

Special Feature 1

Contributing to Resolve Social Issues

Herbicide AXEEV®



AXEEV®, an innovative field crop herbicide developed in-house that has a low impact on the environment, is Kumiai's mainstay product and the driver of the Group's growth. The product is registered as an agricultural chemical in 23 countries and is recognized as a trump card with long-term efficacy at low dosage for dealing with difficult-to-control herbicide resistant weeds that have recently become a serious problem in the cultivation of soybean, corn, wheat, sugarcane, and other crops. AXEEV® is used as an active ingredient in many products and is supporting agriculture in the field and contributing to food production around the world.

Social Issues Resolved by AXEEV®

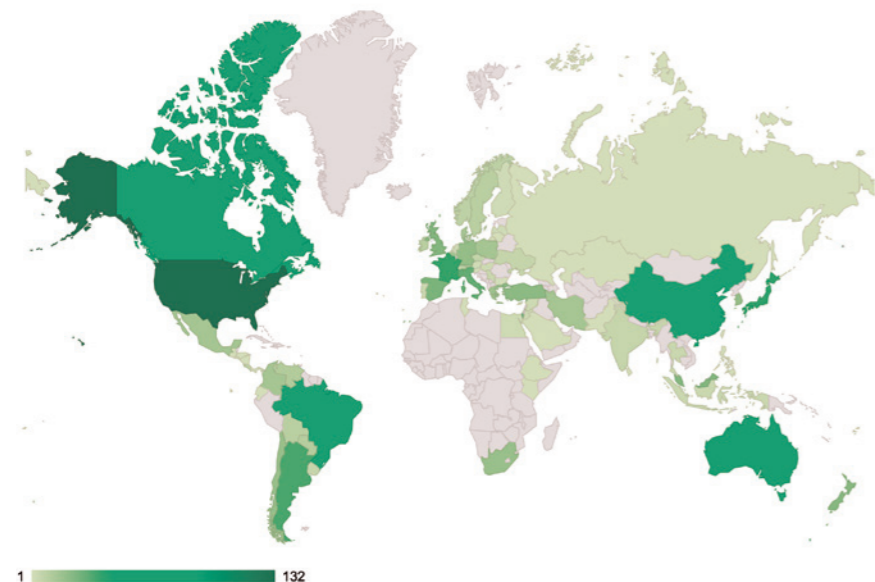
The need to increase food production to feed the world's burgeoning population, which is expected to reach 9.7 billion by 2050, is a pressing issue. In order to increase food production without relying on the expansion of cropland through deforestation, which leads to environmental destruction, it is important to increase productivity through the proper use of safe and secure agricultural chemicals.

The cultivation system introduced in the 1990s as an innovative agricultural technology, combining the use of the herbicide glyphosate and genetically modified crops (GMO\*), has spread widely due to its usability. Currently, this system accounts for more than 90% of the soybean and corn

production in the Americas. However, weed species resistant to glyphosate (herbicide resistant weeds\*) have emerged and are spreading worldwide, becoming a major problem in agriculture.

Among the first to foresee the emergence of these herbicide resistant weeds, Kumiai applied itself to the task of developing a soil-applied herbicide that would solve this problem. AXEEV®, which we discovered and developed, is widely accepted in the market as a means of resolving this problem. Though more than 10 years have passed since the product was first launched, the number of countries where AXEEV® is registered continues to increase along with sales.

Total Number of Reports on Herbicide Resistant Weeds



Herbicide resistant weeds have spread to the countries and regions shown in light green to dark green on the map. With the number of reports reaching 132 in the U.S., it is becoming a serious problem.

Source: International Herbicide-Resistant Weed Database (As of January 2024)

\*1 Genetically Modified Organism (GMO): Crops that have been modified using genetic recombination technology. They are highly tolerant to diseases and pests, and are not killed by herbicides.

\*2 Herbicide resistant weeds: Weeds for which herbicides have lost effectiveness due to repeated use of the same type of herbicide.

Strengths of AXEEV® and Problems Solved

Weeds resistant to glyphosate are a major problem in soybean and corn cultivation in the U.S., Canada, Brazil, and Argentina. In particular, in the case of amaranths (*Amaranthus* spp.), a single plant produces tens of thousands of seeds, and resistance traits are transmitted through pollen as well, and so resistant weeds spread rapidly. Because they grow to a height of one to two meters, they can seriously damage not only crop yields but also the quality of the grain due to weed seed contamination.

In Australia, a major wheat grower, Italian ryegrass (*Lolium multiflorum*), which is resistant to the herbicide used, is widespread. Regarding wheat cultivation in India, areas where the herbicide resistant lesser canary grass (*Phalaris minor*) is prevalent are increasing. These are only examples. Indeed, herbicide resistant weeds are spreading throughout the world and have become a major problem in agriculture.

In view of its efficacy in controlling these herbicide resistant weeds, AXEEV® is a game changer offering a solution to this

agricultural problem. AXEEV® requires a dosage approximately only one-tenth that of conventional herbicides. In addition to its low environmental impacts, its herbicidal effect lasts approximately two weeks longer than that of conventional products. As a result, the frequency of application can be reduced, alleviating the agricultural workload. The increased productivity on limited farmland brought about by AXEEV® helps reduce deforestation associated with the expansion of farmland, and is thus beneficial in terms of conservation of the global environment. Moreover, the volume of AXEEV® products delivered to growers around the world is approximately one-tenth the volume of conventional products that would otherwise be shipped, which is advantageous in terms of lower CO<sub>2</sub> emissions during transportation of AXEEV® products from factories to growers. Furthermore, less frequent applications of herbicide contribute to a reduction of CO<sub>2</sub> emissions associated with the application of herbicide.

Outcome

Since its launch in Australia as a soil-applied herbicide for wheat in 2011, the number of countries where AXEEV® is marketed has increased and sales of AXEEV® have increased during the subsequent 13 years. Sales of AXEEV® were 35.5 billion yen in FY2021, 54.4 billion yen in FY2022, and 73.1 billion yen in FY2023. During the last 11 years, from 2013 to 2023, sales of AXEEV® have continued to grow at a compound annual growth rate (CAGR) of 26%, a very high rate.

As a herbicide for major crops such as soybeans, corn, wheat, and sugarcane, AXEEV® is mainly sold in the U.S., Australia, Argentina, Brazil, and India. In addition to these major markets, AXEEV® is sold in Asia, Africa, and elsewhere. Besides the application for grain cultivation, we are also developing, promoting, and marketing AXEEV® products for golf courses, pastures, orchards, and non-cropland.

AXEEV® shows excellent long-lasting efficacy for controlling herbicide resistant weeds, especially against Italian ryegrass in wheat cultivation and amaranthus in soybean cultivation. Taking advantage of this characteristic of AXEEV®, we have provided technical service in agricultural fields where resistant weeds have become a problem, conducted sales promotion, and introduced new mixed formulations. As a result, AXEEV® has gained recognition among growers as an essential product for controlling herbicide resistant weeds and established a powerful position in the market.

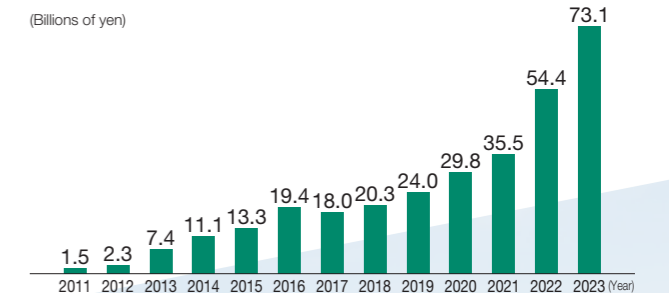
To date, AXEEV® is registered in 23 countries as an agricultural chemical. Supporting various sales promotion activities of our partners in each country, we are working to expand the use of mixed formulations including AXEEV®. In addition, we are striving to further expand sales of AXEEV® by expanding applications to other crops and continuing to develop value-added mixed formulations. We are also

continuing evaluation and development in Asia and Africa with a view to increasing the number of countries where AXEEV® is sold.

Registration Status of AXEEV® (As of February 2024)



Sales of AXEEV®



Year of Launch in Major Countries

|      |           |      |        |
|------|-----------|------|--------|
| 2011 | Australia | 2019 | India  |
| 2012 | U.S.      | 2020 | Brazil |
| 2017 | Argentina |      |        |



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## Future Prospects and Strategy

The global agricultural chemical market has fluctuated greatly in recent years. In 2022, the tense international situation led to a sharp rise in agricultural chemical prices and panic buying of agricultural inputs by growers. In 2023, agricultural chemical products were in plentiful supply, their prices fell, and distributors pared inventories. In 2023, sales from Kumiai to distributors in each country proceeded as planned, driven by strong demand in the North American market. However, sales of AXEEV® on the ground did not proceed as planned by the distributors, and distribution inventories in some countries exceeded the appropriate range. Sales growth is expected to slow in 2024, as the priority will be to sell off these inventories rather than increase sales from Kumiai to distributors in each country. Although the market entry of generic products will have an impact over the medium to long term, the target market itself is expanding, and we think there is room for further growth in sales of AXEEV®.

In North America, the use of AXEEV® products is expanding owing to the launch of new mixed formulations in the soybean and corn markets and the widespread use of overlapping soil applications (two applications of a soil-applied herbicide during cultivation). In addition, we are developing new mixed formulations.

In Brazil, sales have increased since the launch in 2020, but in 2024 shipments from Kumiai will be systematically reduced in order to restore distribution inventory to an appropriate level. We aim to expand sales of AXEEV® over the medium to long term by introducing new mixed formulations for the soybean and corn markets, and by expanding the use of AXEEV® in the sugarcane market.

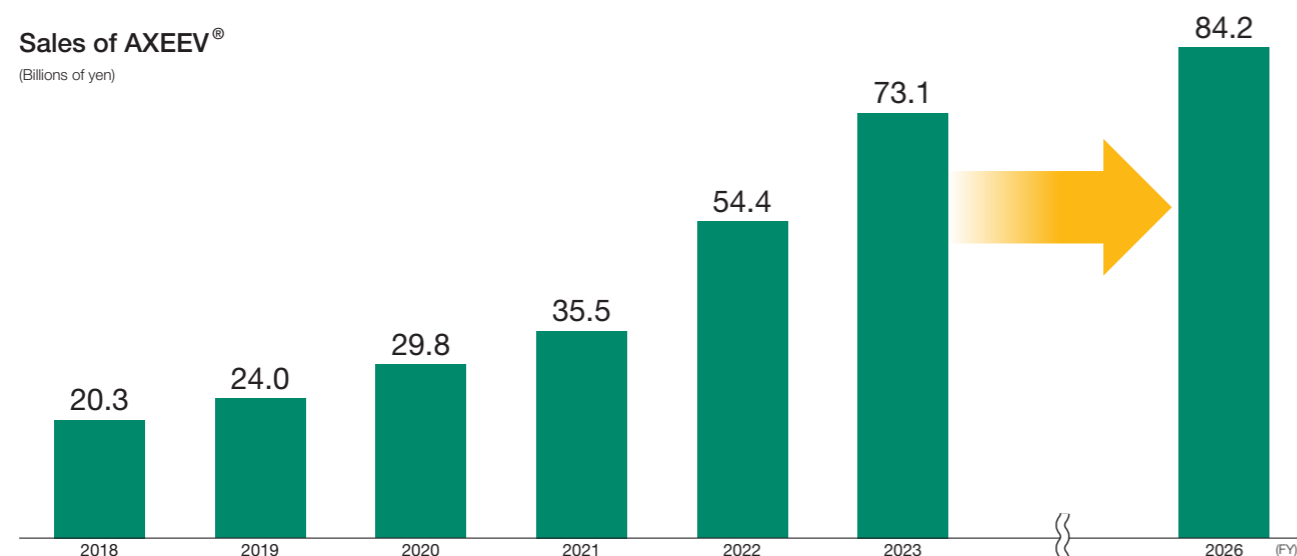
Argentina ranks third after Brazil and the U.S. in terms of the area of farmland devoted to soybean cultivation, and with the spread of herbicide resistant weeds, continued growth in demand for AXEEV® products is expected. Moreover, shipments to some distributors who had been adjusting their inventories will resume in 2024.

To date, no information on the development of active ingredients that pose a threat to AXEEV® has been identified. On the other hand, as the substance patent for AXEEV® expired in 2022, generic products have been available in Australia since 2023 and are expected to be introduced in Argentina within the next few years. In response, in order to ensure continued growth in sales of AXEEV®, we will strengthen measures such as sales promotion support, implementation of an appropriate pricing strategy, and promotion of development of mixed formulations. We will also strive to strengthen competitiveness by further reducing production costs through optimization of the supply chain in Japan and overseas. Kumiai holds several patents on the mixed formulations and manufacturing method for AXEEV®. We are implementing an IP strategy that leverages these patents and, if Kumiai's intellectual property is infringed, we will take decisive action in the market concerned.

Sales of AXEEV® are expected to continue growing, not only through the maintenance and expansion of sales in existing markets but as a consequence of registration as an agricultural chemical and sales expansion in new markets. Under the new Medium-Term Business Plan launched in FY2024, AXEEV® is expected to continue driving Kumiai's growth.

### Sales of AXEEV®

(Billions of yen)



## Column | Social Significance and Safety of Agricultural Chemicals

### Agricultural Chemicals That Contribute to Resolving Food Insecurity and Alleviate Certain Social Issues, Which Are Challenges Common to Humankind Worldwide

With approximately 700 million people said to be suffering from food deprivation, the need to produce sufficient food to feed the growing population has emerged as a global issue. Agriculture itself is facing various problems such as climate change, limits to the expansion of land for cultivation, and a decrease in the number of farmers. The SDGs adopted by the United Nations, which include goals related to hunger, climate change, and the natural environment, correspond to the pressing issues facing humankind.

One way of achieving a world where no one has to worry about lack of food would be to increase food production by expanding the area under cultivation. However, in addition to deforestation and other forms of environmental degradation, there are issues such as the need to secure water resources, and the additional area that can be brought under cultivation is limited. Therefore, it is important to efficiently produce crops and increase yields within a limited area.

Agricultural chemicals on which Kumiai is continuing research contribute to the resolution of these issues.

A survey by the Japan Crop Protection Association shows that without the use of agricultural chemicals, the yields of rice and apples are reduced by about 24% and 97%, respectively. Other crops would also be affected, such as by lower yields and the lower value of shipments due to poorer quality. Appropriate use of agricultural chemicals helps maintain quality and yields while enhancing food safety and security.

Agricultural chemicals also make a significant contribution to labor-saving in agriculture while reducing environmental impacts. The herbicide amount for paddy rice, which was previously 3 kilograms per 10 ares, has been reduced to 250 grams, one-twelfth of the previous amount, thanks to technological advances. Not only is the time and labor required for application greatly reduced, but energy use and GHG emissions associated with the production and distribution of

agricultural chemicals are also reduced. In such ways, agricultural chemicals contribute significantly to food production and provide essential support for the sustainability of society. However, as consumers of crops have few opportunities to perceive the benefits of agricultural chemicals, and negative attitudes without scientific basis have wide currency, general consumers' understanding of agricultural chemicals and their value tends to be patchy.

The primary role of agricultural chemicals is to control crop diseases, pests, and weeds. Plants inherently have a defense system, such as toxic substances and bitter substances that protects them from diseases and pests. However, in the process of breeding them for food, their defenses decline. Historically, olive oil and sulfur have been used to compensate for the decline of natural defenses. Modern agricultural chemicals are the result of the science-based evolution of such natural pest control materials. Natural materials may contain ingredients that are harmful to humans and the environment. Agricultural chemicals are painstakingly designed to eliminate such harmful substances and to be effective only on specific targets.

Today, strict safety evaluation criteria are established by law, and only those products that are judged not to be harmful to crops, users, consumers, and the environment are permitted to be sold as agricultural chemicals. Although agricultural chemicals have a negative image in many people's minds, their safety is meticulously assured through cutting-edge research and development. Contributing to the stable supply of food worldwide by solving the problems facing contemporary agriculture, agricultural chemicals are indispensable for a sustainable society.

### Activities to Raise Awareness about Agricultural Chemicals

Kumiai conducts awareness-raising activities to communicate accurate knowledge of agricultural chemicals to direct stakeholders and general consumers and deepen their understanding of agriculture.

As one of our initiatives, we have created a series of brochures on agricultural chemicals used for crops. To date, we have published brochures on rice, apples and tangerines, and capsicum and potatoes. The brochures include cartoons to explain the role of agricultural chemicals in crop cultivation. Distributed to schools and at agriculture-related events, the brochures are also used in classes given by Kumiai at schools. Through these activities, we aim not only to enhance our corporate value by disseminating accurate information on agricultural chemicals but also to foster an environment in which growers and Kumiai employees can handle agricultural chemicals with confidence.



### World Population and Farmland per Capita

