# Agriculture VRT Market Assessment, By Type [Fertilizer VRT, Crop Protection VRT, Soil Sensing VRT, Seeding VRT, Irrigation VRT, Others], By Technology [Map-based, Sensor-based], By Offering [Hardware, Software, Services], By Farm Size [Large, Medium, Small], By Crop Type [Cereals and Grains, Fruits and Vegetables, Oilseed and Pulses, and Others], By Region, Opportunities and Forecast, 2018-2032F

Market Report | 2025-04-22 | 223 pages | Market Xcel - Markets and Data

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**Report description:**

Global agriculture VRT market is projected to witness a CAGR of 11.15% during the forecast period 2025-2032, growing from USD 7.54 billion in 2024 to USD 17.56 billion in 2032. The significant growth in the market is mostly the result of the aggressive adoption of precision farming worldwide. This technology allows farmers to apply inputs, from seeds to fertilizers and pesticides, in variable proportions in different field spaces thus enhancing resource utilization and raising crop yield. Rising concerns on the conservation of resources are primarily driving the need for high agricultural productivity to suffice for the global feeding requirements.

Recent advances in GPS technology, drone use, and data processing have made VRT incorporation in farming more comfortable. Both developed and underdeveloped countries' governments are striving to liaise with precision farming by offering subsidies and awareness programs among the farming community. The challenges include several technical complexities and high initial capital outlays.

One of the latest trends is that VRT evolve with time by adopting practices like site-specific crop management, real-time data collection, and artificial intelligence integration. This is backed up by the need for sustainable farming and the desire for lower environmental impact. As a result, the market has considerable potential. The transition from agricultural practices to digital transformation in the world of agriculture is projected to accelerate global agriculture VRT market growth, which will evolve with advanced solutions for efficient and sustainable farming practices.

In October 2024, XAG Co., Ltd. and Pix4D SA collaborated to launch the prescription-map design for agricultural drones, to ensure

smooth variable-rate application (VRA) on agricultural lands. This prescription map feature allows customers to make prescription maps for crop protection, seeding, and fertilizer application, making use of Pix4Dfields, that are compatible with agricultural drones by XAG.

Focus on Sustainability Catalyzes Market Expansion

Variable rate technology, or VRT, in agriculture is mostly adopted because of growing sustainability challenges. Ecological concerns like soil degradation, agrochemical use, and dwindling water sources leave farmers with no option but to be more eco-efficient in approaching conservation farming practices. VRT allows farmers to efficiently use fertilizers, pesticides, and water since the precise application is conducted according to real-time field conditions. This ultimately leads to decreased contamination along with reduced water wasting, thus improving the quality of soil health and watersheds.

Moreover, the growing demand for sustainable practices from consumers and regulatory bodies has driven most farmers into the adoption of newer technologies that promote environmentally friendly technology on farms. VRT helps support global agriculture for long-term productivity through resource conservation, crop resilience, and maintenance of ecological balance. As demands for environmentally responsible farming increase, VRT adoption is expected to grow.

In March 2024, in collaboration with ZEN-NOH, BASF Digital Farming and Kubota Corporation integrated their digital platforms, xarvio FIELD MANAGER and KSAS, respectively. This initiative aimed at assisting rice farmers in Japan maximize their yields. The platforms can now communicate data more quickly, easily, and seamlessly. The effective Kubota rice transplanters, including its precision farming models, the NAVIWEL "Special Class 8-row," "Agri Robo 8-row," and "Agri Robo 10-row," can employ the field-specific variable application maps for fertilization produced by xarvio FIELD MANAGER.

Labor Shortages in Agriculture Influence the Market Growth

Shortage of agricultural labor is making the process of adopting variable rate technology (VRT) more expedited. Declining rural populations and the migration of agricultural workers to urban areas have created a scarcity of skilled farm laborers worldwide. The demand for automated and precise technologies to maintain productivity has increased due to the growing shortage of labor. Variable rate technology allows the farmer to make adjustments for seeding, fertilizing, and irrigation with more minimal manual supervision, enabling optimal efficiency and minimization of labor dependency. VRT automates applications of inputs based on site-specific data, enabling the farmer to save time and operational costs managing larger fields with fewer resources.

Although there were over 1.23 million agricultural workers in 2022 in Japan, the farm ministry estimated that the number will drop to around one-fourth of the level over the next 20 years.

Moreover, escalating labor charges in different regions make VRT the much better answer to economic viability. Besides that, the governments of many countries as well as technology providers are encouraging mechanization and digital tools for solving labor challenges driving further growth on this technology. With the ever-dwindling workforce in agriculture, VRT provides a practical and sustainable way of managing labor shortages efficiently.

Fertilizer VRT Holds the Dominant Market Share

Fertilizer VRT has been observed to be holding the dominant share in the global agriculture VRT market, as it helps in optimizing nutrient management significantly. The uses of fertilizer variable rate technology exist in the design of precise applications of nutrients according to the needs registered by different parts of farm fields, allowing better use of resources in the most efficient way possible, reducing losses. In other words, it enhances crop yield by reducing the overuse of fertilizers, which would normally degrade soil, leading to the pollution of water sources. With rising public awareness of sustainable farming practices, the use of fertilizer VRT has been further promoted with farmers seeking to adopt more responsible farming practices with respect to environmental problems.

In October 2024, CropX Technologies Ltd. launched an enhanced capacity for variable rate application (VRA) planning aimed at helping farmers effectively manage the precision of their in-field operations. It allows for better use of fertilizer, along with seed and irrigation water by in-field variability. The idea is to maximize productivity in the field by improving efficiency by using innovative CropX solutions.

Moreover, the ever-improving technology about soil mapping, sensor technology, and data analytics improves the effectiveness of fertilizer VRT providing real-time adjustments, and nutrient delivery with more precision.

North America Dominates Regionally

North America is a world leader in the adoption of farm practices and structures using the largest agricultural variable rate

technology (VRT). The region's advantages include a very high number of technologically advanced farms, special investments in research and development, and rising awareness of VRT among farmers.
In February 2024, Deere & Company launched a new range of 9RX tractors, with models 9RX 710, 770, and 830, making it the latest range of the brand's most powerful tractors. A powerful G5Plus CommandCenter powers this new line with a resolution of 32.5 cm (12.8 inches) and has complete integration with Precision Ag Technology from the company, featuring user-friendly technologies like Variable Rate Control, Section Control, 1-Click-Go-AutoSetup, and full AEF ISOBUS compatibility. JDLink Connectivity and DataSync features are available in the new range, providing better operational performance.
As part of the incentives that the governments of the region provide, farmers invest in VRT technologies, supported by funds to develop them. Additionally, the use of VRT in agriculture broadcasts has a huge role to play as seeding, chemical applications, and fertilizing operations become more sophisticated for each crop.
Future Market Scenario (2025 - 2032F)
- The significant increase in awareness for resource efficiencies and responsible farming may lead to rapid adoption of VRT worldwide.
- Precision farming techniques that focus on sustainability will encourage the use of VRT to reduce chemical exposure, minimize pesticide-related costs, and improve environmental results.
- The economies of scale and technological advancements will lower VRT costs, which are expected to reach small and medium-scale farmers.
Key Players Landscape and Outlook
The market for global agriculture variable rate technology (VRT) represents a changing sector with growing competition, with companies possessing farms geared towards the embracement of precision farming. Prominent players are working on equipping their armor through bundled solutions, which meet advanced hardware such as GPS-based equipment, with sensors, and software platforms ensuring data analysis and decisions. These companies are investing heavily in R&D to increase accuracy and efficiency, as well as the user-friendliness of VRT systems. Strategic acquisitions and collaborations form a major part of the key players' landscape, that help in maximizing the agricultural output using the latest technologies.
In August 2024, CNH Industrial N.V., the manufacturer of Case IH and New Holland equipment, partnered with CropX Technologies Ltd. to allow a data exchange for variable rate application and efficiency in more sustainable agronomic operations. The data exchanged from Case IH equipment and New Holland spans across a wide range of activities, including planting, harvesting and application. Moreover, this integration allows for the creation of maps for variable rate applications for fertilization and seeding through advanced agronomic tools in the CropX platform.
Market environment looks promising, with new advances in automation, artificial intelligence (AI), and IoT field, resulting in significant growth in the future. Moreover, the rising focus of farmers and agricultural firms on protecting the environment and optimizing the available resources will boost the adoption of VRT. Continued innovations in technology and supportive government policies ensure the steady growth of the market, providing opportunities to international and local players.

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*Companies mentioned above DO NOT hold any order as per market share and can be changed as per information available during research work.

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