

Smart Farming Technology in Japan and Opportunities for EU Companies

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List of Abbreviations

AI	Artificial Intelligence
EPA	Economic Partnership Agreement
FY	Fiscal Year
GPS	Global Positioning System
GIS	Geo Information System
HQ	Headquarters
IoT	Internet of Things
ICT	Information and Communication Technology
JA	Japan Agricultural Cooperatives
MAFF	Ministries of Agriculture, Forestry and Fisheries
METI	Ministry of Economics, Trade and Industry
NARO	National Agriculture and Food Research Organization
SIP	Strategic Innovation Program
POS	Point of Sale
PSE	Producer Support Estimate
TSE	Total Support Estimate
QZSS	Quasi-Zenith Satellite System

1. Executive Summary

Since the early 2000s Japan is trying to improve its food self-sufficiency rate (only 37% in 2018) as a major policy goal. The geographical conditions make it hard to reach the current goal of 45% self-sufficiency: two thirds of the nation's surface are mountainous; many areas are hard to reach. Another problem is the shrinking number of farmers, and their increasing age (67 years in average). Labour shortage is a major problem, and thousands of hectares farmland are unused. On the other hand, a structural change towards consolidation is ongoing: large-scale farming as well as agricultural cooperative corporations are increasing.

Political targets play a major role in the public acceptance of new developments and trends in Japan and foster the development of smart agriculture. Japan is determined to tackle the negative trends, and as they have done so often in the past, new technologies are to play a major part in this strategy. In 2016, the Cabinet Office declared to “...*make it [the field of Agriculture] into a growth field using Big Data, IoT and AI*”.¹ Agricultural policy reforms are being pushed forward. The MAFF has released a roadmap for the business expansion of smart farming technologies and services, which aims at a rash implementation within the next few years. MAFF has established 124 demonstration projects of smart farming technologies and services within a large-scale pilot project program, to showcase and facilitate the new opportunities. However, the extraordinary market power of the national association of agricultural cooperatives (JA) stands in the way of improving Japan's sometimes less productive agriculture.

But the decisive growth phase for the smart farming market in Japan is currently underway. The usage of smart farming technologies and services in Japan's agricultural sector is increasing. According to the Yano Research Institute, the market for intelligent agriculture in Japan will almost triple in the next few years from a sales revenue of 15.87 billion JPY (2019) to an estimated amount of around 44.28 billion JPY (2025). This forecast includes precision farming, agricultural robot systems as well as cultivation, sales, and operational support solutions but it does not include POS systems, farm machines or drones for agriculture, so the actual number under a comprehensive market definition is likely significantly higher.²

The biggest challenges are tied to the general state of the agriculture in Japan. The very high and still rising average age of farmers makes it difficult to implement new technologies, as many lack ICT literacy. Attracting the younger generation to this craft is which is considered hard work with low and unsecure income, caused e.g., by frequent extreme weather events, is also difficult in Japan. Retaining skilled workforce, who can handle the new technology is difficult. High investment costs especially for new machinery are a major obstacle for the Japanese agriculture, in which small farms dominate due to the often-difficult topological conditions.

Driven by those challenges there is a high pressure on politics to facilitate this sector and make it competitive again. Next to the programs mentioned above, structural changes such as land reforms to foster the use of abandoned farmland land and to boost large-scale farming are underway and have already shown first results. Smart farming solutions are especially promoted by progressive legislative reforms, such as the usage of drones or self-driving vehicles, chemical spraying reforms as well as the quick, comprehensive rollout of necessary infrastructure such as 5G, QZ Satellite System or the standardized data platform WAGRI.

First results and positive trends, such as a growing number of business farmers, is already emerging. Many smaller farms, especially those organized in cooperatives, are also increasingly using joint procurement strategies to mitigate

¹ Strategic Innovation Program: “Technologies for Creating Next-generation Agriculture, Forestry and Fisheries”.

² Statista [based on the research of Yano Research Institute](2016): “Sales revenue of the domestic smart agriculture market in Japan from fiscal year 2015 to 2019 with forecasts until 2025”.

the investment cost impact. The social cohesion and cooperation in Japan's society is facilitating knowledge and experience-sharing via platforms. There is also a strong trend towards sustainable food production, e.g., food safety and origin, which can be much easier traced via new management and sales solutions.

Another interesting trend is the increasing engagement of companies alien to agriculture so far. Not only ICT companies such as NTT or Fujitsu are participating in the smart farming market, but also companies such as TEPCO have discovered the smart farming sector as a new segment for the application of their know-how and as a new, promising revenue stream.

In general, Japan is an important sales market for agricultural machinery. In 2019, agricultural machinery worth over 630 million EUR was imported, of which almost 60% came from Europe. Added to this is the strong sales of locally produced agricultural machinery (total sales value of 2.9 billion EUR in 2019).³ While the agricultural machinery markets for tractors and combined harvesters are almost completely dominated by the four major Japanese agricultural machinery manufacturers (Kubota, Yanmar, Iseki, Mitsubishi-Mahindra), European manufacturers enjoy a good brand reputation in Japan and are known for their high-quality and advanced machines with future-oriented technology. Especially the easy handling and operator-friendliness is appreciated. Demand in Japan is mainly for labour assisting and labour-saving technologies, to counter the decrease in farming population.

In the general agricultural machinery market, European small and medium-sized enterprises (SMEs) have the best opportunities in the export of dairy machinery as well as other machinery for soil cultivation, harvest preparation and cultivation. Duty-free import of foreign agricultural machinery due to the Economic Partnership Agreement (EPA), government subsidies e.g. for pilot projects and the great potential for automation in Japanese agriculture offer special incentives. A key element could be the provision of maintenance infrastructure for European SMEs.⁴

When it comes to new smart farming technologies, European SME should have good opportunities in the field of drones and precision farming solutions, which are expected to grow exponentially in the coming years, driven by the unique topological features of Japan and tightening regulations along with progressive legislation in the underlying areas such as e.g., unmanned vehicle and chemical spraying laws. This kind of technology can be transferred rather easily, and the necessary infrastructure in form of WAGRI data platform or QZSS is available. This makes Japan a predestined testing ground for those kinds of technologies, making R&D projects in these areas quite appealing.

Smart farming services such as farm management support, POS-solutions for sales support, solutions to share and manage farming information or production management solutions for the supply chain, especially in the dairy and animal husbandry sector, are also interesting fields. However, access to the service market is more difficult and requires a local partner with good knowledge of the regional processes.

When entering the Japanese smart farming market, specific challenges need to be considered. The trust in domestic Japanese companies and Japanese brands, especially the domestic full liners, is a big obstacle and Japanese companies are often favoured by the government. In addition, the language barrier is still a major challenge in Japan, especially in many segments of a rather traditional business such as agriculture.

A specific analysis of the target market segment as well as competitors and possible partners is key to success. A local partner, and ideally a local subsidiary with Japanese speaking manager is strongly recommended. This is very

³ Bundesministerium für Ernährung und Landwirtschaft (2020): „Der Markt für Landtechnik in Japan“.

⁴ Bundesministerium für Ernährung und Landwirtschaft (2020): „Der Markt für Landtechnik in Japan“.

successfully illustrated e.g., by the case of the German company InFarm, who checked all those boxes when they struck a deal with Kinokuniya to use their indoor farming systems in the Kinokuniya supermarkets (see chapter 5b).

How to ensure customer service such as training, or maintenance also needs to be considered. Even though it is possible to do a lot remotely, especially in software segments, Japanese customers emphasize the support of (ideally Japanese) employees on-site. While this trend is possibly changing due to Covid-19, also because the government strongly tries to facilitate remote activities, the customer service and maintenance concept is a key issue, especially with many uncertainties regarding the application of this new technology in a traditional sector.

Adjustment to Japanese conditions is also very important. This includes e.g., providing a Japanese interface for software, but also adapting the interface layout to Japanese quirks. Interesting opportunities also arise from R&D possibilities, e.g., within the framework of an adaption process or pilot project. Japan is very advanced in many fields related to new smart farming segment such as robotics, drones and the use of AI and ICT. European SME might benefit greatly from such a cooperation and can use Japan as a testing ground for new ideas.

Lastly it is important to mention that the challenge of sustainable and advanced agriculture is not only a national matter. Japan has very good ties to Southeast Asian countries and possibilities for third-country co-operations with Japanese companies should not be neglected. Japanese companies often look towards opportunities in Southeast Asia and the demand in those highly populated countries, such as Indonesia, Myanmar or Cambodia, especially for technology and solutions in the food and agricultural sector, is considerable. The QZSS satellite system for example is also being tested in Southeast Asia and applications based on it could be applied to those countries.

2. Scope of Report

This report is addressed to small and medium-sized companies in Europe who offer innovative technology in the smart farming sector such as

- Robots for agricultural use
- Technology for precision farming
- ICT, Artificial Intelligence, drones for agricultural use
- Smart farming services.

The report presents a comprehensive overview of the Japanese smart agriculture market including current trends, drivers as well as opportunities and challenges for SME's seeking to develop or strengthen their positions in the Japanese market.

The focus is set on innovative technologies for precision farming such as GPS guidance systems for tractors or autonomous vehicles, agricultural robots (e.g., for grafting or harvesting) and drones, as well as cloud services for smart farming or IT solutions for complex environmental control (heat, light, ventilation, humidity etc.), for farm management or sales support.

The current size, structure and trends in the Japanese market for smart agriculture are described in part 3, as well as framework conditions including political measures.

Part 4 lists up the main market players (companies, universities/research institutes, associations). Distribution channels for both hardware and services are characterized in part 5.

Some relevant regulations are included in part 6, and some relevant trade fairs are listed in part 7.

The report concludes with a short analysis of the main challenges, business opportunities and key success factors for EU-based small and medium-sized enterprises in chapter 8.

Thus, the report strives to provide practical information for European companies engaging into the smart agriculture market which helps them to estimate the potential of Japan's smart farming market for their specific innovative technology or service.

The report is based on an extensive desk research of relevant publications and media, including publications by Japanese ministries, government bodies and research institutions in Japanese language. Furthermore, information sources such as specialist journals, economic journals, company reports and websites, statistical websites, etc. were integrated to complement the study.

3. Japanese Smart Farming Market

a. Market Characteristics

The smart farming market consists of various solutions such as the usage of agricultural robots and drones, GPS based guidance systems with autopilot or semi self-operating technologies for tracking, monitoring, automating, and analysing operations. These technologies are ideally closely linked to each other to create an innovative production chain. Due to the high grade of innovation and frequently introduced new solutions, the definition is subject to change. Currently the smart farming market in Japan is categorised in the following six segments:⁵

1. Precision Farming
 - GPS Guidance Systems (esp. for tractors)
 - Automatic Steering (does not include unmanned vehicles)
 - Vehicle Robot Systems (incl. unmanned systems)
2. Agricultural Robot Systems
 - Agricultural Robots (e.g., facility robots such as grafting robots)
 - Manipulator Robots (e.g., harvesting robots)
 - Assisting Robots (e.g., Powered suits or exoskeletons)
3. Drone Solutions (does not include the drone as hardware)
 - Agrichemical Spraying
 - Monitoring Service
4. Cultivation support solutions
 - Cloud Services for Farming (Farm work management via internet)
 - Complex Environmental Control Devices (e.g., control of heat, light, ventilation, humidity etc.)
 - Production Support for Dairy Farming and Animal Husbandry
5. Management Support Solutions
 - Accounting Software for Farming
 - Accounting Support for Agricultural Corporations
 - Management Support System (e.g., using climate data)
6. Sales Support Solutions
 - ICT to connect actors and optimize sales process (connect producers with JA and food businesses to reduce effort in optimal sales of products)
 - Sales support service (e.g., using climate data)

b. Market Size

Japan is an important sales market for agricultural machinery. In 2019, agricultural machinery worth over 630 million EUR was imported, of which almost 60% came from Europe. Added to this is the strong sales of locally produced agricultural machinery. Last year the market for agricultural machinery had a total sales value of 2.9 billion EUR.⁶

The market of the three largest product categories of agricultural engineering in Japan including tractors, combine harvesters and rice-setting machines are dominated by the big four manufactures, Kubota, Yanmar, Iseki and Mitsubishi Mahindra, with a total market share of 97%.⁷ Those four hold a market share of 81% of the overall

⁵ Yano Research Institute Ltd. (2019): "Smart Agriculture Market in Japan: Key Findings 2019".

⁶ Bundesministerium für Ernährung und Landwirtschaft (2020): „Der Markt für Landtechnik in Japan“.

⁷ 農林水産省(平成28年): 米の生産コストに係る日韓比較. Based on the number of sold entities in 2015. Market segments are as follows: Kubota 46%, Yanmar 25%, Iseki 21%, Mitsubishi Mahindra 5%.

agricultural machinery market, while the remaining 19% are covered by other companies in the market, including foreign manufactures.

The usage of smart farming technologies and services in Japan’s agricultural sector is increasing. The Yano Research institute estimates the size of smart agriculture technologies to be 18,110 Million JPY in 2020 with a rising tendency to reach 24,164 Million JPY by 2021. The overall market value forecast for 2025 is projected to reach 44,200 Million JPY. Until 2017, the market growth was very much focused on cultivation support solutions including cloud services, complex environmental control systems, and the livestock management solutions for dairy farming. Since 2018, sales support solutions, which are for example connected with weather forecast and analysis of buying behaviour of consumers is expected to grow gradually.

This forecast includes precision farming, agricultural robot systems as well as cultivation, sales, and operational support solutions but it does not include POS systems, farm machines or drones for agriculture, so the actual number under a comprehensive market definition is likely significantly higher.⁸

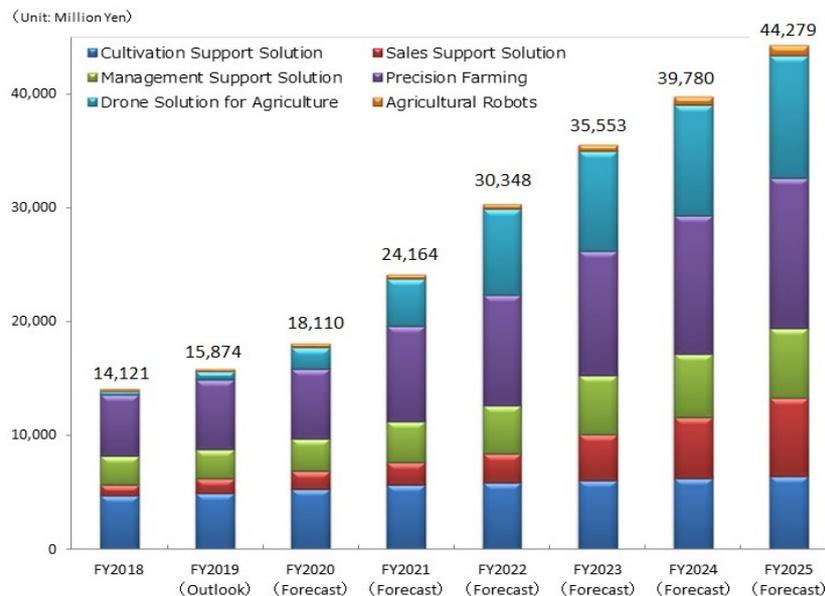


Figure 1: Size Transition and Forecast on Smart Agriculture Market in Japan ⁹

Agricultural robots (tractors, rice transplanters and combine harvesters) are already well-established in the agricultural sector and indispensable for rice and wheat cultivation. The statistic in Figure 1 categorizes vehicle robot system as precise farming. This seems to be one of the reasons why agricultural robots in this figure does not grow rapidly. Market analysis of Industry Robots released by NEDO in 2010, however, estimated that the agricultural robot market will be 466.3 billion JPY in 2035, almost ten times as large as the market size of 2015, so the long-term outlook might be more positive than this research suggests.¹⁰

The expansion of precision farming is triggered by the full-scale launch of the agricultural data collaboration platform (WAGRI) and the four-satellite Quasi-Zenith Satellite System, which enables high-precision GPS to manage farmland

⁸ Yano Research Institute Ltd. (2019): “Smart Agriculture Market in Japan: Key Findings 2019”.

⁹ Graph and survey by Yano Research Institute Ltd. (2019): “Smart Agriculture Market in Japan: Key Findings 2019”.

¹⁰ NEDO (2010): “Future market forecast for the robotic industry”.

more systematically. Having met the market saturation, the technological market trend is turning towards the agricultural drone market, which is expected to expand significantly from 2019.¹¹

The research of Nomura Agri Planning and Advisory (NAPA) underlines that usage and market size of drones is going to increase significantly as an innovative farming solution due to political deregulation and facilitation of agricultural drone usage. In 2019 the market size of drone products was 31 billion JPY, including the total shipment from manufacturers, agencies, and various service entities for farmers (services such as agricultural work agencies and growth diagnosis). The market will reach 58.3 billion JPY in 2020 and is estimated to increase to 107.3 billion JPY in 2025.¹²

The introduction of drones for farming has been increasing because of its low price compared to previous radio-controlled helicopters.¹³ Political support will be also an important factor for promoting drone utilization in Japan. METI released a “Roadmap for Industry Revolution in the Sky” and set the goals from 4 levels for utilization of drones.¹⁴ MAFF also has a target to enlarge pest control by drone to 1 Million ha until 2022.¹⁵

Japan introduced a standardized communication protocol for agricultural machinery “WAGRI” in 2019 which is already in full-scale operation. Together with the “Quasi-Zenith Satellite System” QZSS this is the basis for further expansion of drones and precision farming as well as unmanned solutions and those markets are expected to carry the growth of smart farming. Positioning information can be combined with other data such as satellite images, weather information, geographical and geological data.¹⁶

c. Political Measures

Political targets play a major role in the public acceptance of new developments and trends in Japan. There are quite a few strategies and measures which work very much in favour for the development of smart agriculture.

Since the early 2000s Japan is trying to improve its food self-sufficiency rate as a major policy goal. The Democratic Party of Japan in 2010 set a goal of 50% self-sufficiency (based on caloric value) until 2030, which was revised by the Liberal Party to 45% in 2015 as the previous goal was deemed unattainable.¹⁷ In 2018 this goal seemed to be as far away as never before, with the self-sufficiency rate hitting a record-low 37%.¹⁸ Japan’s struggles have many reasons. According to the World Bank only 12.3% (2016) of the land area in Japan is agricultural land¹⁹ and the number is ever decreasing. Many areas are hard to reach due to difficult geographical circumstances and Almost 98,000 ha of farmland is currently unused and sitting idle (with Fukushima and Chiba Prefectures having the largest share in it) and the trend is likely to continue.²⁰ The number of farming population halved from 4.1 million in 1995 to only 1.7 million

¹¹ Yano Research Institute Ltd. (2019): “Smart Agriculture Market in Japan: Key Findings 2019”.

¹² Nomura Agri Planning & Advisory: “Chapter 1 The age of smart farming”.

¹³ Fuji Keizai Group (2019): “A survey of the growing market for “smart agriculture””.

¹⁴ METI (2016): “Roadmap for the Application and technology Development of UAVs in Japan”.

¹⁵ 日本経済新聞 (2019): 農水省、農地の半分でドローン活用 22年度の目標設定

¹⁶ Yano Research Institute Ltd. (2019): “Smart Agriculture Market in Japan: Key Findings 2019”.

¹⁷ MAFF (2020): “FY2019 Summary of the Annual Report on Food, Agriculture and Rural Areas in Japan”.

¹⁸ Yamashita K (2019): “What’s behind the food self-sufficiency `crisis`”.

¹⁹ The World Bank: “Arable land (% of land area) – Japan”.

²⁰ Japan Property Central (2019): „Japan has 98,000 hectares of unused farmland“.

in 2018. The average age of farmers in Japan is 67 years with farmers under 40 only comprising around 4%²¹, so labour shortage is a major problem. A shortage of up to 200,000 farmers by 2040 is prognosed.²²

The number of core persons engaged mainly in farming (“business farmers”) decreased in 2019 by 3.2% from the previous year to 1.404 million. The number of farms decreased by 2.6% from the previous year to 1.189 million farms. While the number of farms decreased, the number of corporation farms increased by 3.1% from the previous year to 23,000 due to their easier employment and business continuation.²³

Japan is determined to tackle the negative trend, and as they have done so often in the past, new technologies are to play a major part in this strategy. This is displayed for example by the Strategic Innovation Program of the Cabinet Office, declaring for the field of Agriculture in 2016 to “...make it into a growth field using Big Data, IoT and AI”.²⁴ Agricultural policy reforms are being pushed forward, but critics say they fall short. In particular, the extraordinary market power of the national association of agricultural cooperatives (JA) stands in the way of improving Japan’s sometimes less productive agriculture.

A decisive driver in the overall use of new technologies is the concept of Society 5.0 as a comprehensive framework put in place by the government, with the goal to utilize potential of Big Data, Deep Learning, AI, IoT and ICT for all sectors of economy, including agriculture. This ever-present framework is well-known in all levels of the Japanese society. It serves as a vision for the future and greatly enhances the approval of new technologies in all parts of the economy, even in rather traditional sectors such as agriculture.

The Japanese agricultural policy is characterized by many interlocking and complementary measures, some of which are decoupled from production with a high level of protection and support for farmers. The share of measures designed as price interventions and production-related payments has decreased over the last 20 years, but the Producer Support Estimate (PSE) was 41% of the share of gross farm receipt and the Total Support Estimate (TSE) was 0.9% of the GDP from 2017-2019, most of which went as direct support to producers (PSE). This is almost 2.4 times the OECD average and underlines the current lack of competitiveness of Japanese agriculture.²⁵

When Abe took over the government at the end of 2012, he planned structural reforms in this sector as one part of the “Abenomics”²⁶. The strategic aim is to revitalize rural areas economically, to contain the population decline there and to improve the competitiveness of the agricultural sector by utilizing latest technological solutions.

MAFF’s roadmap envisions a step-by-step implementation of smart agriculture technologies by 2025.

²¹ Satake A (2020): “Number of Women Farmers in Japan Continues to Decline”, United States Department of Agriculture; Foreign Agricultural Service”.

²² Swiss Business Hub Japan (2018): “Japanese Agritech Market Overview”.

²³ MAFF (2020b): “FY2019 Summary of the Annual Report on Food, Agriculture and Rural Areas in Japan”.

²⁴ Strategic Innovation Program: “Technologies for Creating Next-generation Agriculture, Forestry and Fisheries”.

²⁵ OECD (2020): “Agricultural Policy Monitoring and Evaluation 2020, Japan”.

²⁶ Invest Japan (2017): “Abenomics”.

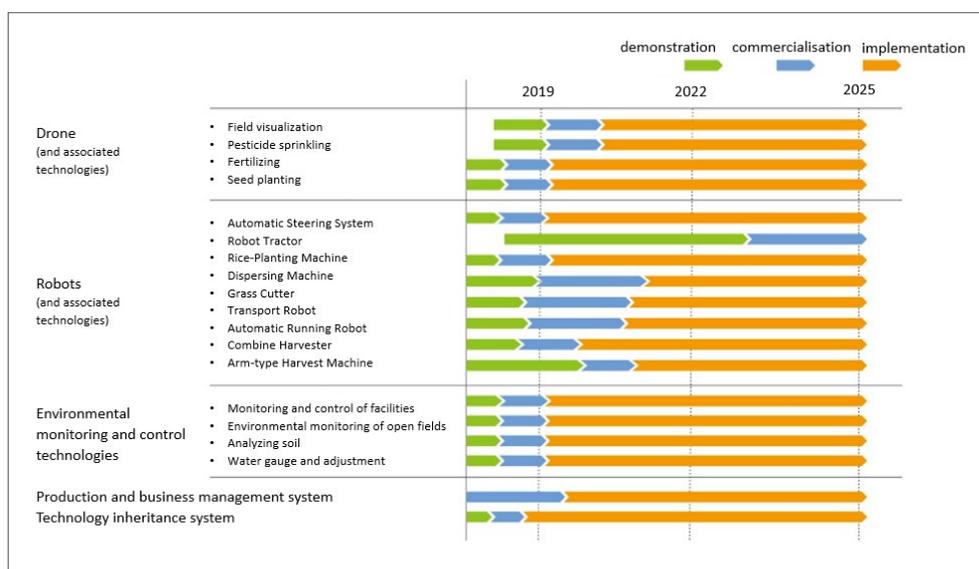


Figure 2: Smart Agriculture Business Expansion Roadmap ²⁷

- The Basic Plan for Food, Agriculture and Rural Areas by the responsible Japanese ministry MAFF, together with the government, sets a comprehensive agricultural policy direction for 10 years (last revision March 2020). In response to the above-mentioned challenges such as the decrease of farming population and the implementation of new large-scale trade agreements, the plan aims to strengthen the agricultural production base regardless of farm size or its hilly and mountainous condition.

Emphasis is also placed on sustaining rural areas by accelerating smart agriculture and promoting the digital transformation. Finally, the Basic Plan addresses responses related to the COVID-19 providing farmers with financial help.²⁸

- The Cross-ministerial Strategic Innovation Promotion Program (SIP) is a national program led by the Council for Science, Technology and Innovation (CSTI), which is under the supervision of the Cabinet Office. As part of the Society 5.0 framework, the program targets different key economic and social issues and aims to bring together various key players from their respective subject to achieve interdisciplinary cooperation beyond traditional disciplinary boundaries.

- In the *first phase* from 2014-2018, 12 subjects have been chosen as critical, one of which was led by MAFF “Making Agriculture, Forestry and Fishery into a growth field using Big Data, IoT and AI”, putting forward smart farming as the key for the future agricultural strategy in Japan. The program was led by Noboru Noguchi, Professor for Vehicle Robotics from the Agriculture Dept. of the University of Hokkaido.²⁹

Projects include e.g. crop growth information collection or self-operating agricultural robot systems. Through the gain of significant data, Software is used (i.e., AI, deep learning) to produce an optimal

²⁷ Based on [マイナビ農業 (2020): 2025 年の市場規模は 3885 億円へ], adapted from the Ministry of Agriculture, Forestry and Fisheries' Program for the Promotion of Field Implementation of New Agricultural Technologies.

²⁸ MAFF (2020b): “FY2019 Summary of the Annual Report on Food, Agriculture and Rural Areas in Japan”.

²⁹ Japan Science and Technology Agency (2018): “What SIP (Cross-ministerial Strategic Innovation Promotion Program) is”.

farming plan, control environmental conditions in greenhouses, make sales plans or facilitate new research.

- In the *second phase* from 2018-2022, several topics touched on issues of smart farming, for example “Automated Driving as Universal Service”, led by Toyota Corp., which touches on the issue of unmanned vehicles³⁰ as well as “Technologies for smart bio-industry and agriculture”, led by Kirin Holdings which deals with topics such as sales solutions in agriculture or data platforms.³¹
- On-Farm Demonstration Trials of Smart Agriculture - The projects funded by the SIP include both data acquisition systems/ data analysis as well as agricultural robot solutions. Since FY 2019, the National Agriculture and Food Research Organization (NARO) supports and monitors 124 smart agriculture demonstration projects across Japan, featuring the usage of the latest state of the art smart farming technology and solutions on a practical basis³². A total of six application areas for smart agriculture solutions are worked on in these projects: paddy rice production, field and greenhouse cultivation, fruits, tea and livestock.³³ The total budget of projects supported by NARO for FY 2019 was 7.15 billion JPY³⁴.
- The deregulation of agricultural drones promoted by MAFF, for example by relaxing the Civil Aeronautics Act and Agricultural Chemical Regulation Law³⁵, has led to a rapid increase in 2019 and will likely continue to grow. MAFF intends to use drones to spray over 1 million ha of farmland by 2022. Fertilizing and seeding by drones is the next step and expected to increase rapidly from 2020. This includes remote sensing technology for drones.³⁶

d. Further Market Drivers & Trends

The Japanese agricultural sector faces many challenges, some of which already mentioned above, which have an effect on market trends:

- Aging farmer population and lack of ICT literacy.
- general socio-economic trends such as population decline and an aging society.
- Negative reputation of farming (especially among young people) as tedious and hard work, in combination with relatively low income, makes it difficult to win the younger generation to engage in agriculture.³⁷
- Reluctance to accept new technologies in a traditional sector, especially in older generations.
- High investment costs for new machinery and solutions are especially problematic for smaller farms.
- Rural-urban migration trend towards the big metropolitan areas makes attraction and retaining of skilled workers difficult.^{38 39}

³⁰ Cabinet Office (2019a): “Automated Driving for Universal Services”.

³¹ Cabinet Office (2019b): “Technologies for smart bio-industry and agriculture”.

³² 農林水産技術会議 (2020): 「スマート農業実証プロジェクト」について.

³³ Nagasaki Y (2019): “Realization of Society 5.0 by Utilizing Precision Agriculture into Smart Agriculture in Naro, Japan”

³⁴ 農研機構 (2020): スマート農業の実証プロジェクト.

³⁵ MAFF (2020a): “Information on aerial spraying of agricultural chemicals by unmanned aircraft”.

³⁶ Yano Research Institute Ltd. (2018): “Smart Agriculture Market in Japan: Key Findings 2018”.

³⁷ Trade and Agriculture Directorate Committee for Agriculture (2018): “Innovation, Agricultural Productivity and Sustainability in Japan”.

³⁸ Statistic Bureau, Ministry of Internal Affairs and Communications: “Statistical Handbook of Japan 2019”.

³⁹ LBBW Landesbank Baden-Württemberg – Research (2015): „Urbanisierung - Demographische Entwicklungen und Auswirkungen im globalen Vergleich“.

- Japan's rather unique topographical conditions (two thirds of the nation's surface is mountainous, many areas are hard to reach) and small, fragmented farmland (more than 80% of all farmers cultivate 2 ha or less⁴⁰) are a challenge for machinery and equipment.
- Fragile income security due to frequent extreme weather events and natural disaster as well as low level of income compared to other sectors.
- Weakened production infrastructure due to increase in abandoned cultivated land.
- Lobbyism and strong influence of JA Group (Japan Agricultural Cooperatives, see chapter 4b) also regarding smart agriculture machinery and solutions is often an obstacle to improve productivity in agriculture.⁴¹
- Strong protection of domestic agriculture by government to ensure competitiveness of products. New trade deals threaten competitiveness.⁴²

In addition to political strategies and measures described in chapter 3c, some further drivers have an effect on the development of the smart farming market:

- Political goal of cost reduction and export of Japanese products, especially in high-quality markets for products such as rice, fruits or sake.⁴³
- Consolidation of agricultural land driven by the state: semi-public "Farmland Banks" were established on prefectural level to ease the allocation of farmland to full-time "business farmers", which leads to more large-scale farming.⁴⁴
- Requirement to label production location of raw materials will lead to increased use of ICT solutions to provide a gapless information and increase trust of consumers.⁴⁵
- Call for better working conditions and enhanced work safety due to comparably high incident-rates in agricultural sector; will lead to increased use of support systems for difficult or heavy-duty work.
- Resource optimisation promotion of land, water, chemicals (fertilizer, pesticides, herbicides) by MAFF to reduce resource input, minimize impact on natural resources and ensure eco-friendly products.⁴⁶

The political measures and other business initiatives have already triggered some trends in the market:

- Growing share of "business farmers" due to land reform efforts by the MAFF (see above).
- Rise in joint procurement strategies (often navigated by JA) for goods with high investment costs, e.g., tractors or smart agricultural machinery.
- Increased use of drones and unmanned solutions due to the advanced infrastructure, which includes:
 - National data platform WAGRI, as already commercialized standard for communication and information exchange in agricultural sector⁴⁷
 - QZSS system for geo-data and GPS, enabling very precise control of autonomous units.⁴⁸

⁴⁰ Swiss Business Hub Japan (2018): "Japanese Agritech market Overview".

⁴¹ Yamashita K (2015): "A First Step Toward Reform of Japan's Agricultural Cooperative System".

⁴² Yamashita, K (2019): "What's behind the food self-sufficiency 'crisis'?".

⁴³ JA Zen-Noh (2019): „ZEN-NOH Report 2019“.

⁴⁴ Bundesministerium für Ernährung und Landwirtschaft (2020): „Der Markt für Landtechnik in Japan“.

⁴⁵ JETRO (2017): "Market Report: Smart agriculture".

⁴⁶ MAFF (2020): "FY2019 Summary of the Annual Report on Food, Agriculture and Rural Areas in Japan".

⁴⁷ Shinjyo A, Wada M, et al. (2019): "Agricultural Data Collaboration Platform: WAGRI-System Structure and Operation".

⁴⁸ Cabinet Office, QZSS: "Highly precise positioning achieves more efficient work".

- Advanced legislation on the use of self-driving vehicles in Japan in the Road Traffic Act, which allow Level 3 automated vehicles (no need for a driver to monitor the vehicle) to be used on public roads.

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- Shift to product-specific strategies in the agricultural production, depending on rate of self-sufficiency. For example, increased focus on products with high import-dependency such as vegetables and meat.
- Increase in female farmers due to government-lead programs to tackle labour shortage⁵⁰ as well as increase in foreign workforce due to the newly established Immigration Act to tackle skilled worker shortage in specific sectors.
- Using ICT and platforms to share knowledge and educate workers in the use of smart agriculture technology while at the same time maintain a simple-to-handle approach, so access to smart solutions can reach a broader number of farmers and motivate also younger people to engage in farming.⁵¹
- Trend towards sustainable food production; food safety and origin are increasingly important for consumers, which also supports domestic production.⁵²
- Change of Japanese consumers dietary preferences, especially “westernization” of Japanese food, reduced rice and increased milk products and meat consumption.⁵³
- Increased cross-sector collaborations and engagement of companies in agricultural sector that have so far been alien to the subject, for example TEPCO’s launch of vertical salad farm.⁵⁴

4. Key Players

a. Ministries

Due to the overarching nature of smart agriculture, many ministries are relevant to different aspects.

- Ministry of Agriculture, Forestry and Fisheries (MAFF)

MAFF is the cabinet level ministry in charge of agriculture, forestry, and fishing industries and mainly responsible for legislation in the agricultural sector. Since September 2020 Hideki Miyauchi is the cabinet minister. The primary function of the ministry is to set quality standards for food products, supervise the agri-product market and food-sales, as well as promotion of activities to enhance the productivity in these sectors.

<https://www.maff.go.jp/e/index.html>

- Ministry of Economy, Trade and Industry (METI)

The ministry of Economy, Trade and Industry has jurisdiction over a broad policy area including Japan’s industrial and trade policies. They are relevant for smart farming e.g., due to the Japanese Industrial Standards Committee (JISC), who issues the Japan Industrial Standard (JIS).

<https://www.meti.go.jp/english/index.html>

⁴⁹ HSF (2019): “Japan allows Level 3 automated vehicles on public roads”.

⁵⁰ MAFF (2020b): “FY2019 Summary of the Annual Report on Food, Agriculture and Rural Areas in Japan”.

⁵¹ JETRO (2017): “Market Report: Smart agriculture”.

⁵² MAFF (2018): “FY2017 Summary of the Annual Report on Food, Agriculture and Rural Areas in Japan”.

⁵³ Government of Canada (2020): “Sector Trends Analysis – Meat trends in Japan”.

⁵⁴ Agrigate Global (2020): “TEPCO launches huge vertical farm reliant on artificial light in Japan”.

- Ministry of Land, Infrastructure, Transport and Tourism (MLIT)

The Ministry of Land, Infrastructure, Transport and Tourism is responsible for national land planning, infrastructure building and maintenance, national land surveying, transportation, tourism policy, meteorological services, and disaster countermeasures. It is, among others, responsible for the expansion of the law on the usage of autonomous vehicle (2019) and drones (2020).

<https://www.mlit.go.jp/en/index.html>

- Ministry of Internal Affairs and Communications (MIC)

The Ministry of Internal Affairs and Communication is a cabinet-level ministry, which supervises the Japanese administrative system, manages local governments, elections, telecommunication, post, and governmental statistics. Many underlying infrastructure issues, such as 5G are in the hands of the MIC.

<https://www.soumu.go.jp/english/>

b. Associations

- Japan Agricultural Cooperatives (JA)

The *Nogyo Kyodo Kumiai*, also known as JA Group, is an association conducting various activities, which include the collective purchase of materials necessary for agricultural production, marketing of agricultural products, supply of daily necessities, distribution of agricultural news, financial and insurance services. Having originally been initiated by the Japanese government in 1954,⁵⁵ it is now basically a farm lobby organization with widespread privileges and a quasi-monopoly on both ends of the supply chain, giving it extraordinary influence in the agricultural sector in Japan.

The market power of JA Group might also have an influence on spreading smart farming technologies. In its strategy for the next 5-10 years, new technologies to improve productivity and the implementation of ICT play a major role. As explained in Chapter 5, Zen-Noh, the marketing and purchasing association of the JA Group, is a major distribution channel for agricultural machinery in Japan, which can facilitate the implementation of smart agriculture. Zen-Noh already introduced a cloud farming management system named “Z-GIS” in 2018, which allows to enter information such as varieties, production history, and farm work for each field on an electronic map.⁵⁶ Zen-Noh also co-operates with foreign companies in this field: they started a cooperation with BASF Digital Farming GmbH in 2020 for introducing the AI cultivation control system „xarvio® FIELD MANAGER” in Japan. The system will also use Z-GIS as a basis.⁵⁷

However, the supremacy of the JA might be dwindling in future. The Japanese government under the former Prime Minister Abe started to reduce the influence of the JA Group, as its power as a non-government organization is rather extraordinary. So, the status and power of the JA, while currently still being strong, might change in the future.

⁵⁵ Godo Y (2014): “The Japanese Agricultural Cooperative System: An Outline”.

⁵⁶ 全農業 (2020): スマート産業

⁵⁷ 全農業 (2020): スマート農業を実現する栽培管理支援システム「xarvio® FIELD MANAGER (ザルビオ フィールドマネージャー)」来春にリリース予定

As of 2015, there is a total of 10.37 million members.⁵⁸ The JA Group consists of 652 regional, primary-level Agricultural Cooperative Associations, entities on a prefectural-level (JA federations and Chuokai [Prefectural Central Union of Agricultural Cooperatives]), and the national level JA federation. The national level includes e.g.:

- JA Zen-Noh, based in Tokyo, is the marketing and purchasing association of the JA Group with sales of 4.8 trillion JPY (2018). It is responsible for wholesale business in food products and production inputs across municipal and prefectural borders.
- JA Zenchu as the national headquarter that controls the entire group and manages government relations.

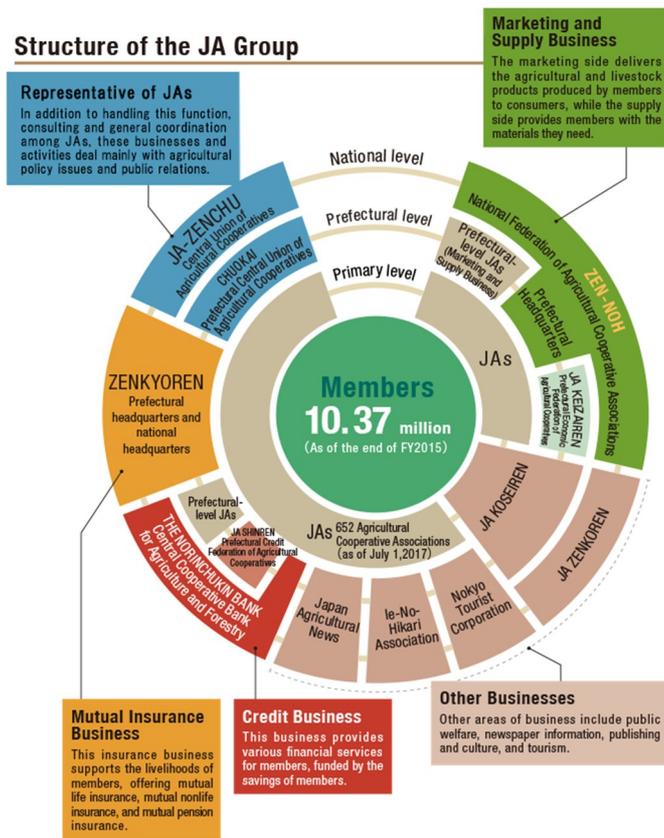


Figure 3: Structure of JA Group ⁵⁹

- JAMMA (Japan Agricultural Machinery Manufacturers Association)

JAMMA (founded in 1939) is a nationwide association of 63 domestic agricultural machinery makers including Kubota, Yanmar, Iseki, or Mitsubishi Mahindra. Through the cooperation of its member companies, JAMMA works on a wide range of tasks in such fields as technical development, safety countermeasure and export promotion with the goal of furthering the sound growth of the agricultural machinery industry, including smart agriculture application.

More information: <http://www.jfmma.or.jp>

⁵⁸ Zen-Noh: "The JA Group".

⁵⁹ Zen-Noh: "The JA Group".

- JAISA (Japan Agriculture Information System Association)

Established in 2014 with approx. 60 members (35 companies), JAISA is a private industry initiative not tied to any government entity. It offers services to agricultural businesses including part-time farmers and small-scale farmers. Jointed activities of companies and individuals include the dissemination of innovative agricultural technology. Support to farmers for the introduction of Agri-tech is offered.

More information: <https://jaisa.org/> (Japanese only)

- SMARTAGRI Consortium

SMARTAGRI was established in July 2017 and has currently 104 members. It aims to enhance industry-academia and government cooperation to further advance and distribute farming technologies by utilizing ICT with UECS (Ubiquitous Environment Control System).

More information: <http://smartagri.uecs.jp/> (Japanese only)

- Japan Agrobot Association

The association comprises 10 members from leading agricultural machinery manufacturers and academic institutions. The aim is the promotion of industry-academia and government interchange in the agricultural production technologies, especially in the robotic sector. It also engages in compiling recommendations concerning safety of robots for agriculture and standard specifications.

More information: <http://www.agrobot.jp/english.html>

c. Companies

Japan is one of the largest machine manufacturers in the world. Together with China and Germany they make the top 3 producers in 2018.⁶⁰ The country has traditionally been a reliable producer of electronics and various high-end machines for the world market and holds its top position in 2020. The agricultural machinery market is no exception. World-famous manufacturers of agricultural machinery such as Kubota, Yanmar, Iseki and Mitsubishi are particularly widespread in the Asia-Pacific market and dominate the market in Japan. The following sections lists up the dominating domestic agricultural machinery manufacturers, suppliers for agriculture-related technology, some foreign players as well as companies in the ICT sector and start-ups which increasingly engage in the smart farming market.

⁶⁰ Statista (2019): "Machine tool producers' market share in 2018, by country"

i. Agricultural machinery manufacturers

	Name	Kubota Corp.
	HQ	2-47, Shikitsu-higashi 1-chome, Naniwa-ku, Osaka 556-8601
	Website	https://www.kubota.com/innovation/smartagri/index.html
	Products	Tractors, combine harvesters, rice setting machines, tillers, harvesting machines, various other agricultural machines
	Information	<p>Japan's largest producer of agricultural equipment with 41,000 employees and sales around 1.9 trillion JPY/year.</p> <p>Comprehensive solution provider of agriculture machinery and solutions with a focus on smart agriculture</p> <p>Despite the wide range of agricultural technology, foreign products are also sold in Japan through the Kubota Corporation.</p>
	Name	Yanmar Agribusiness Co., Ltd.
	HQ	Umeda Gate Tower, 1-9, Tsuruno-cho, Kita-ku, Osaka
	Website	https://www.yanmar.com/global/agri/
	Products	<p>Tractors, mowers, tillers, harvesters, various other agricultural machines.</p> <p>Smart agriculture solutions such as auto tractor, drones, unmanned helicopters, cloud based IoT service, remote sensing, etc.</p>
	Information	<p>With a sales volume of 797 billion JPY (2019), Yanmar is one of the largest agricultural technology manufacturers in Japan.</p> <p>The company has more than 20,000 employees and sells its own agricultural technology in a wide range of products and machinery. Yanmar also imports and sells foreign products.</p>
	Name	Iseki Co., Ltd.
	HQ	700 Umaki-cho, Matsuyama-shi, Ehime-ken, 799-2692
	Website	https://www.iseki.co.jp/
	Products	Tractors, combine harvesters, various other agricultural machines
	Information	ISEKI's total net sales topped 160 billion JPY (2019) with around 5,650 employees.

		As a "full-line" manufacturer, the company sells various types of agricultural machinery, from tractors to combine harvesters. Technology that is not manufactured in-house is however imported from abroad and distributed in Japan through its own sale channels.
 MITSUBISHI	Name	Mitsubishi Mahindra Agricultural Machinery Co., Ltd.
	HQ	667-1 Iya, Higashi Izumo-cho, Matsue City, Shimane, 699-0101
	Website	https://www.mam.co.jp/english/
	Products	Agricultural machinery and agricultural facilities such as for horticulture, mushrooms or stockbreeding.
	Information	<p>The company has around 1,500 employees and engage into developing, selling, installing, and repairing of agricultural machinery and facilities. Capital amounts to 4,5 billion JPY, while sales (consolidated) reached 44,8 billion JPY in 2017.</p> <p>A synergistic effect is expected based on respective strengths of Japanese and Indian sides. Mitsubishi Mahindra Agricultural Machinery Co., Ltd. is engaged in R&D on new agricultural machinery and facilities by using biotechnology, computer control and robot technology etc.</p> <p>Mitsubishi Mahindra is also involved in construction and engineering projects of greenhouses and other such facilities.</p>

ii. Suppliers of agriculture-related products

Nileworks	Name	Nileworks Inc.
	HQ	1-7 Nishihara 3-Chome, Shibuya-ku, Tokyo
	Website	https://www.nileworks.co.jp
	Products	Drones, field support such as precision farming for spraying
	Information	<p>Private placement of new shares has given Nileworks a total funding of 2.4 billion JPY.</p> <p>Founded in 2015, the company focusses on the development of agricultural use drones and cloud services for growth diagnosis and cultivation management. Investors are companies such as Sumitomo Chemicals or Kumiai Chemical</p>
	Name	Nikkari Co., Ltd.

	HQ	465-1, Saidaiji Kawaguchi, Higashi-ku Okayama-shi, Okayama, 704-8125
	Website	https://www.nikkari.co.jp/english/
	Products	Farming supporting gear, Power Assist Suits
	Information	Established in 1959 Nikkari is engaged into manufacturing and sale of agricultural and forestry civil engineering machinery.
	Name	INNOPHYS Co., Ltd.
	HQ	6th Floor, GRAN FIRST Kanda-Kon'yacho, Kanda-Kon'yacho 15 banchi, Chiyoda-ku Tokyo
	Website	https://innophys.jp/en/
	Products	Farming supporting gear, Power Assist Suits
	Information	Established in 2013, the company develops body supporting gear with compressor technology. INNOPHYS CO., Ltd. is currently in the process of developing a further improved product under the Project Nagasaki Smart Agriculture Demonstration Project.
	Name	Futureagri Inc.
	HQ	Okubonaka 5-chome, Kumatori-cho, Sennan-gun, Osaka, 1102-42
	Website	https://www.futureagri.co.jp/ (Japanese only)
	Products	Farming supporting gear, robot solutions
	Information	Founded in 2013 the portfolio includes mobile robot, robots for tomato farming (pollination robot, tomato harvesting robot), robot for harvesting fragile vegetables and farm field management robot. Enhancing collaborative work between man and robot.
	Name	INAHO Inc.
	HQ	1-15-2, Komachi, Kamakura-shi, Kanagawa 248-0006
	Website	https://en.inaho.co
	Products	Autonomous vegetable harvesting robots
	Information	Start-up that develops autonomous vegetable harvesting robots, e.g., for tomatoes or asparagus, by using AI and robotic technologies

iii. ICT-related companies

A recent trend is the engagement of companies that have been alien to agriculture so far. Due to the usage of ICT in agriculture new business opportunities open for a lot of companies, some of which are listed below.

 NTT	<p>The telecommunication company headquartered in Tokyo aims to build up a new NTT Group food and agriculture chain by bringing together NTT group companies, NTT research institutes and business partners.</p> <p>Within the NTT Group, some examples are below</p>	
	<p>More Information: https://www.ntt.co.jp/activity/en/creation/agriculture/</p>	
	Name	NTT AgriTechnology
	HQ	1970 Nishi-hanawa, Chuo, Yamanashi 409-3843
	Website	https://www.ntt-agritechnology.com/en/
	Information	The company engages into next-generation greenhouse farming solutions, e.g., high-tech greenhouse construction, digital farming system development for optimization of sales marketing, operation or analysing growth data.
	Name	NTT Data Corp.
	HQ	Toyosu Center Building, 3-3, Toyosu 3-chome, Koto-ku, Tokyo 135-6033
	Website	https://www.nttdata.com/jp/ja/industries/agriculture/
Information	Information processing to digitalize agricultural value chains. Together with NTT Group it offers the agriculture-support platform "Aisaku".	
 FUJITSU	Name	Fujitsu Limited
	HQ	4-1-1 Kamikodanaka, Nakahara-ku, Kawasaki, Kanagawa 211-8588
	Website	https://www.fujitsu.com/global/themes/internet-of-things/hyperconnected-business/agriculture/index.html
	Information	<p>The company offers connection solutions for efficient and improved operations.</p> <p>The food and agriculture cloud Akisai provide services to connect distribution, region and consumers with the production site based on the use of ICT. It is a cloud-based service that covers open field cultivation, greenhouse farming, animal husbandry and supports corporate agriculture management from production to management and sales.</p>

	Name	Daiwa Computer Corp.
	HQ	36-18, Wakamatsu-cho, Takatsuki-shi, Osaka
	Website	https://www.daiwa-computer.co.jp/en/
	Information	<p>The company mainly focuses on the cultivation of melon and tomato based on hydroponic cultivation method.</p> <p>Daiwa Computer established i-Nogyo to connect agriculture with IT over its cloud network "EPICS", monitoring the entire value and distribution chain.</p>

iv. Start-ups

There are several interesting start-ups engaging in smart agriculture related services/ products in Japan. Some prominent examples are:

	Name	ZeRoAgri
	HQ	1-chōme-1-1, Manpukuji, Asao Ward, Kawasaki, Kanagawa, 215-0004
	Website	https://www.zero-agri.jp/
	Information	<p>One of the most famous start-ups in Japan's smart farming sector. Offers AI based on-point irrigation and fertilizer system software, which calculates data about the plant's condition from sensors in the soil.</p>
	Name	Polar Star Space Co., Ltd
	HQ	〒001-0022 北海道札幌市北区北 22 条西 2 丁目 2-11
	Website	http://polarstarspace.com/
	Products	High-precision spectrum analysis data solution service
	Information	<p>Start-up specializing in smartphone spectroscope and drone-mounted multi-spectral camera and construct a highly accurate bidirectional reflectance distribution function (BRDF) spectral library for various crops. Information used for the discovery of lesions, optimization of fertilization and pesticide use.</p> <p>Planned is high-precision remote sensing in a wide area in which micro satellites for harvest prediction, natural disaster prediction and resource mapping.</p>

	Name	Farmnote Holdings Inc.
	HQ	1-3-14 Koenhigashimachi, Obihiro-shi, Hokkaido, 080-0847
	Website	https://farmnote.jp/en/
	Products	Cloud based herd management system, cloud and AI based heat detection system
	Information	Start-up founded in 2013, that has developed a digital platform for maintaining data related to livestock farms. Platform also features the option for the user to search for ideal practices based on the specific cattle breed.

d. Foreign Players

There are several prominent overseas companies engaging in smart agriculture related services/ products entering the Japanese market:

 JOHN DEERE	Name	John & Deere (USA)
	Website	https://www.deere.com/en/agriculture/
	Information	Data Management, Remote Management, Guidance (autonomous driving tractors), variable rate applications producing displays and receiver "Precision AG Technology" for field preparation, plant, application and harvest.
	Distributor in Japan	e.g. Yanmar Corp.
 AGCO	Name	Agco Corporation (USA)
	Website	https://www.agcocorp.com/
	Information/ Product	Manufactures and distributes agricultural equipment worldwide. The Company sells a wide range of agricultural equipment and related replacement parts, including tractors, combines, hay tools, sprayers, and forage equipment. Prominent manufacturer under the Agco Corporation is agricultural tractor and machinery company FENDT.
	Distributor in Japan	MSK Farm Machinery Corp.

	Name	NEW HOLLAND (USA)
	Website	https://agriculture.newholland.com/apac/en
	Information	New Holland Tractor Ltd. NV designs and retails agricultural machinery. The Company offers a range of tractors, combines, hay balers, shedder loaders, telescopic lifters, utility vehicles, spare parts, and accessories.
	Distributor in Japan	New Holland HFT Japan Inc.: www.nh-hft.co.jp
	Name	CLAAS (Germany)
	Website	https://www.claas-group.com/
	Information	Agricultural engineering equipment with tractors, agricultural balers and green harvesting machinery. European market leader in combine harvesters and world leader in self-propelled forage harvesters. CLAAS is also a top performer in world-wide agricultural engineering. The CLAAS product portfolio also includes state-of-the-art farming information technology
	Distributor	MSK Farm Machinery Corp., Lemken Marketing of Japan

e. Customers

End users or customers for smart farming machinery and solutions in Japan are:

- Farmers: In 2018, 1.22 million unit engaged in agricultural business on an economically active basis. They are divided into two different sections in Japan:
 - 35,500 "Organized Management Entities", of which 25.500 are registered companies
 - 1.19 million units registered as family businesses ("Family Management Entities"), implying personally managed farm households or individual households. Of those, 1.16 million are commercially active but only 252.000 are full-time while the rest are only part-time or on a spare-time basis⁶¹
- Community-based farm cooperatives, as already mentioned in chapter 4b, are made up of cooperating farm households that build up their relationship through the basis of a shared local community or other geographic reasons. The aim is to enhance the agricultural production. This form of cooperation takes on a large range of forms from sharing parts of agricultural equipment/machinery to closed farm management as a company. Thus, the fixed costs can be reduced for the individual farmer through sharing models.⁶² In 2018 there were around 15,100 such agricultural cooperatives registered in Japan and they are a frequent and growing business model. Those cooperatives are usually linked and supported by JA and their local offices, who for example also

⁶¹ MAFF (2020): "The 93rd statistical yearbook of Ministry of Agriculture, Forestry and Fisheries".

⁶² Bundesministerium für Ernährung und Landwirtschaft (2020): „Der Markt für Landtechnik in Japan“.

organize agricultural machines and smart farming solution sales or renting, which makes JA a powerful bottleneck to reach the end consumer.⁶³

- Machine Rings, also known as “machinery banks”, are rather poorly developed in practice in Japan. But especially for the mostly still very small-scale agriculture in Japan, renting instead of owning agricultural vehicles and equipment is a solution to reducing production costs. There are some isolated machine rings on city or island level (such as in Nankoku City in Shikoku or Iki island). Manufacturer sales offices, agricultural engineering dealers and agricultural cooperatives also offer equipment for rent.⁶⁴ JA Mitsui Leasing Ltd. for example is selling agricultural machinery on a leasing basis and offering used vehicles and has now set up the new “Noki Share Lease”⁶⁵ program, which enables several agricultural producers to share access to agricultural machinery.
- Agricultural Contractors and agricultural outsourcing have not been frequently used yet. The most popular way of outsourcing is contracts with recruitment agencies for workers in farmlands. These companies usually do not deal with renting agricultural machineries or provide ICT systems. However, if smart farming will be widely adopted, outsourcing business for farmers will be also more divers and this kind of service is expected to grow in this context.

f. Research Institutions

National Institutions

- National Agriculture and Food Research Organization (NARO)
Website: <http://www.naro.affrc.go.jp/english/index.html>
 - National Institute associated with the MAFF, with HQ in Tsukuba; Around 3,400 employees of which 1,800 are researchers in 19 different research centres; NARO coordinates the smart farming pilot projects initiated by MAFF in 2019
 - Prominent NARO Research Centres in the focus of smart agriculture include:
 - § Research Center for Agricultural Information Technology (RCAIT)
 - Involved in creation of data platform WAGRI
 - § Institute of Agricultural Machinery (IAM)
 - Focus on applying robotics and ICT to agriculture

Universities

- Hokkaido University – Faculty of Agriculture
Website: <https://www.agr.hokudai.ac.jp/en>
Located in Sapporo, has among others, the current research activities:
 - Vehicle Robotics Studies
Focus: Intelligent systems; remote sensing; GPS/GIS; biomass energy
More Details under: <https://www.agr.hokudai.ac.jp/en/r/lab/vehicle-robotics?from=us>
 - Applied Bioproduction Engineering Studies
Focus: Remote sensing, communication systems for farm use and vehicle robotics

⁶³ MAFF (2020): “The 93rd statistical yearbook of Ministry of Agriculture, Forestry and Fisheries”.

⁶⁴ Bundesministerium für Ernährung und Landwirtschaft (2020): „Der Markt für Landtechnik in Japan“.

⁶⁵ J A 三井リース: 農機シェアリース (大型コンバイン)

More details: <https://www.agr.hokudai.ac.jp/en/r/lab/applied-bioproduction-engineering?from=us>

- Tokyo University of Agriculture and Technology (TUAT)
Website: <https://www.tuat.ac.jp/en/>
 - The TUAT "WISE"-Program supports the collaboration between agriculture and engineering. The program leverages high engineering technology in the production of food, introduces AI, robotics and self-driving smart mobility technology for production and distribution.
Focus: New materials, advanced measurement, energy control, biotechnology and the environment
<http://www.wise.tuat.ac.jp/en/>
- Other prominent Universities in Japan engaging into research of smart agriculture technology include:
 - Kyoto University: <https://www.kais.kyoto-u.ac.jp/english/>
 - Tokyo University of Agriculture: <https://www.nodai.ac.jp/english/>
 - Osaka Prefecture University: <https://www.osakafu-u.ac.jp/>

Private Research Entities in the Field of Smart Farming

- Yano Research Institute Ltd.
Website: www.yanoresearch.com
 - Yano Research is a private research institute; They frequently publish comprehensive market reports about smart agriculture and latest market developments in Japan
- Japanese Society of Agricultural Informatics
Website: <https://www.jsai.or.jp/> (Japanese only)
 - The purpose of the Society is to promote the research, development and practice of information science and technology in the fields of agriculture, forestry and fisheries, as well as in the food industry.
- Iseki Yumearu Total Agriculture Research Institute
Website: <https://www.iseki.co.jp/yume/> (Japanese only)
 - Iseki's research institute for smart farming is one example for a private company institute. It collaborates with other enterprises, universities, JAs and municipalities. Pilot projects and research on cultivation, robot use, ICT utilization and information analysis are being carried out. They also provide consulting and seminars for farmers.

5. Distribution Channels

Japanese manufactures make up about three quarters of the whole Japanese domestic agricultural machinery market. The most prominent players, the so-called "full-liners", are e. g. Kubota, Yanmar, Iseki, Mitsubishi Mahindra. Approx. 20% of the market volume is covered by foreign companies such as John Deere, Fendt, Claas, etc. The four main Japanese manufacturers are also functioning as distributors with an approx. volume of 200 billion JPY and are often not only distributing their own products but also acting as a distribution channel for foreign companies. Through their sales branches or other machinery shops, they sell or rent out new and second-hand products as well as providing maintenance services for farmers.

As Figure 4 shows, another big distribution part with a wholesale volume of about 100 billion JPY is Zen-noh, the National Federation of Agricultural Cooperative Association, which is responsible for marketing and supply business of JA Groups and Keizairen, the Prefectural Economic Federation of the JA organization. The 652 regional JA entities

lease machinery through specific leasing companies or rent/sell agricultural machinery and maintenance services to the farmers. It is estimated that 50-60% of the machinery is distributed via those Agricultural Associations.⁶⁶

Foreign agricultural machinery providers can either choose the above-mentioned distribution channels or decide to distribute their products through domestic agents who at the same time are trained for maintenance of the products.

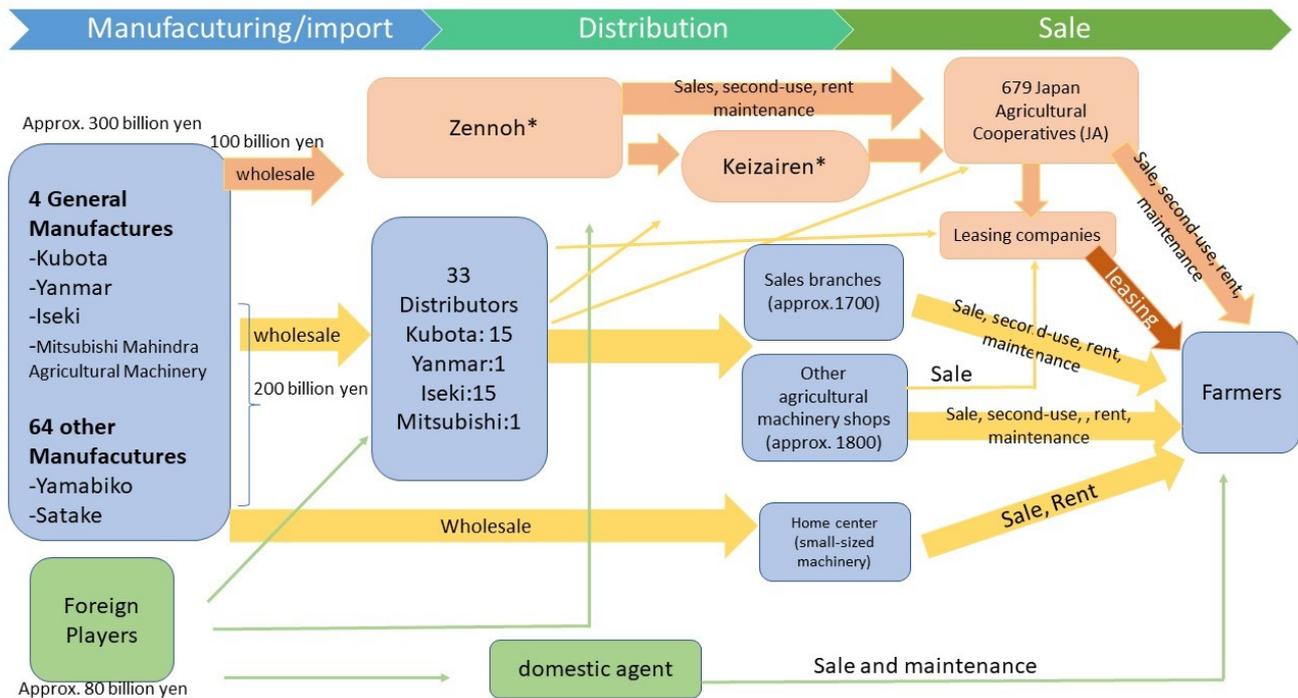


Figure 4: Distribution structure of agricultural machinery⁶⁷

*Zennoh means the national Federation of Agricultural Cooperative Association, which is responsible for marketing and supply business of JA Groups.
*Keizairen means Prefectural economic federation of JA

This classical distribution chain especially reflects the hardware agricultural machinery market, but also basically applies to the new services, as a new segment in this field. The new services, however, also use new distribution channels, and possibilities for market entry is more diverse. The following two sections list up several distributors for different segments of agricultural machinery (“hardware”). The point b “Services” describes some case examples of new smart farming services and how a market entry can also work in those new segments.

a. Hardware

For smart agricultural machinery, the classical distribution paths described above are basically applicable, as the distributors are starting to expand their portfolio into smart farming technology in addition to their “classical” line-up. Some of the most well-known distributors that are also importing machinery for foreign countries to Japan are listed below.

⁶⁶ Bundesministerium für Ernährung und Landwirtschaft (2020): „Der Markt für Landtechnik in Japan“.

⁶⁷ Based on 農林水産省 (平成 28 年): 米の生産コストに係る日韓比較. 農業機械をめぐる情勢

Agri Forest Machine	
Website	https://agf-machine.com/countdown/
Product	Tractors
Information	Agriforest Machine Co., Ltd. imports and sells all kinds of machinery and parts for agricultural machinery, such as tractors and forestry machinery, such as choppers to individual parts and attachments.
Cornes AG Corp.	
Website	https://www.cornesag.com/
Product	Milking machines, tractors, harrows, ploughs, harvesters, fertilisers, working machines for cattle feed and cattle stalls, machines for the detection of oestrus for cattle
Information	In addition to agricultural machinery of all kinds, the large agricultural machinery dealer from Hokkaido specialises primarily in dairy farming and imports state-of-the-art automated systems from Europe. The headquarters in Hokkaido is accompanied by 17 branches in all agricultural regions of Japan.
EZOX Corporation	
Website	http://ezox.co.jp/
Products	Potato harvesters, ploughs, mowers
Information	The company founded in 2011, specialises in the import and sale of agricultural machinery (especially for potato and beet harvesting), machine parts, machine control systems. In addition to providing advice on the foreign trade of agricultural machinery as a whole, it is also active in the export of Japanese machinery.
FORCUM Co., Ltd.	
Website	http://www.forcum.jp/
Products	Various agricultural machinery
Information	The company, which was only founded in 2014, deals with the import and sale of machine tools, construction machinery, excavation machinery and agricultural machinery.
Honda Manufacturing Co., Ltd	
Website	http://www.hondass.com/
Products	Dairy machinery (milking parlours, milking robots, feeding robots, large-scale coolers), Manure processing equipment
Information	The range includes a variety of different devices and systems that are designed to improve work efficiency and save labour by means of the latest technologies. Foreign parts or systems are also imported and partnerships with European manufacturers are already in place.

	Honda Manufacturing Co., Ltd. has its headquarters in Kanazawa, Ishikawa and other branches throughout Japan. Customers include Mitsubishi Mahindra Agricultural Machinery, Dongdong Honda Dairy Machine and the Hokkaido Economic and Agricultural Cooperative Federation.
IDEC Co., Ltd.	
Website	https://www.idec-jpn.com/
Product	Harvesting machines (hay tedders, roller balers, bale wrappers), compost spreaders, seeders, ploughs, levellers, dairy machines, mowers, mixers
Information	The company specifically imports American, but primarily European agricultural technology products from various manufacturers, ranging from harvesting and compost spreading machines to sowing machines, soil cultivation technology and dairy machines.
Matsui Co., Ltd.	
Website	http://www.matsui-corp.co.jp/english/
Product	Various agricultural machinery
Information	The Tokyo-based trading company for all kinds of machinery specialises primarily in automotive and hydraulic machinery, but also sells industrial machinery for agriculture, among other things.
MSK Farm Machinery Corporation	
Website	https://www.mskfm.co.jp
Product	Tractors, combines, harvesters, calf feeders
Information	MSK Farm Machinery Corporation, whose shareholder is Mitsubishi Corporation, imports and sells tractors and other economic machinery from overseas. In particular, the latest agricultural machinery from CLAAS, Massey Ferguson and Kuhn. In addition to the assembly and repair of agricultural machinery and the sale of raw petrol, individual parts of agricultural machinery are also sold.
Nomura Trading Co., Ltd.	
Website	https://www.nomuratrading.co.jp/en
Product	Various agricultural machinery
Information	Based in Tokyo and Osaka the foreign trade company specialises in three business areas: Food, consumer goods and services, and industrial goods. The latter includes imported agricultural machinery.
Vicon Japan Co., Ltd.	
Website	http://www.viconjapan.com/
Product	Pesticide distributors, seed drills, combine harvesters, ploughs, mowers, balers, Forage mixers

Information	General distributor of agricultural equipment based in Tokyo: Import and sale of the world's most innovative agricultural machinery and systems that support efficient and labour-saving agricultural management. Distribution of imported machines to various local manufacturers of agricultural technology - Kubota Ltd., Japan New Holland Co. Ltd., Matsuyama Co. Ltd., Mitsubishi Agricultural Machinery Co. Ltd., Yanmar Agri Japan Co. Ltd. who use the machines to supplement their product ranges.
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b. Services

A sector that is relatively new in Japan is the provision of new services related to smart farming. Also, many companies formerly not at home in agriculture have expanded their business into this field. For example, the telecom-giants NTT and Softbank or energy provider TEPCO, who built a gigantic vertical farm with artificial lighting in Shizuoka, that can produce up to 5t lettuce per day.⁶⁸ This area of new smart farming services is therefore very diverse and there is no standard channel or way to distribute or market them in the Japanese market.

A good example for a successful expansion to Japan with a new service in the field of smart agriculture is the company “InFarm” from Berlin. InFarm has developed a vertical indoor farming system including a cloud management system to control and constantly optimize watering, PH-level, temperature lighting and other factors. InFarm set up an own subsidiary in Tokyo and engaged a Japanese manager for their subsidiary. They partnered up with JR East-owned Kinokuniya supermarket chain and are now providing indoor farming systems to Kinokuniya, so customers can harvest their own fresh vegetables directly from the vertical “fields” inside the supermarket.⁶⁹

This example showcases very well how such a market entry can work. Another example is the German company Bosch, who launched “Plantect” in June 2017 which can monitor the status of crops in a hothouse in real time and is equipped with the disease prediction system based on algorithm utilizing artificial intelligence (AI). Based on accumulation of measured data in the cloud with the help of sensors, user can confirm the status inside a hothouse and carry out suitable crop control⁷⁰. Bosch is in a little different position as most SME, as they already have their own subsidiary and a well-established brand in Japan.

Interesting however is, that Bosch often partners with interesting start-ups or SME and supports their business efforts. A major foreign (European) company such as Bosch, with an established based in Japan is therefore another window that can be used to enter the Japanese market. SME could use existing business contacts to larger companies for this purpose. In addition, Bosch’ system is mainly software, so that a remote service and maintenance is feasible. For purely software products, the entry conditions are potentially much lower than for physical products.

Another example is the Dutch company Philips Lighting, who partnered with CCS Inc., a Japanese company known for LED lighting. They provide lighting with optimum wavelengths of blue, red and white for each plant type for optimal growth as well as pesticide-free crop-growth solution. The partnership with a Japanese company from a similar field as a sales and inspection agent eased the market entry and reduced the effort they had to spend on training for maintenance.⁷⁰

⁶⁸ Agrigate Global (2020): „TEPCO launches huge vertical farm reliant on artificial light in Japan“.

⁶⁹ JETRO (2020): “Infarm, a Berlin indoor vegetables vertical farming start-up established a subsidiary in Tokyo”

⁷⁰ JETRO (2017): “Market Report: Smart agriculture”

The examples show that ways of market entry in this segment are manifold and very much depend on the business field. A Japanese partner or a foreign partner that has a presence and a name in Japan is recommendable in any case. Some interesting Japanese companies active in the field of smart farming, especially support solutions, are for example:

- Fujitsu launched the new cloud service “Akisai” for food and agriculture in 2012. It provides comprehensive support to all aspects of agricultural management, such as for administration, production, and sales in open field cultivation of rice and vegetables, horticulture, and in animal husbandry. The service aims to connect distributors, agricultural regions, and consumers through an enhanced value chain.⁷¹
- AEON Group is a commercial and financial service provider. In the retail sector, the company strives to produce its own goods such as vegetables and rice. Therefore, the group runs with Aeon Agri Create 20 farms (AEON Farms) across Japan under direct management.⁷²

6. Regulations

Japan does not impose import duties on agricultural machinery. EU countries that export agricultural machinery to Japan are treated according to WTO standards and to the EU and Japan Economic Partnership Agreement (EU-Japan-EPA). There is no import duty in the Japanese law for the main categories of the agricultural machinery industry or other agricultural technology.^{73, 74}

a. Export and Sales to Japan

When it comes to importing agricultural machinery into Japan, the importing company wishing to distribute foreign agricultural machinery in Japan does not require any specific licenses or operating permits. For the European company that wants to export to Japan, it is recommended to register with the respective European Commission customs office as a registered exporter (REX): <https://customs.ec.europa.eu/rex-pa-ui/#/create-preapplication/>.

In this way, the declaration of origin for the biogas plant components can be drawn up, if it meets the original. In the agreement between the EU and Japan on an economic partnership (EU-Japan-EPA), a declaration of the origin of a registered exporter is provided as proof of preference when exporting from the EU.⁷⁵ It is recommended to check the current export regulations and procedures at the German customs office research.⁷⁶ More information and a list of custom brokers available depending on the arrival port/airport in Japan can be obtained from the Japan Customs Brokers Association (JCBA): <http://www.tsukangyo.or.jp/profile/english.html>

The EU-Japan EPA Helpdesk can also provide further information: <https://www.eu-japan.eu/epa-helpdesk>

b. Technical Approval

The Japan Industrial Standard (JIS) is issued by the [Japanese Industrial Standards Committee](#) (JISC) which underlies the jurisdiction of METI. JISC is in close cooperation with the International Organization for Standardization (ISO) and

⁷¹ Fujitsu (2012): “Fujitsu Launches New “Akisai” Cloud for the Food and Agricultural Industries”.

⁷² イオン農場: 農場紹介.

⁷³ 日本関税 (2020a): 輸入統計品目表 (実行関税率表) 実行関税率表、第 16 部第 87 類.

⁷⁴ 日本関税 (2020b): 輸入統計品目表 (実行関税率表) 実行関税率表、第 17 部第 84 類.

⁷⁵ Zoll (2019): “Das Freihandelsabkommen mit Japan tritt am 1. Februar 2019 in Kraft”

⁷⁶ Zoll: “Unternehmen”, refer to: https://www.zoll.de/DE/Unternehmen/unternehmen_node.html.

the International Electrotechnical Commission (IEC). As of March 31, 2019, there are 10,773 valid standards. Agricultural machineries and related products are indicated through the letter B (Mechanical Engineering) in the classification.⁷⁷

Although JIS is not mandatory and in many cases very close to ISO, Japanese customers prefer to stick to JIS-certified products, as the certification process may include certain Japanese special regulations or specifications that only apply to the Japanese market. While not very significant for agricultural machinery, one should also keep in mind that JIS-certified products get a preferential treatment in tenders by public entities. This is regulated by law.

Especially for foreign companies the application process might be difficult due to specific regulations and language barrier. However, there are entities in Japan that support foreign companies in this application process.

Application for JIS: https://www.jqa.jp/english/jis_a/application.html

7. Related Trade Fairs

Trade fairs in Japan cannot be compared in size with big shows in Europe such as AGRITECHNICA in Hanover or the SALON INTERNATIONAL DE L'AGRICULTURE in Paris. However, they can be interesting to get an overview of the market trends, available technologies and competitors and also a platform for presenting own innovations, get first-hand feed-back and make contacts. Some related trade shows in Japan are listed below.

AGRI WEEK		
Organizer	Reed Exhibitions Japan Ltd	
Exhibits	<ul style="list-style-type: none"> - AGRITECH, International Agricultural Material & Technology Expo - AGRINEXT, Next generation Agricultural Expo - AGRIPROCESS, Farmers' Processing & Sales support Expo - LIVESTOCK, International Livestock Supply & Equipment Expo 	
Frequency	twice a year in Tokyo & Osaka	
Venue: Osaka <i>Intex</i>	Date	24.-26. February 2021
	Website	https://www.agriexpo-osaka.jp/en-gb.html
	Exp. Participants	<ul style="list-style-type: none"> - Visitors (25000) - Exhibitors (400)
Venue: Tokyo <i>Makuhari Messe</i>	Date	13.-15. October 2021
	Website	https://www.agriexpo-tokyo.jp/en-gb.html
	Exp. Participants	<ul style="list-style-type: none"> - Visitors (25000) - Exhibitors (400)

⁷⁷ Japanese Industrial Standards Committee (2017): "About JISC".

AGRO Innovation		
Organizer	Japan Management Association (JMA)	
Exhibits	<ul style="list-style-type: none"> - Wild Animal Management - Weed Solution World - Floral Innovation - Vegetable & Fruits World 	
Frequency	twice a year in Tokyo & Kyushu	
Venue: Tokyo <i>Tokyo Big Sight</i>	Date	24.-26- November 2021
	Website	https://jma-agro.com/en/
	Exp. Participants	<ul style="list-style-type: none"> - Visitors (15000) - Exhibitors (170)
Venue: Kyushu <i>Marine Messe Fukuoka</i>	Date	16.-17. June 2021
	Website	https://jma-agro.com/kyushu/en/
	Exp. Participants	<ul style="list-style-type: none"> - Visitors (5000-20000) - Exhibitors (100-500)
FOOMA Japan		
Organizer	The Japan Food Machinery Manufacturers' Association	
Exhibits	<ul style="list-style-type: none"> - Food materials processing - Engineering, robots, and IoT - Quality maintenance - Packaging and filling 	
Frequency	Annually	
Venue: <i>Nagoya Aichi Sky Expo</i>	Date	1.-4. June 2021
	Website	https://www.foomajapan.jp/english/index.html
	Exp. Participants	<ul style="list-style-type: none"> - Visitors (100.000) - Exhibitors (400)
International Agricultural Machinery Show		
Organizer	Hokuren Federation of Agricultural Cooperatives, Hokkaido Agricultural Machinery Manufacturers Association, Tokachi Agricultural Machinery Association	
Exhibits	<ul style="list-style-type: none"> - Agricultural Machineries - Robotic, AI, IoT - Biotech innovations - Processing and Waste machineries 	
Frequency	Every 4 years	
Venue: <i>Obihiro, Hokkaido</i>	Date	July 2022
	Website	https://iams-obihiro.com/eng/
	Exp. Participants	<ul style="list-style-type: none"> - Visitors (n/a) - Exhibitors (n/a)

The Supporting Technology Exhibition and Seminar for Agriculture & Fishery Industries		
Organizer	Executive Committee of Supporting Technology Exhibition and Seminar for Agriculture and Fishery Industries, Okinawa	
Exhibits	<ul style="list-style-type: none"> - soil conditioners, agricultural machines, pesticides, - wildlife damage control products, - aquaculture equipment, water quality management and measuring instruments, water purification equipment, - food processing equipment, freshness preservation technology, packaging technology, equipment for labour saving 	
Frequency	Annually	
Venue: Naha, Okinawa, Jichikaikan Hall	Date	09. + 10. March 2021
	Website	https://supportokinawa.com/
	Exp. Participants	<ul style="list-style-type: none"> - Visitors (1300) - Exhibitors (40)

8. Opportunities for European SME and Recommendations

a. Business Opportunities for European SME

Looking at market size and growth forecast (chapter 3b), it becomes clear that the decisive growth phase for the smart farming market in Japan is currently underway for the next few years. This development is politically backed by the comprehensive rollout plan of the MAFF for smart agriculture technology and services. Business opportunities for European companies vary depending on the specific market segment:

The cultivation support segment, such as cloud support services or on-site environmental control, is already quite mature and many products are on the market. The growth stalled since 2017 and the segment is not expected to grow much more.

Management support solutions, such as software for accounting etc. are predicted to become growth areas, as they are downstream segments. Interesting fields are e.g., solutions to share and manage farming information (resources, terrain, borders, ownerships) or production management solutions that facilitate supply-chain management.

The same holds true for sales support solutions, which support the farmer in reducing and optimizing sales of products. However, both of those segments require specific market knowledge of the Japanese agricultural market, its food distribution channels and the accounting system. This segment is therefore rather difficult for foreign companies to access and requires a strong local partner with good knowledge on those topics to be successful.

Drones and precision farming are segments which are more promising, as this kind of technology is easier transferable. Especially the very good infrastructure and regulatory framework for drones (e.g., chemical regulation law, civil aeronautics act) and autonomous driving (advanced regulation on self-driving vehicles) is the ideal “playground”, also for European companies, to test and market their products. This includes, among others, drone technology, e.g. for precision fertilizer spraying or evaluation of landslide risks and other disaster prevention technologies. As many applications are not quite market-ready, it might also make sense to partner with Japanese companies for technology development. Especially due to the specific infrastructure standard on which many applications are based (WAGRI-platform, QZSS positioning system), a joint R&D project might make sense in these segments.

Robotics is a little bit different from the previous segments as the market forecast predicts only small growth rates until 2025. This coincides with the roll-out plan by MAFF, in which robotics have the longest time until actual large-scale implementation. The priority fields in agriculture, forestry, and fishery and foods industries for introducing robot technologies are:

- Automation of operations using GPS guidance system
- Mechanization and automation of heavy labour currently being done manually
- Labour-saving and high-quality production based on linking of robot and advance sensing technology

b. Challenges

Some challenges tied to the agricultural sector in general and the introduction of smart farming machinery and services in Japan have already been introduced in chapter 3d. Specific challenges for European SMEs might be:

- Market domination of domestic full liners
The Japanese market of agricultural machinery, especially in the fields of tractors, is dominated by the “big four” introduced in chapter 4c-i. Foreign companies successfully in the Japanese market are either well-known international brands, such as John Deere, or offer niche products.
- Trust in domestic companies
Japanese end-users in the agricultural machinery sector tend to trust in domestic companies. They favour Japanese brands over foreign products, mainly due to high-quality customer service networks.
- Advantageous treatment by the government
Economy and administration are often tightly interconnected in Japan. The extensive Ministerial bureaucracy favours Japanese companies by giving support through strong political and administrative guidance.
- Adjustment to Japanese conditions
Adjustment of machinery to Japanese specifications, for example JIS, while not being mandatory, is one hurdle to take. This process can be tedious, especially due to language barrier and possibly high costs for adjustments as well as application support. The technology might also need some adjustment to smaller-scale farms and fields and difficult terrain compared with Europe. For Software, the regionalisation e.g. in the form of Japanese language versions or adjusted interfaces according to Japanese demands and standards must be made.
- Local partnership & language barrier
For market entry, especially for new services, finding a local Japanese partner/distributor or at least an established foreign partner with an on-site presence, is one of the first challenges.
- Customer service and training
The high demands especially regarding customer service in Japan are challenging. Either a very good training of the partner or remote support or an own presence with a Japanese-speaking manager might be necessary. New smart farming technologies are often not easy to handle and an appropriate support as well as possibilities to train end customers to use the new technologies, e.g. via training seminars, must be ensured.

c. Key Success Factors

Key factors for the success of SMEs certainly lie in a thorough preparation of the market entry and in establishing a trustful relation with Japanese partners or costumers. This will be explained in detail in chapter 8d. Other main success factors are:

- Innovative technologies & appropriate target segment

Japan is a very innovation and technology-driven market, which applies for agricultural machinery as well as services and software. There are many innovative companies and institutions active in this new field of smart farming already. To have a chance, innovative technologies with unique sales points are key.

In some areas such as tractors or Japanese specialties such as rice machines or tea, Japanese brands are so dominant on the domestic market, that it is very difficult to compete. In other segments, such as animal husbandry but also certain special harvesters e.g. for vegetables such as potatoes, European companies have a good reputation, as those are not (yet) a key market in Japan. Thus, choosing the right target segment is another key factor.

- Local partner(s) and good customer service

As previously explained, especially new smart farming technologies need explanation and also maintenance support. Thus, a suitable local partner is definitely an important success factor.

- Localization

In many sectors, but especially in the agricultural sector, localization, meaning at least Japanese language versions of manuals, interfaces etc., but on top of that also adjustments of interfaces or options to Japanese standards and habits should be undertaken.

- Contact to key players

When engaging in business of import of smart farming machinery and solutions, cooperation with key players such as the Zen-Noh association on national level, as well as with their regional organizations such as JA Fukui or JA Shizuoka, who act as regional distributors, or to specialized associations such as the JAISA (Japan Agriculture Information System Association) or leading universities can be helpful to get access to the market.

d. Recommendations

Agriculture has its local specific culture and practices as well as geographic conditions, in Japan maybe even more than in other countries due to unique circumstances. The choice and development of products suitable for the Japanese market should focus on the needs of the local farmers who are the costumers of the smart farming technologies.

- A thorough market research, including research for potential partners should be prepared as a first step which can be done by specialized consultants who are familiar with the Japanese language and codes of business and have networks in the target market segment. Much up-to-date information is often hidden behind the language barrier and only at a later point accessible in English.
- Distribution via trade houses or distribution companies might cut the revenues as every step in the distribution chain causes a higher end-user price. Thus, a wise choice of distribution channel is crucial.

- Furthermore, it is very difficult to enter the Japanese market with a new service or technology without an own subsidiary on-site, a local representative with Japanese language skills or references. This is especially true for SME, who often face tight funding constraints, and for whom a bigger risk is involved in expanding in a new market. Therefore, finding a suitable distributor or partner is crucial. The agriculture sector is very unique in many ways, and knowledge about legislation or access to networks is, especially in Japan, often hidden behind languages barriers.
- As a first step into the market, realizing pilot projects as first references can help to stimulate interest in the market. It also helps to get to know the market environment and
- Japan is, due to its affinity to new technologies (Society 5.0) and leading role in robotic research, also an ideal testing ground for R&D cooperation. Incentives such as subsidies for R&D are however only applicable in certain sectors. The application period for subsidy or applicable conditions vary depending on the segment and type of innovative agricultural technology. It is recommended that inquiries are made with the MAFF or METI, together with a local partner (e.g. university).⁷⁸
- A very important, often forgotten chance also lies in the partnerships for third-country activities. Japanese companies often have very good market access to Southeast Asian countries. Japan is very active in supporting developing countries in the agricultural field and even has their own research institute dedicated to international agricultural research with focus on developing countries, the “Japan International Research Center for Agricultural Sciences” (<https://www.jircas.go.jp/en>). Chances to distribute and access the Southeast Asian markets together with a Japanese partner are very promising, especially as the domestic Japanese agricultural market is not so big, compared to countries such as e.g. Vietnam or Indonesia.

⁷⁸ JETRO (2017): “Market Report: Smart agriculture”.

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