust by emphasizing the importance of genuine parts and providing quality guarantees.

3.2.2. John Deere's Aftermarket Growth Strategy

John Deere analyzed the US and Canadian markets—which contribute greatly to John Deere's global sales—together with a consulting institution to identify potential aftermarket demand. As shown in Figure 1, between 2010 and 2014, the proportion of net operating income (NOI) from whole goods (equipment) and aftermarket from John Deere dealers in the US and Canada was approximately 50% each. The US and Canadian markets are

typical new equipment sales saturation markets where growth rates differ greatly from developing countries with clear new equipment sales growth.

To break through this equipment sales saturation, John Deere began strengthening the aftermarket segment together with dealers—from 2015, the aftermarket NOI proportion rapidly increased and now far exceeds the NOI proportion of equipment sales. The lesson here is that the Korean agricultural machinery market is also moving toward a saturation state like the US and Canadian markets, where replacement demand for existing equipment predominates over new equipment demand, making this a good time to benchmark and apply the various cases and strategies used in those markets.

As shown in Figure 2 (BENDING THE AFTERMARKET CURVE), the proportion of genuine parts (brown area) rapidly decreases over time during the lifecycle—from machine launch to disposal. The red dotted line indicates potential aftermarket parts demand currently being lost to competitors: demand that John Deere should focus on capturing.

As shown in Figure 3, John Deere divided the equipment lifecycle into four stages—Warranty, Maintain, Repair, and End of Life—with demand capture rates of 95%, 65%, 42%, and 30% respectively. While sufficient parts demand exists at each stage, this demand cannot be connected to actual parts sales, meaning third parties are capturing this demand rather than John Deere.

As shown in Figure 4, while 'Buying from John Deere Dealers' is the majority for the relatively early stages of the equipment lifecycle, from the 11th year onward, 'Buying from Competition' increases markedly. To target these uncaptured aftermarket parts demand areas, John Deere pursues the Tiered Portfolio strategy.

3.2.3. John Deere's Tiered Portfolio Strategy

John Deere's aftermarket Tiered Portfolio is a strategy that provides stratified parts and service options tailored to customers' diverse needs and budgets—structuring multiple product tiers so customers can choose according to their needs. This goes beyond a simple dichotomy of 'genuine or not' to provide choices considering various factors such as quality, price, and warranty period, aiming to enhance customer satisfaction and strengthen market competitiveness.

The Tiered Portfolio generally consists of three main tiers. For example, when replacing a tractor engine oil filter, customers can choose from: John Deere Original Filter (highest quality and performance genuine filter; price: high); John Deere Reman Filter (filter remanufactured to the same level as genuine; price: medium); A&I Filter (affordable filter compatible with various models; price: low).

First, John Deere Original Parts are parts designed and manufactured by John Deere itself, guaranteeing the highest level of quality, performance, and durability. They pass John Deere's strict quality management standards, apply the latest technology and engineering, provide the longest warranty period, and are easily available through the John Deere dealer network. Suitable for customers wanting the highest quality and reliability, recommended for maintaining the same performance level as new equipment and for replacement of critical parts or core systems.

Second, John Deere Reman Parts are remanufactured parts produced from recovered used John Deere parts through disassembly, cleaning, inspection, and reassembly to perform at the same level as new parts. They comply with the same quality standards as genuine parts, are guaranteed through strict testing, are less expensive than genuine parts, and are environmentally friendly. Suitable for customers valuing both cost efficiency and environmental benefits, recommended for economically resolving repairs or replacements of major parts.

Third, A&I Products—acquired by John Deere—provides aftermarket parts compatible with various agricultural machinery models. Offered at much lower prices than genuine parts, they boast broad compatibility and are suitable for customers emphasizing price-to-performance ratio. Appropriate for general maintenance or emergency repairs, recommended for old equipment or customers wanting economical repairs.

3.2.4. John Deere's Aftermarket Strategy Through JDLink

John Deere's JDLink goes beyond a simple GPS-based location tracking device to become a core telematics system for efficient agricultural machinery management and agricultural productivity improvement. It is a system connecting the computer built into agricultural machinery with the internet to check equipment status in real-time, analyze data, and optimize farm operations. JDLink performs a core role in aftermarket strategy and becomes an important tool for deepening customer relationships and retaining customers within the John Deere ecosystem.

First, JDLINK collects various data in real-time including equipment location, operating time, engine status, and fuel consumption. Through this, equipment status is remotely monitored and potential failure possibilities are predicted in advance. Collected data is analyzed to identify parts or systems with high failure probability in advance and provide notifications to customers, preventing sudden failures and minimizing equipment downtime. JDLINK records and manages equipment maintenance history, allowing customers to easily identify equipment maintenance status, while dealers can provide more accurate diagnosis and maintenance services based on past maintenance records.

Second, JDLINK monitors parts usage time or status to notify customers of replacement timing, recommending John Deere genuine parts or remanufactured parts to induce parts sales. Customers who confirm parts replacement timing through JDLINK can conveniently order parts through the linked online parts ordering system. JDLINK connects customers with John Deere dealers—when failures occur, customers can contact nearby dealers through JDLINK to quickly receive service, while dealers can prepare more efficient services by identifying equipment status in advance through JDLINK.

Third, JDLINK collects equipment operational data and provides it to customers, enabling them to analyze equipment efficiency and improve operations. John Deere provides agricultural consulting services to customers utilizing data collected through JDLINK—for example, analyzing soil conditions and weather information to propose optimal sowing times and fertilizer usage amounts.

Fourth, JDLINK serves as a communication channel between customers and John Deere—providing equipment management tips and new technology information to customers, and responding promptly to customer inquiries. Customized services matching individual customer needs can be provided based on data collected through JDLINK.

Fifth, for the purpose of proactive service provision, minimizing equipment downtime and improving customer satisfaction by predicting and responding before failures occur; supporting customer decision-making by analyzing equipment operational data; and providing integrated services including parts sales, service, and consulting through JDLINK to retain customers within the John Deere ecosystem and prevent competitor entry.

3.2.5. Ideal Demand Forecasting for John Deere's Aftermarket Parts (Tractors)

All tractor manufacturers write basic replacement cycles for major consumables such as engines, transmissions, and axles, along with equipment maintenance-related documents after tractor development. As shown in Figure 5, John Deere also provides detailed descriptions of replacement cycles for major consumables and consumable information by tractor model. The following describes how John Deere predicts annual aftermarket parts demand amounts for tractors.

Key variables for calculation are: (1) number of tractors sold (shipped)—manufacturers can accurately know the number of tractors sold domestically or overseas through manufacturers or dealer networks; (2) average equipment usage hours—essential variable that aligns with consumable replacement cycles; (3) capacity information of engine oil, transmission oil, coolant, etc.—typically available in equipment management manuals; and (4) unit prices of individual consumable parts—the most important variable, used to calculate ideal parts demand amounts for that tractor on an annual basis.

Example calculation assumptions: annual equipment usage 500 hours; engine oil capacity 20 liters; hydraulic oil capacity 60 liters; coolant capacity 20 liters; engine oil unit price USD 3/liter; hydraulic oil unit price USD 3/liter; coolant unit price USD 3/liter; tractors sold 100 units.

Table 7. Parts Consumable Cost Calculation Example.

Part	Replacement Cycle (Hours)	Part Unit Price (USD)	Maintenance Cost (USD)	Calculation Formula
Oil Filter	500	500	500	(Equipment usage hours / Replacement cycle) × Unit price
Engine Oil	500	60	60	1. Engine oil unit price: Oil capacity × Price per liter 2. Maintenance cost: (Equipment usage hours / Replacement cycle) × Unit price
Hydraulic Oil	1,500	180	60	1. Hydraulic oil unit price: Oil capacity × Price per liter 2. Maintenance cost: (Equipment usage hours / Replacement cycle) × Unit price
Hydraulic Oil Filter	1,500	500	170	(Equipment usage hours / Replacement cycle) × Unit price

Coolant	6,000	60	5	1. Coolant unit price: Coolant capacity × Price per liter 2. Maintenance cost: (Equipment usage hours / Replacement cycle) × Unit price
Air Filter	—	—	—	(Equipment usage hours / Replacement cycle) × Unit price
Fuel Filter	—	—	—	(Equipment usage hours / Replacement cycle) × Unit price
Total			1,000	

Source: John Deere's Internal data.

For secondary non-consumable parts cost calculation, the total of USD 1,000 from Table 7 is only for consumable parts demand cost. The calculation for parts costs excluding consumables can be computed using values from Figure 6. Figure 6 is John Deere's own parts revenue composition table, where Oil 40%, Coolant 2%, and Filter 9% represent typical consumable parts—their total is 51%. Since consumables account for 51% of total parts revenue, non-consumable parts revenue can be back-calculated as 49%.

The non-consumable revenue calculation formula is: $(\$1,000 \text{ (consumable total)} / 51\% \text{ (consumable revenue)}) \times 49\% \text{ (non-consumable revenue)} = \961 . The annual parts demand cost calculation formula for consumable and non-consumable parts is: $(\$1,000 + \$961) \times 100 \text{ units} = \text{approximately } \$196,100 \text{ in annual ideal parts revenue from equipment sold during a specific period.}$

This calculation serves as baseline information for understanding the approximate aftermarket parts revenue scale and is shared with domestic agencies or dealers selling equipment as a benchmark for potential parts demand. As shown in Table 8, by referencing the number of registered tractors in Korea, domestic manufacturers can estimate the approximate domestic aftermarket market scale, and it is recommended that domestic manufacturers actively utilize this analysis to calculate aftermarket parts demand for their tractors.

Table 8. Status of Agricultural Machinery Ownership by Province.

Province	2018	2019	2020	2021	2022	5-Year Total
Seoul	97	98	112	118	134	559
Busan	2,010	1,886	1,859	1,901	1,873	9,529
Daegu	2,190	2,200	2,258	2,228	2,246	11,122
Incheon	4,176	4,170	4,290	3,889	4,356	20,881
Gwangju	1,704	1,677	1,676	1,698	1,647	8,402
Daejeon	567	682	675	602	611	3,137
Ulsan	2,381	2,365	2,411	2,501	2,566	12,224
Sejong	1,694	1,745	1,730	1,800	1,831	8,800
Gyeonggi	37,196	37,989	38,191	38,822	38,837	191,035
Gangwon	20,274	20,939	21,628	21,821	21,967	106,629
Chungbuk	16,988	17,515	17,853	18,083	18,296	88,735
Chungnam	38,578	39,237	39,497	39,624	39,362	196,298
Jeonbuk	32,588	33,562	34,108	34,358	34,573	169,189
Jeonnam	42,251	43,112	43,416	44,670	45,039	218,488
Gyeongbuk	47,865	50,502	51,295	52,232	53,111	255,005
Gyeongnam	34,754	36,096	36,653	37,050	37,674	182,227
Jeju	4,945	4,905	4,918	4,712	4,666	24,146
Total	290,258	298,680	302,570	306,109	308,789	1,506,406

Source: Statistics Korea.

4. Conclusions

4.1. Research Summary

This study emphasized the importance of the agricultural machinery aftermarket and conducted an in-depth analysis of various strategies for activating parts sales in a changing market environment. The agricultural machinery aftermarket plays an important role beyond simply replacing broken parts—it drives the development of the entire agricultural machinery industry as a core element that improves agricultural productivity and increases farm income.

The agricultural machinery aftermarket is growing steadily driven by smart farming and increasing agricultural machinery lifespans, but also faces difficulties such as intensifying global competition and technology gaps. A customer-centered approach is essential for success in this market. Product development reflecting customer needs, strict quality management, IoT technology application, optimized online/offline distribution channels, and efficient logistics management systems are important. Additionally, various pricing models and discount strategies to present attractive prices to customers, effective promotions through digital and offline channels to enhance brand awareness, and customer-centered marketing through engagement campaigns and education opportunities are important.

Systematic after-service must improve customer satisfaction and build long-term customer relationships through customer education and support programs, free inspection services, and rapid problem resolution services. Leading companies like John Deere are strengthening aftermarket competitiveness through data-based services utilizing telematics systems, predictive maintenance, and remote support, and employing Tiered Portfolio strategies to meet the needs of various customer groups.

The spread of smart farming, increasing agricultural machinery lifespans, precision farming technology development, and growth in online sales are major forces driving the sustained growth of the agricultural machinery aftermarket market. IoT-based sensor technology enables real-time identification of machinery operating status, parts wear, and consumable replacement timing, and data collected through big data analysis is utilized to predict agricultural machinery failures and parts demand. Specific digital technology application examples include predictive maintenance, parts demand prediction, remote diagnosis support, and personalized parts recommendations.

In conclusion, while the domestic agricultural machinery aftermarket is still in an early growth stage, major companies including Daedong, LS Mtron, and TYM are making various efforts including online platform building, differentiated service provision, and customer education strengthening. If domestic companies expand investment in the aftermarket business and pursue innovation based on these research results, they are expected to contribute not only to improving agricultural productivity and increasing farm income but also to strengthening domestic agricultural machinery company competitiveness, improving agricultural productivity, developing the agricultural machinery industry ecosystem, spreading smart farming, and establishing government policies.

4.2. Implications

John Deere's success case provides important implications for the aftermarket business for domestic agricultural machinery companies.

7. Domestic companies should move away from viewing the aftermarket business as merely parts sales and recognize it as a core element for building long-term customer relationships and generating revenue. Strategic investment in the aftermarket business should be expanded to strengthen competitiveness in various areas such as product development, distribution network securing, service system building, and personnel training. The growing trend of agricultural machinery lifespan extension makes the aftermarket business increasingly important.
8. Segmenting customer groups and providing products and services tailored to each customer group's characteristics is an important strategy for improving customer satisfaction and expanding market share. Referencing John Deere's Tiered Portfolio strategy, customized strategies should be established such as providing economical product lines to price-sensitive customers and premium product lines to customers who value quality and performance. For example, affordable compatible parts can be provided to small farms, while high-quality genuine parts and professional technical support services can be provided to large agricultural companies.
9. Digital technology is a powerful tool that can revolutionize aftermarket services and provide new value to customers. Following John Deere's JDLINK system, IoT, big data, and AI digital technologies should

be actively utilized to provide customers with convenient and efficient services. Agricultural machinery remote monitoring, predictive maintenance, and customized consulting services should be developed and invested in to improve customer satisfaction.

10. The success of the aftermarket business depends on building long-term relationships with customers. To maintain continuous relationships based on customer trust, customer loyalty program operation, regular customer satisfaction surveys, and expanded customer opinion collection channels should be used to strengthen communication with customers.
11. To strengthen aftermarket business competitiveness, strategic alliances and cooperation with companies in various fields should be sought. Synergy effects can be created and new business models developed through cooperation with parts manufacturers, distributors, service providers, and IT companies.
12. The proposed strategies are realizable if sufficient resources and time are invested and implemented in stages. For strengthening digital technology capabilities, investments in IT specialist personnel training, big data analysis system building, and AI technology introduction are necessary. For customer segmentation and customized strategies, efforts in market research, customer data analysis, and product line diversification are needed. For strengthening cooperation, partnership building, information sharing systems, and joint projects are necessary.

4.3. Research Limitations and Future Research Directions

This study made a meaningful contribution in presenting strategic directions for the growth and development of the domestic agricultural machinery aftermarket. However, several limitations were encountered during the research process. First, the research scope was limited to tractors, and analysis of other agricultural machinery such as combine harvesters and rice transplanters was not sufficiently conducted. Since the agricultural machinery aftermarket encompasses various agricultural machinery types, future research needs to expand the analysis scope for a more comprehensive market perspective.

Additionally, there were difficulties in securing accurate data on domestic agricultural machinery aftermarket market size, company-specific market shares, and customer satisfaction. This acted as a constraint in securing research result objectivity and presenting specific figures. In future research, accurate data should be collected and analyzed through various methods such as securing data from credible institutions or conducting direct market research.

Future research directions include: expanding the analysis scope to various agricultural machinery products including not only tractors but also combine harvesters, rice transplanters, and dry-field crop machinery; collecting and analyzing quantitative data on market size, growth rate, and customer satisfaction for objective market analysis; deriving benchmarking strategies through in-depth analysis of domestic and overseas success cases and presenting practically applicable measures for domestic companies; researching aftermarket service innovation plans utilizing smart technologies such as AI, big data, and IoT; and conducting research on policy support plans and regulatory improvement measures for aftermarket activation.

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- Aftermarket
<https://terms.naver.com/entry.naver?docId=3472980&cid=40942&categoryId=31909> definition: