



MAP

Green and High-Quality Development Report

2022



China Agricultural Green Development Research Center
Sinochem Agriculture Holdings



Seeking transformation for Chinese agriculture and well-being for Chinese farmers

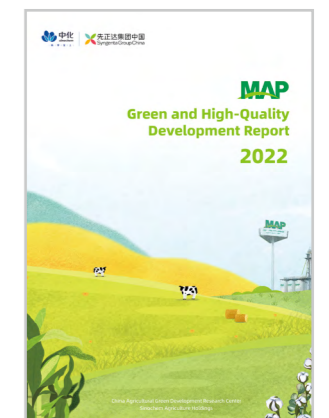
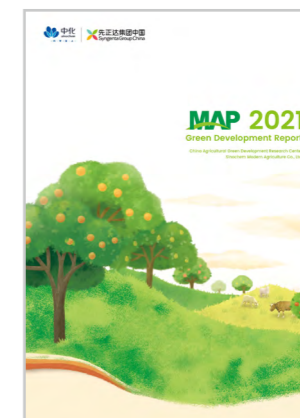
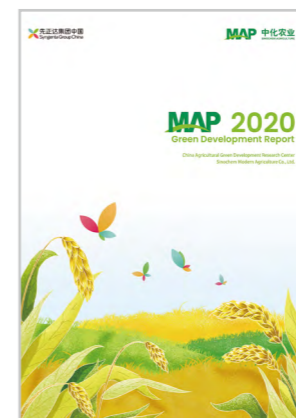
Foreword

Sinochem Agriculture Holdings developed the innovative Modern Agriculture Platform (MAP) model to proactively explore green and sustainable development methods within the agricultural sector. Since 2020, Sinochem Agriculture Holdings has collaborated with China Agricultural Green Development Research Center to carry out large-scale annual sample surveys of regions and farmers serviced by MAP. Drawing upon the analysis of survey results, we release a *MAP Green Development Report* each year, highlighting the sustainable development achievements of modern agricultural services and practice, and sharing our experience in modern agricultural green development.

In 2022, on the basis of the previous Agricultural Green Development Index, China Agricultural Green Development Research Center and Sinochem Agriculture Holdings applied the core principles of high-quality agricultural development and regenerative agriculture in creating a new Agricultural Green and High-quality Development Index. The new Index comprises four indicators - Resource Conservation, Environmental Friendliness, Industry Efficiency, and Green Supply. As this year's survey, carried out both in-person and online, encompassed a more expansive and inclusive sample of regions and farmers, it gave more comprehensive and representative results. *The Green and High-Quality Development Report 2022* ("the Report") presents that the average Agricultural Green and High-quality Development Index score of farmers getting MAP services reaches 43.29, which is 31.01% higher than farmers who do not have MAP services. The Report also provides in-depth interpretations of some of the key indicators, providing readers with a direct understanding of the benefits of MAP's green and low-carbon practice for farmers, and their role in advancing China's sustainable development.

This Report also features a collection of best practices, highlighting the significant achievements of the MAP team in 2022 and witnessing MAP's commitment to promoting green and high-quality agricultural development in China.

April 2023



Messages from the Management

Facilitating the comprehensive green transformation of the Chinese agriculture sector is essential to promote high-quality agricultural development and build a beautiful China. Adhering to the principle of green development, Sinochem Holdings implements the development strategy set by the CPC Central Committee and the State Council. It plays a leading role in pursuing green development together with small and medium-sized farmers, new agricultural business entities, and upstream and downstream industry chain partners. This collaboration centers on producing agricultural inputs and providing specialized agricultural services, with the aim of establishing a new agricultural development pattern to ensure that the agricultural sector operates within the carrying capacity of resources and the environment.

Over the past five years, Sinochem Holdings has played an active role in augmenting grain production, increasing farmers' income, and alleviating poverty through the operation of MAP service centers and demonstration farms across the country. With these accomplishments, we continuously work towards increasing the supply of green and high-quality agricultural products. Our efforts include promoting resource-intensive agricultural technologies, and innovating green development models, while focusing on improving the utilization efficiency of various resources such as land, water, labor, fertilizers and pesticides, to improve product quality, and reduce carbon emission intensity.

In the future, we will persist in promoting green and low-carbon agricultural development by accelerating the development, demonstration, and adoption of green and low-carbon agricultural solutions to achieve greater results. We will strive to explore the development model of climate-smart agriculture and regenerative agriculture, and implement high-quality agricultural development with the characteristics of high output efficiency, product safety, resource efficiency, and environmental friendliness, and contribute to accelerating the realization of the carbon peaking and carbon neutrality targets.



Li Fanrong

Party Committee Secretary & Chairman of the Board, Sinochem Holdings
Chairman of the Board, Syngenta Group

Around the world weather extremes, conflict and climate change are threatening food security for hundreds of millions of people. In 2022, we had massive droughts and heatwaves in Europe, the western United States and in western China – with the mighty Yangtze River almost completely drying up. This is why Syngenta Group's purpose of helping farmers to ensure food security and address climate change is critical.

Companies across the agriculture and food value chain are united that the best way to tackle these challenges are by moving the industry towards a new approach called Regenerative Agriculture. It is an outcome-based approach that enhances soil health and reduces greenhouse gas emissions while increasing farm productivity and profitability. These practices are good for the environment, good for agricultural productivity and good for consumers.

In China, the MAP team is leading the way in helping farmers to adopt regenerative practices through leading-edge technologies and services. MAP farmer solution centers help growers adopt the latest technology and grow a good crop, despite weather extremes. MAP beSide connects farmers all the way to consumers, improving food quality and sustainability. This model is raising the income of Chinese farmers and in 2022, MAP was recognized by the UN for helping to lift growers out of poverty in Funan.

With more and more food companies committed to a regenerative future, MAP plays an important role in leading collaboration across the food industry. For example, in Huantai, Nestlé China and MAP have started a demonstration farm with terrific results. While in Zhijiang, MAP is working with local governments to promote practices that reduce methane emissions from rice cultivation. I believe MAP will continue to lead the transformation of agriculture in China, and we are now exploring expanding the MAP model to more countries, so we can help more farmers improve sustainability around the world.



Erik Fyrwald

Chief Executive Officer, Syngenta Group

Contents

06 About Us

- 08 Sinochem Holdings
- 09 Syngenta Group
- 10 Syngenta Group China
- 11 The MAP Model

12 MAP Green and High-Quality Development

- 14 Sustainability Development Plans and Practices
- 16 MAP Agricultural Green and High-quality Development Index
- 18 2022 MAP Agricultural Green Development Survey
- 20 Resource Conservation
- 24 Environmental Friendliness
- 28 Industry Efficiency
- 32 Green Supply
- 36 Looking Forward

MAP Cases

- 22 Increasing the Yield of Soybean and Other Oil Crops
- 22 Promoting High-Efficiency Water Conservation for Cotton Industry Upgrading
- 23 Mechanical Equipment Boosts Growth of Inner Mongolia's Potato Industry
- 26 Precise Soil Testing Facilitates Fertilizer Reduction and Efficiency Enhancement
- 26 Precision Crop Protection Monitoring Reduces Chemical Pesticide Application
- 27 Developing Regenerative Agriculture as a Leader of Low-Carbon Agriculture
- 30 Wrapped Silage Alfalfa as an Innovative Solution to Reducing Forage Loss
- 31 Helping Farmers Reduce Costs of Corn Production with Full-process Services
- 31 Centralized Management Helps Small Farmers to Realize Scale Production
- 34 Green Coverage in Winter Contributes to Carbon Reduction and Soil Protection in North China
- 35 MAP beSide: Full-Process Traceability Underpins Product Quality
- 35 Improving Variety Structure for Higher Yield and Better Quality

About Us

- 08 Sinochem Holdings
- 09 Syngenta Group
- 10 Syngenta Group China
- 11 The MAP Model

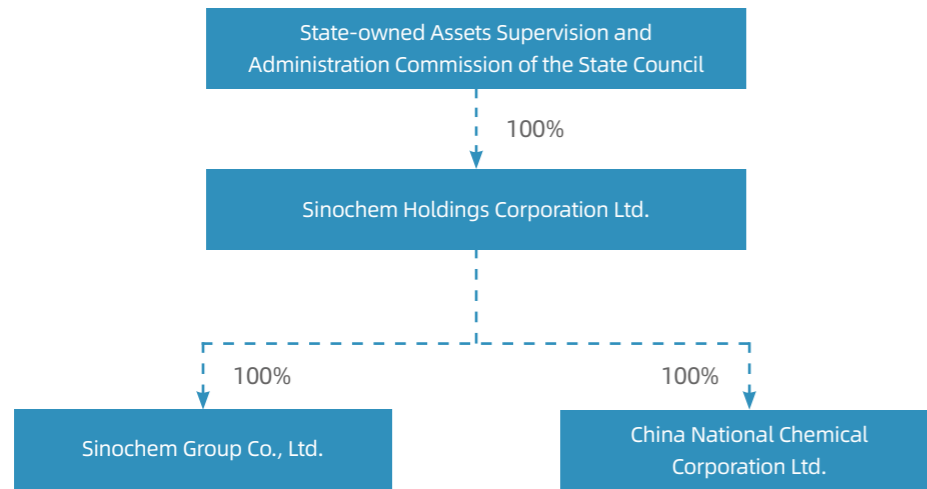


Sinochem Holdings



Sinochem Holdings Corporation Ltd. ("Sinochem Holdings") was established through the joint restructuring of Sinochem Group Co., Ltd. and China National Chemical Corporation Ltd. on May 8, 2021. Sinochem Holdings is one of the leading state-owned enterprises under the supervision of the SASAC (State-owned Assets Supervision and Administration Commission of the State Council). It boasts over 220,000 employees.

Looking ahead, Sinochem Holdings will uphold the Company's value of "In Science We Trust" as it strives to develop a world-leading chemical conglomerate, constantly improve upon its technological innovations and enhance its core competitiveness and sustainability, and realize its vision of "to become a great respectful conglomerate with global presence" while constantly contributing to social progress and the development of the chemical industry.



Business Units



Syngenta Group



Syngenta Group (SG) is a subsidiary of Sinochem Holdings, and serves as the main operating company within its life science segment. As a global leader in agricultural technology and innovation, Syngenta Group is involved in the development, production, and commercialization of a diverse range of seeds, crop protection and crop nutrition products, as well as modern agricultural services. Syngenta Group assists farmers around the world, both large and small, in enhancing their yields and adopting sustainable agriculture practices.

Syngenta Group, which was registered in Shanghai in 2019, has four business units: Syngenta Crop Protection, Syngenta Seeds, ADAMA, and Syngenta Group China. The Company has a long-standing history of over 250 years in Switzerland, and has now grown to employ 57,000 people, operating in more than 100 countries and regions worldwide. In 2022, Syngenta Group posted \$33.4 billion in sales.

A Leading Agricultural Technology and Innovation Company

Four business units globally

57,000 employees	Operating in 100+ countries and regions	\$33.4 billion 2022 sales
	Syngenta Crop Protection is a leading global crop protection company with \$16.3 billion in sales.	
	Syngenta Seeds is a leading global developer and producer of seeds with \$4.7 billion in sales.	
	ADAMA is a globally recognized leader in off-patent crop protection solutions with \$6.7 billion in sales.	
	Syngenta Group China is China's leading agricultural technology and innovation company with \$8.6 billion in sales.	

Source: Based on 2022 data, with -\$2.9 billion of related transactions.

Syngenta Group China

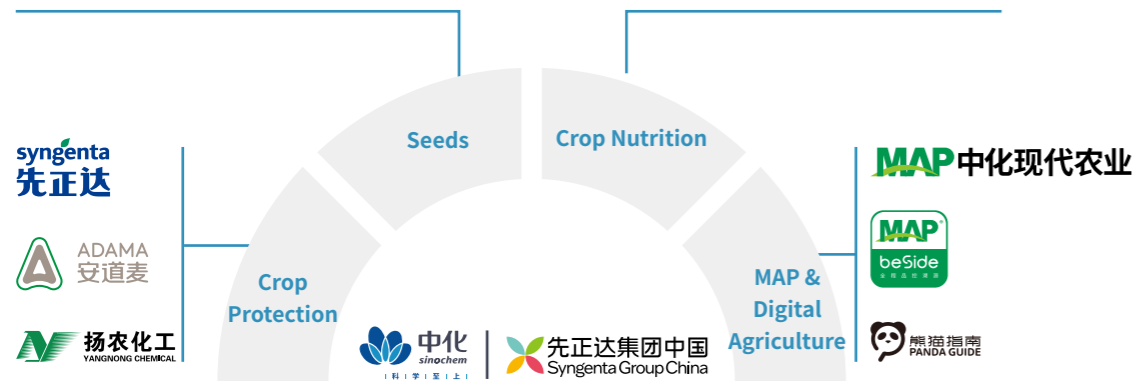


As one of the four business units within the Syngenta Group, Syngenta Group China is the leading partner for agricultural technology and innovation in the country. Our diverse portfolio encompasses Crop Protection, Seeds, Crop Nutrition and farmer service in China. Based in China as a prominent participant in global operations, Syngenta Group China is committed to combining Syngenta Group's leading global innovations and talent resources with its local expertise, market insights and professional teams in China, to empower agrotechnological innovation, high-quality sustainable development, and the rural revitalization in China by accelerating the modernization of the country's agriculture industry.

Syngenta Group China's vision is to be "the most influential agri-tech innovator in China and beyond", and its mission is "to enable everyone in the food chain ecosystem to prosper".



Source: 2022 data.



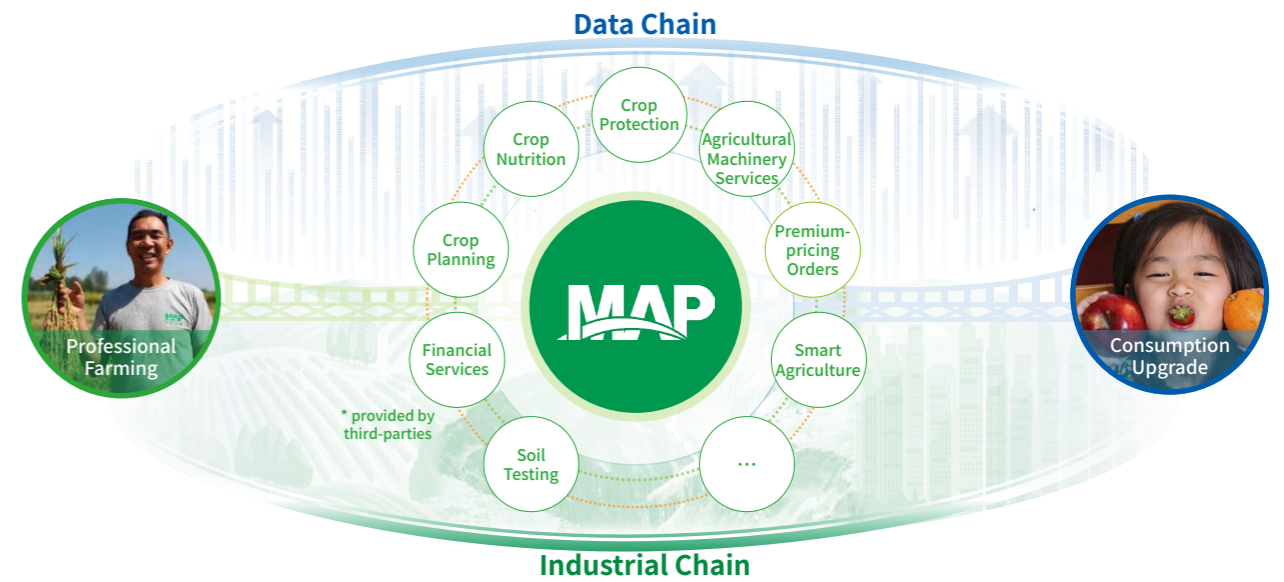
The MAP Model



On November 29, 2017, Sinochem launched the Modern Agricultural Platform (MAP) based on China's rural revitalization strategy and the development goals for agricultural and rural modernization.

Centered around the core concept of "demonstration & collaboration" for farmers, the MAP model developed a nationwide network of MAP service centers, MAP demonstration farms and a team of grassroots agronomists. The platform's approach focuses on developing, demonstrating, delivering, and promoting whole-process planting solutions that prioritize "good varieties & good practices". By providing both high-quality seeds and implementing best practices directly on farms, MAP collaborates with farmers to "grow quality crops, and sell at a good price". In addition to this, the platform collects extensive data on the agricultural industry chain, creating an agricultural value chain that generates shared value for all stakeholders.

Over the past five years, MAP remained committed to its original mission of "seeking transformation for Chinese agriculture and well-being for Chinese farmers", providing services to over 87,000 farmers, covering over 1.87 million ha of farmland, through the deployment of 628 MAP service centers across China. MAP's steadfast dedication to innovation has enabled it to continually explore new avenues for agricultural and rural modernization, as well as rural industry revitalization.

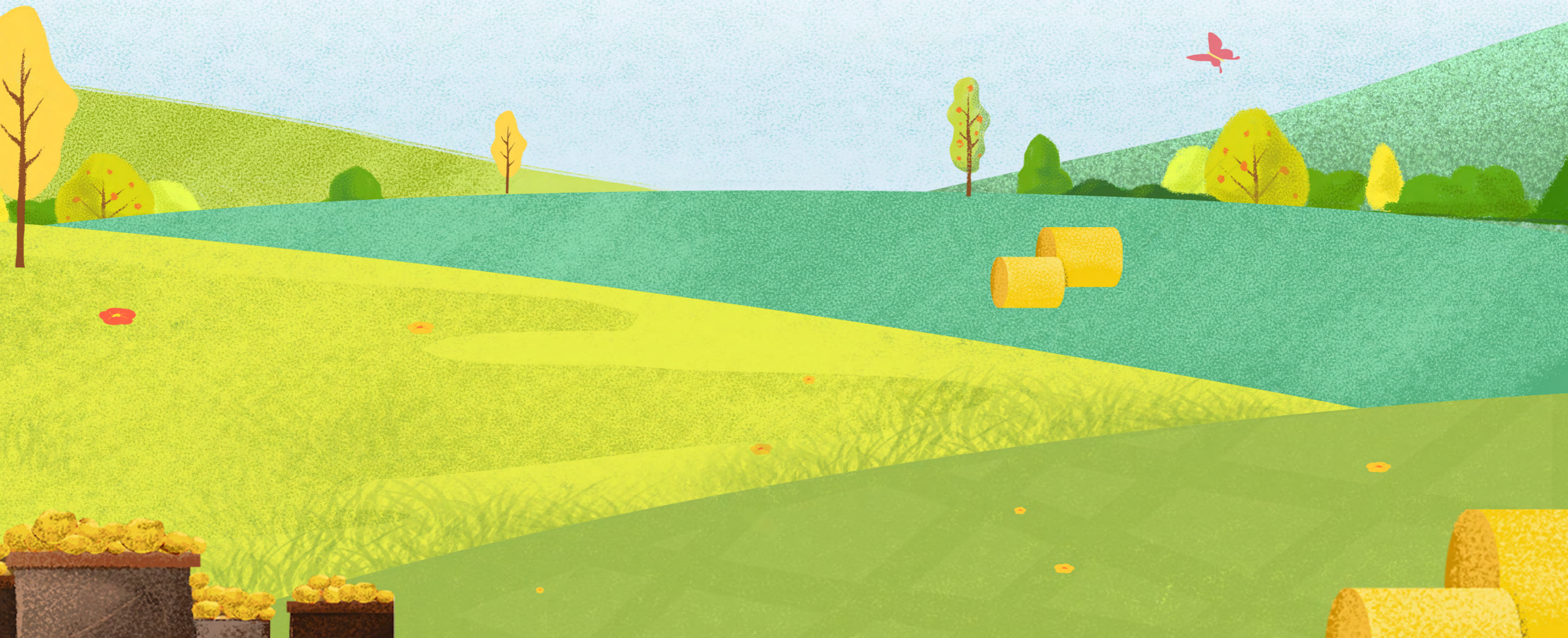


Awards and Recognitions



MAP Green and High-Quality Development

14	Sustainability Development Plans and Practices
16	MAP Agricultural Green and High-quality Development Index
18	2022 MAP Agricultural Green Development Survey
20	Resource Conservation
24	Environmental Friendliness
28	Industry Efficiency
32	Green Supply
36	Looking Forward



Sustainability Development Plans and Practices

Syngenta Group: The Good Growth Plan

Syngenta launched the Good Growth Plan in 2013, which have been achieved in 2020. Based on its unwavering commitments, Syngenta Group has launched the new Good Growth Plan, setting four new pillars and relevant quantitative targets until 2025.

Accelerate innovation for farmers and nature

\$2bn

- Invest \$2bn in sustainable agriculture breakthroughs
- 2 new sustainable technology breakthroughs per year
- Strive for the lowest residues in crops and the environment



Help people stay safe and healthy

8m

- Goal zero incidents in our operations
- Train 8m farm workers on safe use every year
- Strive for fair labor across our entire supply chain



Strive for carbon neutral agriculture

3m ha

- Measure and enable carbon capture and mitigation in agriculture
- Enhance biodiversity and soil health on 3m ha of rural land every year
- Reduce the carbon intensity of our operations by 50% by 2030*

Currently Syngenta Crop Protection and Syngenta Seeds only.



Partnering for impact

- Build cohesive partnerships and publish their sustainability objectives
- Launch innovation dialogues for inclusive consultation on sustainability
- Board level governance of sustainability



Regenerative Agriculture

Regenerative agriculture is a results-oriented agricultural production system that combines both innovation and tradition, which can help restore soil health, promote biodiversity, mitigate climate impacts, protect water resources, and improve agricultural productivity and farmers' profitability.



Syngenta Group China: Promoting Sustainable Practices

Adhering to the concept of green development and harmonious coexistence of people and nature, and focusing climate resilience, Syngenta Group China takes a technological innovation-driven approach to practice environmental protection and low-carbon production, and spares no effort in promoting sustainable development transformation.



We spent 10 years researching and developing patented compound fungicides, reducing usage and increasing efficiency with the characteristics of low dosage, high targeted capability, wide applicability, and long-term effectiveness.



We cooperated with the National Agro-Tech Promotion and Service Center and the China Agricultural Industry Association to implement trainings to promote safe and scientific use of pesticide and protect the safety and health of farmers.



We cooperated with UNDP and the General Ecological Station of the Ministry of Agriculture and Rural Affairs, and jointly carried out the Run Tian Project, focusing on soil health, showcasing and promoting straw returning technology, and facilitating sustainable agricultural development in China.

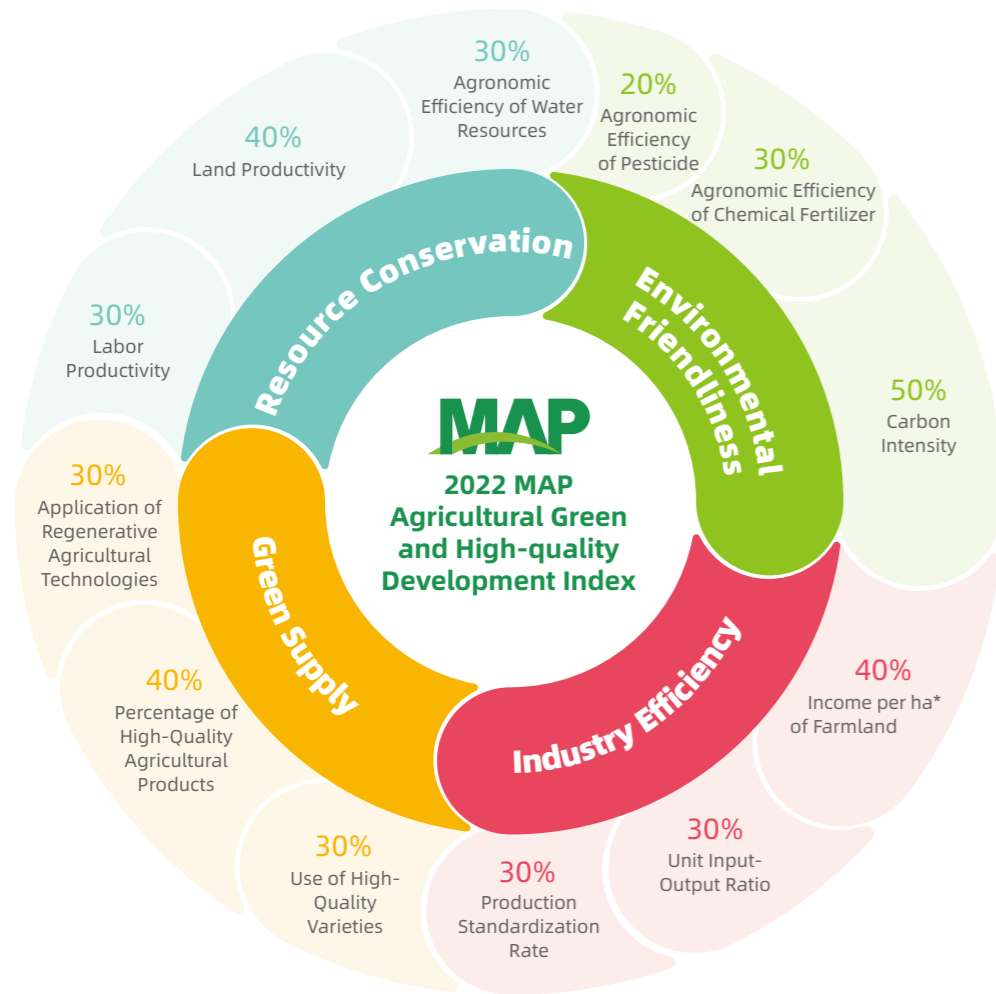


We collaborated with Beidahuang, Mengniu and other eight companies and jointly formed the Agricultural and Food Enterprise Alliance for Climate Change, working together to promote carbon sequestration and reduction measures and reduce greenhouse gas emissions in the industrial chain.

MAP Agricultural Green and High-quality Development Index

MAP is committed to promoting green agriculture by encouraging sustainable agricultural practices and raising the awareness of sustainable development among farmers, so as to maintain environmental conditions conducive to long-term agricultural development.

MAP supports the United Nations 2030 Agenda for Sustainable Development (SDGs) through its agriculture industry chain services. The MAP model contributes directly to reach Goal 2 (Zero Hunger) and significantly to achieve other five goals, including Goal 1 (No Poverty), Goal 6 (Clean Water and Sanitation), Goal 12 (Responsible Consumption and Production), Goal 13 (Climate action), and Goal 15 (Life on Land).



Note: Converted from data in mu, 1 ha=15 mu.

In 2022, based on the core concepts of sustainable agricultural development and regenerative agriculture, and aligned with China's carbon-peaking and carbon neutrality strategy, as well as *The No.1 Central Documents for 2022* and *The National Green Development Plan for Agriculture during the 14th Five-Year Plan*, China Agricultural Green Development Research Center and Sinochem Agriculture Holdings updated the previous MAP Agricultural Green Development Index and built the 2022 MAP Agricultural Green and High-Quality Development Index ("the Green Index"). During the process, we fully balanced between the needs of achieving sustainable development and ensuring agricultural supply, and followed the principles of materiality, systematic, independence, and applicability. The Green Index uses four primary indicators, including Resource Conservation, Environmental Friendliness, Industry Efficiency, and Green Supply, and 12 secondary indicators to measure the practices of green development by farmers from multiple dimensions. Scores of these indicators were calculated to reach a Green Index score, with a total score of 100, based on their relevant weights and in accordance with the research methodology.

Weight Determination of Indicators

The weights of the Green Index indicators are determined by using the expert scoring method following the Delphi methodology. Experts in the agricultural sector are selected to determine the weights independently, and the weights for the indicator are calculated based on their input statistically.

Calculation of the Green Index Score

Based on the survey data and the definition of indicators, we obtained the scale values of the secondary indicators, which are processed with the entropy weighting method to get the score of the secondary indicators, and calculate the scores of the primary indicators from the weighted sums of the secondary indicators before getting the Green Index score eventually.

Calculation Method of the Green Index Score and the Primary Indicators



Please scan the QR code to see the calculation methodology.

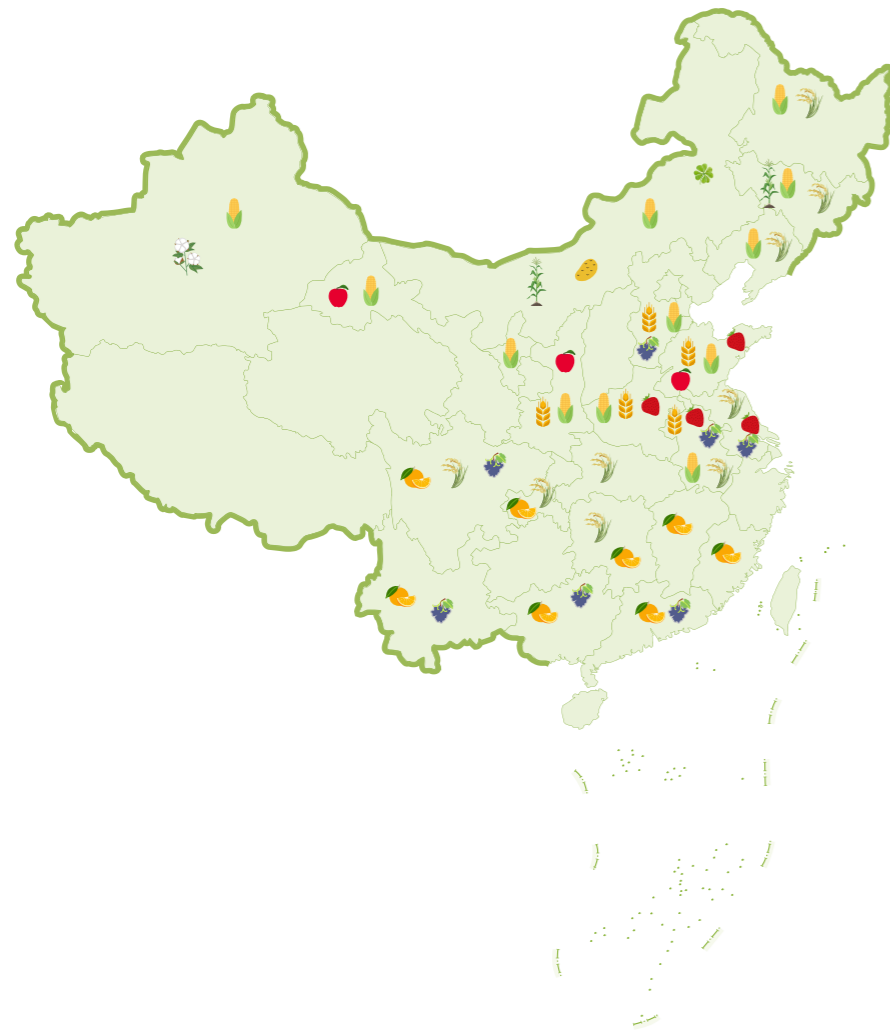
Calculation Method of the Secondary Indicators



Please scan the QR code to see the calculation methodology.

2022 MAP Agricultural Green Development Survey

In 2022, MAP conducted field and online surveys on the agricultural production of eleven crops, including rice, corn, wheat, apple, citrus, grape, strawberry, potato, silage corn, cotton, and alfalfa, namely three main grain crops and most common cash crops. The survey covered both farmers who had MAP services ("MAP farmers") and those had no MAP services ("non-MAP farmers").



21 provinces covered

2,771 valid questionnaires received, including **1,747** questionnaires from MAP farmers and **1,024** questionnaires from non-MAP farmers

33,318 ha of farmland surveyed, including **21,947** ha of MAP farms and **11,371** ha of non-MAP farms

Survey Results

2022 Green Index



Based on the analysis of four primary indicators calculated from nation-wide survey data, the average Agricultural Green High-quality & Development Index score of MAP farmers in 2022 is 43.29, which is 31.01% higher than that of non-MAP farmers surveyed.

2022 Green Index Score



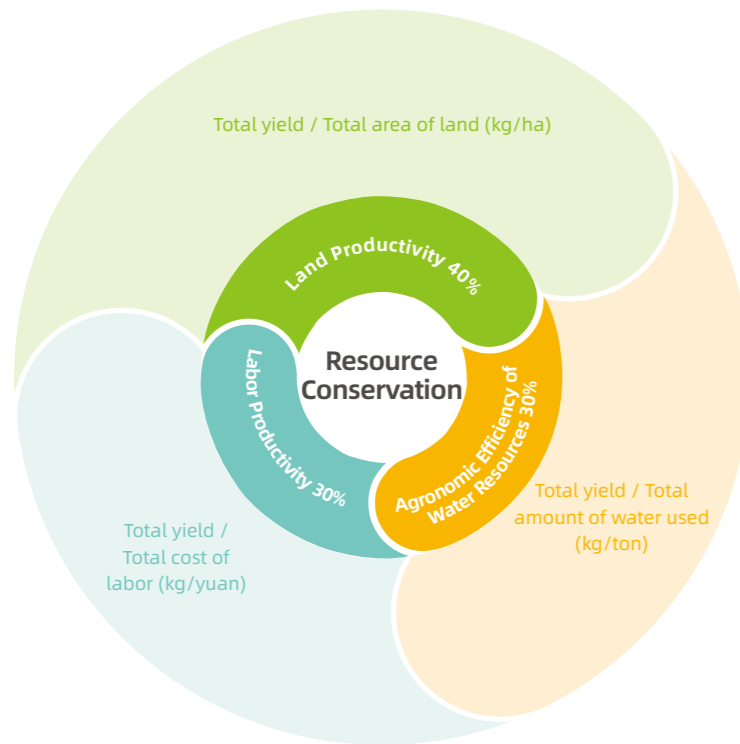
Resource Conservation

Protecting the ecological environment is a fundamental strategy that fosters productivity while maintaining harmony between people and nature. It is an essential approach towards realizing efficient and effective use of resources, and the effective protection and efficient utilization of agricultural resources such as arable land and water.




MAP focuses on addressing the major issues and challenges related to the utilization of agricultural resources. Through the adoption of various innovations and green practices, MAP enhances the management of standardized agricultural production throughout the entire process and helps farmers improve the efficiency of the utilization of key production factors such as land, water, and labor.



Indicators



Indicator Definitions

- 
Land Productivity
 The yield of a crop during a single production cycle per unit of farm land.
- 
Agronomic Efficiency of Water Resources
 The ratio between the total yield of a crop to the total amount of irrigation water used during a single production cycle. It is related to factors such as the natural conditions of the irrigation area, conditions of irrigation facilities, water management conditions, and irrigation technology used.
- 
Labor Productivity
 The ratio of crop yield to its corresponding labor cost in a single production cycle of the crop. The lower the production cost, the higher the labor productivity. The survey includes the cost of hiring labors and leasing agricultural machinery, and the payment to agricultural machinery operators, in the calculation of labor cost.

Survey Findings

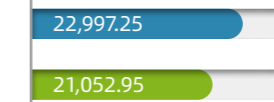
Average improvement with MAP services for Land productivity
9.23%

Average improvement with MAP services for Agronomic Efficiency of Water Resources
14.92%

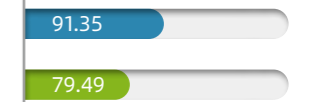
Average improvement with MAP services for Labor Productivity
26.25%



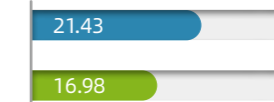
Land Productivity (kg/ha)



Agronomic Efficiency of Water Resources (kg/ton)



Labor Productivity (kg/yuan)



● MAP Farmers
● Non-MAP Farmers

Indicator Interpretations

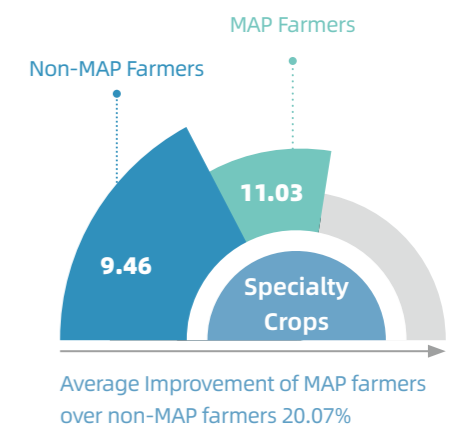
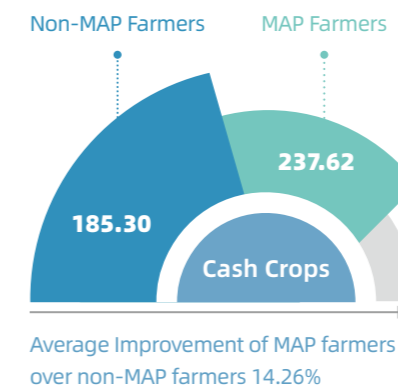
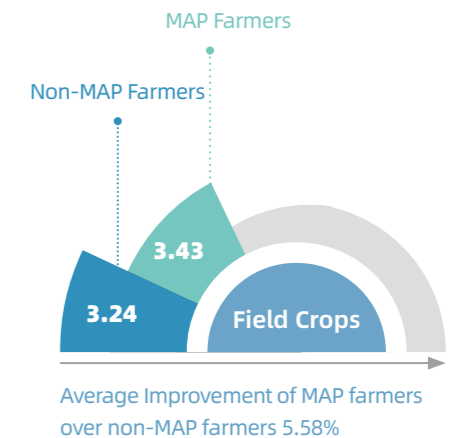
Agronomic Efficiency of Water Resources

MAP promotes water-saving agricultural practices and improves agricultural efficiency of water resources through technologies such as drip irrigation, soil moisture testing based irrigation, and precision irrigation, etc.

Precision Irrigation Technology

Precision irrigation technology is used to timely and appropriately meet the water needs of crops and realize efficient water utilization by comprehensively evaluating the relationship between yield, quality and water utilization rate of crops, with considerations of soil characteristics, climatic conditions, and other environmental factors, as well as a profound understanding of the growth process and water needs of test crops.

Agronomic Efficiency of Water Resources (Total yield / Total amount of water used, kg/ton)



Land productivity Increasing the Yield of Soybean and Other Oil Crops

The 2022 No. 1 Central Document called for enhanced efforts to enlarge the production of soybean and other oil crops. In order to implement the national strategy, MAP joins hands with its upstream and downstream partners, adopts a series of measures to effectively increase the yield of soybean and other oil crops, and has obtained good results.

Combined with agricultural machinery and agronomic knowledge, MAP promotes the ridge cultivation technique of "deep cultivation, layered fertilization and two-row cultivation" and high ridge density cultivation to replace the narrow ridge two-row cultivation mode used by farmers. Meanwhile, MAP introduces Pneumatic Precision Seed Drill to provide farmers with sowing services and enhance sowing uniformity as well as seedling density, so as to achieve the overall improvement of land productivity.

MAP applies seed coating and fertilization techniques to help crop tolerate the low temperatures in spring and protect

crops from diseases and pests. In addition, it takes innovative customized program combined with core master batch, slow-release nitrogen technology and foliar fertilization, so as to meet nutritional needs during crop growth and effectively raise soybean yield.



A soybean farmer served by MAP has good soybean yield.

With MAP services, the 533 ha of farmland of the Yilan Chengxin Cooperative realized an average productivity of 3,885 kg per ha, witnessing a year-on-year increase of 975 kg per ha and an income increase of RMB6,000 per ha of farmland. In particular, the productivity of 20 ha high yield experimental farm realized a local annual record of 4,725 kg per ha.

In 2022, MAP operates 68 technical service centers in Heilongjiang, Liaoning, Henan, Shandong and other major soybean growing areas, providing services to a total of 36,667 ha of soybean crop, raising yield by 600-862.5 kg per ha and earning the farmers RMB3,750-5,250 per ha of farmland.

Han Zhimin, Secretary-General of Chengxin Cooperative, expressed his joy, "We appreciate the full process services by MAP, and are looking forward to keep working with MAP next year!"

Agronomic Efficiency of Water Resources Promoting High-Efficiency Water Conservation for Cotton Industry Upgrading

As the pillar and regional advanced industry in northwestern China, the cotton sector plays a significant role in local economy.

MAP collaborates with local enterprises to explore the whole-industry-chain service approach for cotton industry, so as to promote the adoption of modern cotton planting and management technology. In 2022, MAP, focusing on precision irrigation and precision fertilization, introduced advanced irrigation technology, and developed digital, smart and modern

cotton farms based on environmental and plant growth data by learning from the "farm service centers" mode from Northern America, and made unmanned farming into reality.

MAP realizes the efficient use of water resources via automatic low-flow multi-frequency irrigation technology, reducing water consumption by 330-435 m³/ha in comparison with traditional drip-irrigation approach with a water saving rate of 20-26.3%.



MAP Automatic Low-flow Multi-frequency Irrigation System



Precision Irrigation Management Facility

Labor Productivity Mechanical Equipment Boosts Growth of Inner Mongolia's Potato Industry

Among the four major food crops, potato is the only crop that cannot be produced in a fully mechanized way, in comparison to rice, wheat and corn. The main unmechanized processes include seed potato-cutting and harvesting. The traditional method of potato production relies on hand cutting and manual sorting and bagging, which proves to be inefficient resulting in poor workforce management, high labor cost and frequent safety accidents. Imported mechanized seed potato cutting equipment has a number of problems, including high rate of blind seed pieces and infection. Combine harvesters are prone to cause damage to potatoes, which will lead to inventory loss.

MAP optimizes the disinfection process via adopting smaller seed potato-cutting mode, to eliminate seed potato cut without sprout and reduce wounds. This efficient disinfection method improves seedling rate of mechanical sowing and prevent the spread of disease. In combination with efficient fertigation, vine kill and other techniques, MAP manages to cultivate potatoes more suitable for large-scale mechanical combine harvesting with higher dry matter content and faster tuber aging.

In contrast to traditional practice, potato growing season can be extended by 5-10 days through the potato mechanization project, and labor costs can be lowered by RMB3,600 per ha.



Potato combine harvester

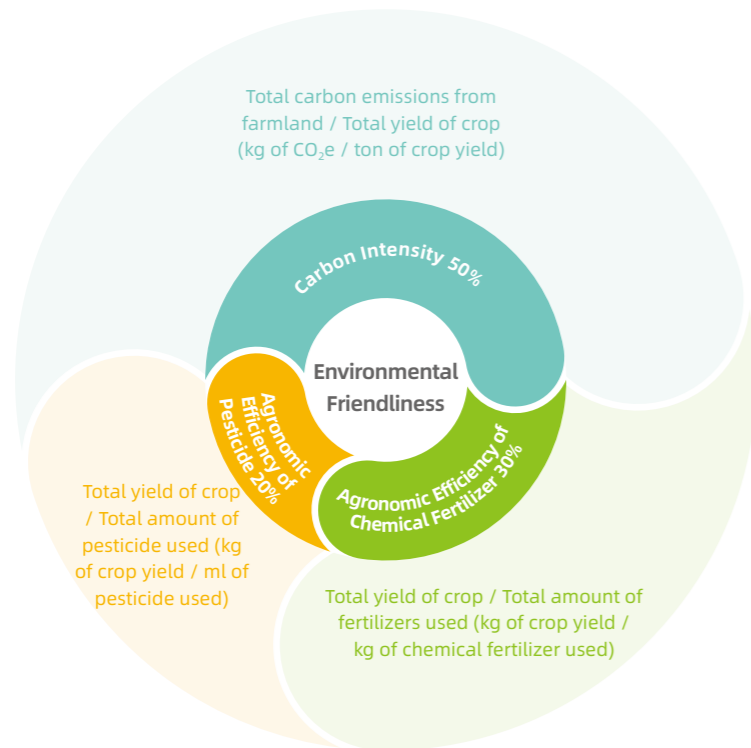
Environmental Friendliness

"To protect the environment is to protect our productivity, and to improve the environment is to develop our productivity." To promote the full-process green transformation of agriculture, it is essential to adhere to principles of both resource conservation and environmental protection. By doing so, we can strive to establish a new agricultural development pattern that fosters harmony between people and nature.

MAP strives to vigorously promote advanced technologies, such as soil nutrient management and green prevention and control of pests, with the aim of reducing farmers' reliance on chemical fertilizers and pesticides, and optimizing the growing environment of crops. We also attach great importance to climate change, and are committed to contributing to the reduction of agricultural greenhouse gas emissions in China.



Indicators



Indicator Definitions



Agronomic Efficiency of Chemical Fertilizer (kg of crop yield / kg chemical fertilizer used)

The crop yield that can be produced per unit of fertilizer application, which varies with factors such as crop varieties, soil conditions, cultivation management, and fertilization techniques.



Agronomic Efficiency of Pesticide (kg of crop yield / ml pesticide used)

The crop yield that can be produced per unit of pesticide application, which varies with factors such as the application time and the application tools used.



Carbon Intensity (kg of CO₂e/ton of crop yield)

The direct or indirect greenhouse gas emissions caused by various agricultural activities during the entire production process of producing a unit of crop yield. The survey includes seeds, fertilizers, pesticides, plastic sheeting, and energy consumption of agricultural machinery and irrigation as carbon emission sources.

Survey Findings

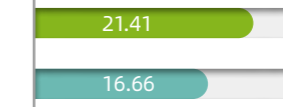
Average improvement with MAP services for Agronomic Efficiency of Chemical Fertilizer **28.51%**

Average improvement with MAP services for Agronomic Efficiency of Pesticide **21.54%**

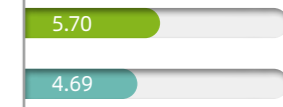
Average improvement with MAP services for Carbon Intensity **13.43%**



Agronomic Efficiency of Chemical Fertilizer (kg of crop yield / kg of chemical fertilizer used)



Agronomic Efficiency of Pesticide (kg of crop yield / ml of pesticide used)



Carbon Intensity (kg of CO₂e/ton of crop yield)



Indicator Interpretations

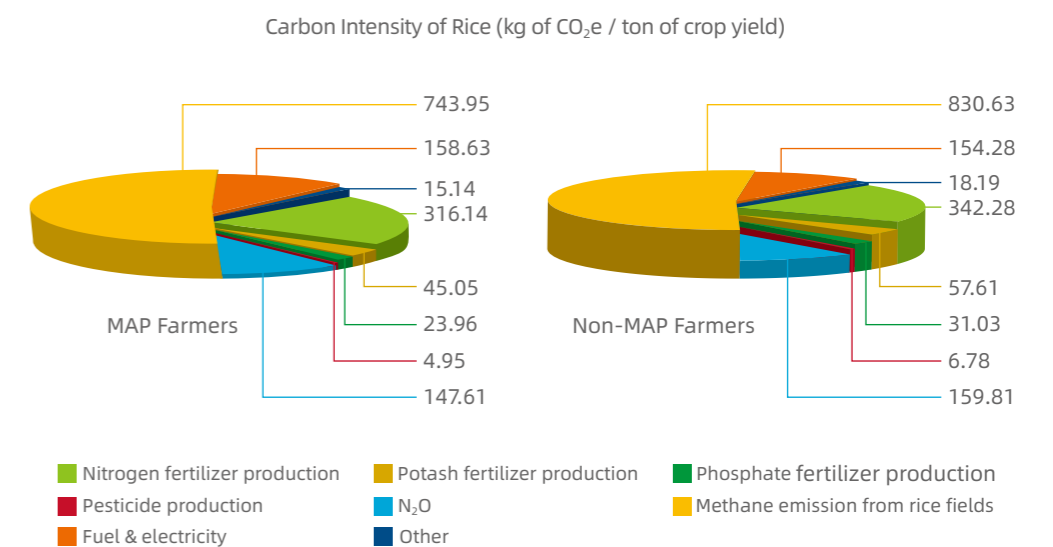
Carbon Intensity

Carbon emissions during crop planting and production mainly come from rice farming, the application of nitrogen fertilizers and the production of agricultural inputs. MAP actively promotes green practices to reduce emissions and enhance carbon sink effect, such as intermittent irrigation, chemical fertilizer reduction, conservation tillage and straw returning to the field, effectively reducing the carbon intensity of rice farming through MAP services.

Soil Testing and Fertilizer Formulation

Soil testing and fertilizer formulation is a major approach to reduce chemical fertilizer usage and increase fertilizer efficiency. It refers to providing farmers with customized fertilizer formula and proper amount of fertilizers and medium and trace elements, in combination with the appropriate application of organic fertilizers, and customized application plans, in accordance with the fertilizer requirements of crops, the fertilizing characteristics of soil, and the effectiveness of fertilizers.

For rice growing, the average improvement with MAP services for Carbon Intensity is **16.57%**



Agronomic Efficiency of Chemical Fertilizer Precise Soil Testing Facilitates Fertilizer Reduction and Efficiency Enhancement

In order to help farmers use fertilizer in a scientific way and improve fertilizer utilization efficiency, MAP makes every effort to promote soil testing and fertilizer formulation. While reducing fertilizer application, this practice also helps add medium and trace elements into soil to enhance crop stress resistance, realizing the goal of quality and efficiency improvement, simplification and sustainability.

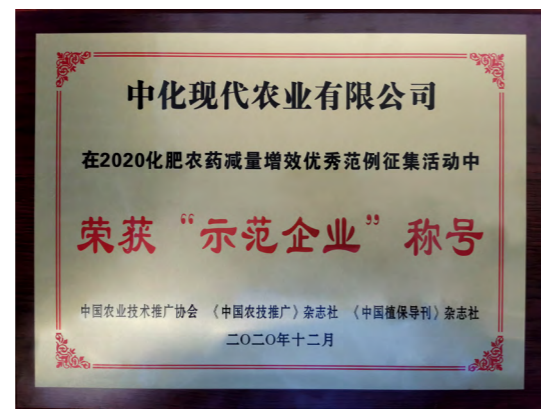
To date, MAP has set up over 600 service centers located in core advantageous production regions nationwide, and more than 30 fertilization stations based on regional demands so as to take both soil testing result as well as local planting

condition into sufficient consideration and put forward with the most suitable nutrition plan for farmers, which has covered the "last kilometer" of soil testing and fertilizer formulating implementation.

In 2022, MAP promoted soil testing for field crops and applied the technique to 400,000 ha of farmland, which helped reduce the use of nitrogen, phosphorus, and potassium fertilizers by 5.9%, 7.6%, and 8.5% respectively, with a total fertilizer reduction rate of 4.07%, equivalent to 15,542 tons of fertilizers in total.



Comparison of soil testing and fertilizer formulation results on seedling growth



MAP was recognized as a Model Enterprise for Pesticide and Chemical Fertilizers Reduction and Efficiency Enhancement.

Agronomic Efficiency of Pesticide Precision Crop Protection Monitoring Reduces Chemical Pesticide Application

Pests and diseases have been an important external factor limiting the yield and quality of cash crops such as fruits and vegetables. Frequent pesticide application not only increase the cost of labor and agricultural machinery, but also increase the risk of pesticide residues to a certain extent.

For growers of citrus, apple and other crops, MAP provides timely and accurate early warning of pests and diseases through pest forecast, UAV application and other technologies, as well as timely optimized crop protection service plans, ensuring both precision crop protection and less frequency and lower amount of chemical pesticides used.



Agricultural unmanned vehicle working in orchard

Citrus in Southern China

MAP significantly improved pest control efficiency and effect through accurate prediction, combined with the application of crop protection UAV, agro spray drones and optimized spray technology.

Apple in Qixia

With MAP services for two consecutive years, pesticide application frequency was reduced from 10 times to 8 times, saving the cost of pesticide use by 20%.

Carbon Intensity Developing Regenerative Agriculture as a Leader of Low-Carbon Agriculture

In 2022, Syngenta Group China and Nestlé China started the first regenerative agriculture demonstration farm in Huantai, Shandong Province. Data from Nestlé China indicates that the carbon emission per hectare of wheat produced by Huantai demonstration farm is only 60% of that of the control farm, providing the market with 140 tons of low-carbon wheat.

The close collaboration between Syngenta Group China and Nestlé China in regenerative agriculture is a good showcase

for the upstream and downstream enterprises in the food value chain to complement each other and work together, which plays a positive role in promoting the emission reduction of greenhouse gases in the whole life cycle of agricultural products. In the future, the two companies will continue to promote the establishment of low-carbon agricultural production norms and standards, enhance the promotion of regenerative practices, and jointly make greater contribution to the sustainable development of China's agriculture.



Delivery of the first batch of the low-carbon wheat



Low-carbon corn field in the Huantai Regenerative Agriculture Demonstration Farm

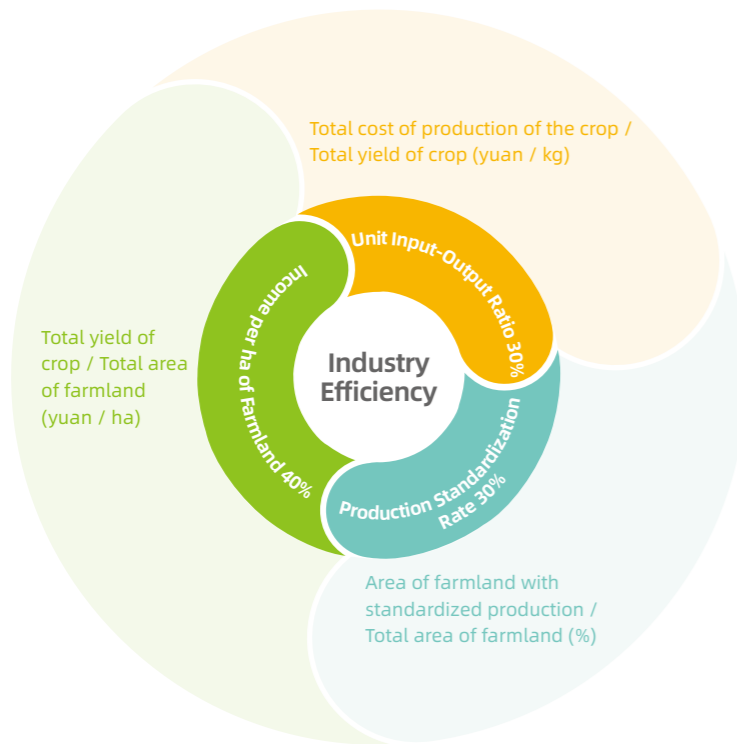
Industry Efficiency

The 14th Five-year Plan for Promoting Agricultural and Rural Modernization puts forward a development goal that prioritizes the steady improvement of the quality, efficiency, and competitiveness of the agricultural sector in China.

MAP constantly innovates and improves agricultural service models to help Chinese farmers improve the quality of agricultural produce and farming productivity. By doing so, we aim to improve standardization and efficiency, boost crop yields, reduce input costs, and support farmers in increasing their income through multiple channels, further exploring the potential to improve quality and efficiency.



Indicators



Indicator Definitions



Income per ha of Farmland

The total income per unit of farmland generated by farmers through the sale of crops. This indicator measures the benefits farmers receive from crop cultivation.



Unit Input-Output Ratio

Refers to the ratio of total planting cost to total crop output in the agricultural production process within a single crop production cycle. The smaller the value the better. The investment in planting in the survey includes land rent, seeds, fertilizers, pesticides, labor, agricultural machinery, irrigation, plastic sheeting, and other expenses.



Production Standardization Rate

Standardized production refers to standardized activities of the entire agricultural industrial chain. Standards for key industrial chain activities are formulated, revised and implemented to ensure necessary and reasonable level of standardization.

Survey Findings

Average improvement with MAP services for Income per ha of Farmland **14.06%**

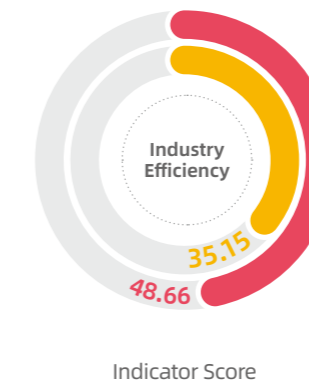
Average improvement with MAP services for Unit Input-Output Ratio **14.00%**

Average improvement with MAP services for Production Standardization Rate **25.27%**

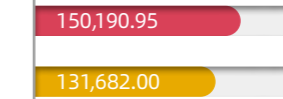
Average improvement with MAP services for field crops **7.78%**

Average improvement with MAP services for cash crops **17.60%**

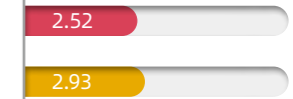
Average improvement with MAP services for specialty crops **10.92%**



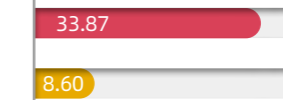
Income per ha of Farmland (yuan / ha)



Unit Input-Output Ratio (yuan / kg)



Production Standardization Rate (%)



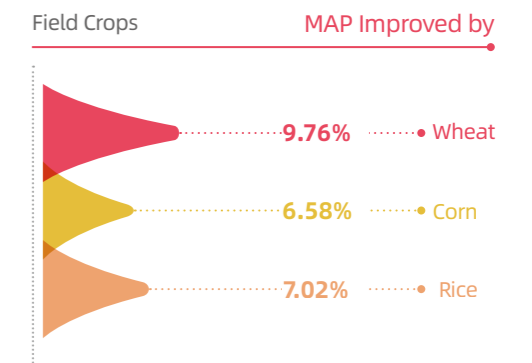
● MAP Farmers
● Non-MAP Farmers

Indicator Interpretations

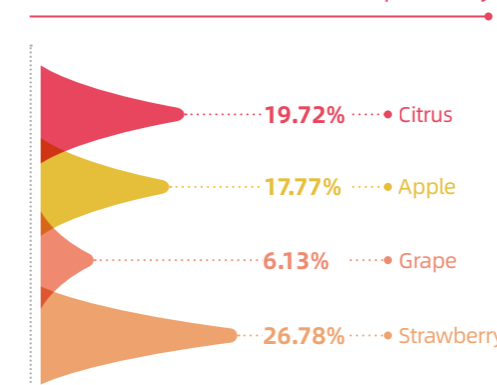
Unit Input-Output Ratio

The reduction of unit output input cost within the crop production cycle is a highly effective way to improve the industry efficiency of agricultural green development.

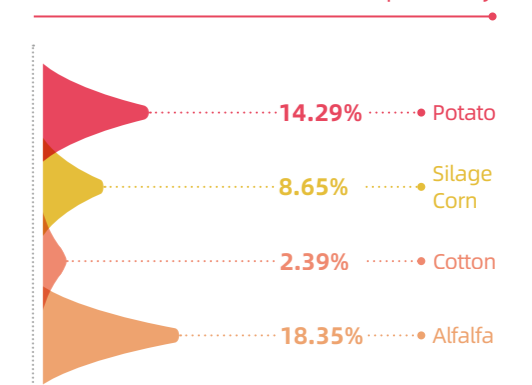
By enhancing the application efficiency of key synergistic technological products of seed, fertilizers, pesticides, and machinery, and providing farmers with full-process services ranging from cultivation, growing, management to harvesting, MAP help farmers improve planting efficiency, reduce cost, and improve both crop quality and yield.



Cash Crops



Specialty Crops



Income per ha of Farmland Wrapped Silage Alfalfa as an Innovative Solution to Reducing Forage Loss

Alfalfa is widely needed by the animal feed industry due to its rich content of high-quality crude protein and crude fiber. Its crude protein content, which is 2.47 times of that of corn, makes it a "must have" feed for lactating cows. As the price for imported US alfalfa hay increased to over RMB4,000 yuan/ton because the impact of complex global political and economic trends, cow farms were faced with significantly higher cost, making it a priority to find new ways to effectively utilize domestic alfalfa.

MAP made efforts to restructure, optimize and empower the local alfalfa industry chain, and implemented the new model of alfalfa utilization - wrapped alfalfa silage. Wrapped alfalfa silage can prevent the rain damage in the drying process, and

increase the income of planters by RMB9,000/ha. In addition, wrapped alfalfa silage can effectively retain 90-97% of the protein and vitamin of the crop with better palatability and digestibility, helping reduce the forage cost by RMB500 yuan/ton.

In 2022, MAP provided 31,000 tons of wrapped alfalfa silage to the newly founded dairy company "Adopt a Cow", accounting for 25.9% of its total demand and playing an important role in support the company to overcome its dependence on imported alfalfa and pursue its goal of reaching "12 tons" of daily dairy production.



Wrapped alfalfa silage



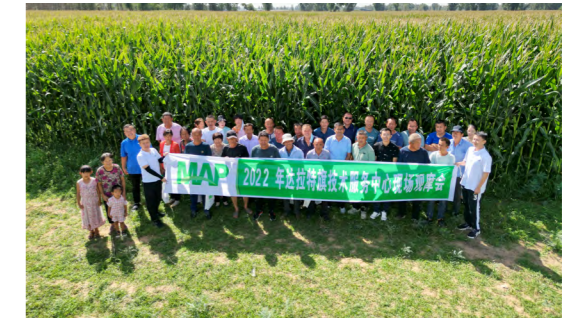
Alfalfa harvesting

Unit Input-Output Ratio Helping Farmers Reduce Costs of Corn Production with Full-process Services

In Dalat Banner, the local MAP Service Center provides farmer cooperatives with full-process farming services, covering "sowing, planting and harvesting", leveraging its core capabilities, such as large-scale operation, supply chain optimization, and scientific farming, to help improve farming efficiency and improve quality and yield. The cooperative allows its member farmers to fully realize the benefits of large-scale and scientific farming, and plays a leading role in helping local farmers alleviate poverty and increase income.

MAP provides the Daolao Cooperative full-process technical services, including seed selection, whole-process crop nutrition, whole-process crop protection, and intelligent agriculture, etc. In 2022, MAP provided services to 447 ha of silage corn. Through technical services such as soil testing and fertilizer formulation, crop growth inspection, high-efficiency fertigation, full-process crop protection, and quality traceability of wrapped silage, MAP helped improve the utilization efficiency of farming inputs, reducing fertilizer application by 26%, provide quality guarantee for the silage corn supplied, and increase the silage output by 16%.

By promoting rural cooperatives to develop towards low-carbon agriculture, MAP not only helps reduce the cost of agricultural inputs, but also contributes to the improvement of rural ecological environment and the green and sustainable development of agriculture.



Field demonstration of MAP full-process services

Production Standardization Rate Centralized Management Helps Small Farmers to Realize Scale Production

Jing'an Village is situated in Dingxing County, Baoding City, Hebei Province. With a population of 3,620, Jing'an village has 340 ha of arable land and 17 production teams. Previously, location, economic foundation, economic capabilities and other factors had been playing a detrimental role the village's development, and putting limits on the income of the village collective.

In 2020, MAP expanded its services in Dingxing. After understanding the situation of Jing'an Village, MAP proposed the business model of "village-level coops" accordingly. While keeping the farmers' land contract unchanged, farmers put their farms into a village cooperative, and entrust its management to the village collective, who contacted MAP's professional full-process services to realize higher productivity as well as higher revenue for both the farmers and the village collective.

In order to make full use of the local agricultural machinery resources and create jobs, the village collective took the lead in establishing the village cooperative to complete the sowing and watering tasks, leaving MAP in charge of the rest, including making planting plan, agricultural supplies supply, field management, crop protection and agro spray drones, and harvesting and sales, etc., all carried out in standardized way.

During the wheat planting season from October 2021 to June 2022, after deducting the guaranteed income of RMB15,000 per ha for farmers, the net income per ha reached RMB7,275, and the income of farmers and village collective both increased by nearly RMB300,000 respectively.

"By working with Sinochem Agriculture, we have higher yield and more income, and the cooperation also saves our time and efforts." Lin Jing, a local farmer, gave MAP a thumbs-up.



MAP and Dingxing County Agricultural Bureau of Hebei Province discussing the business model of "village-level coops"

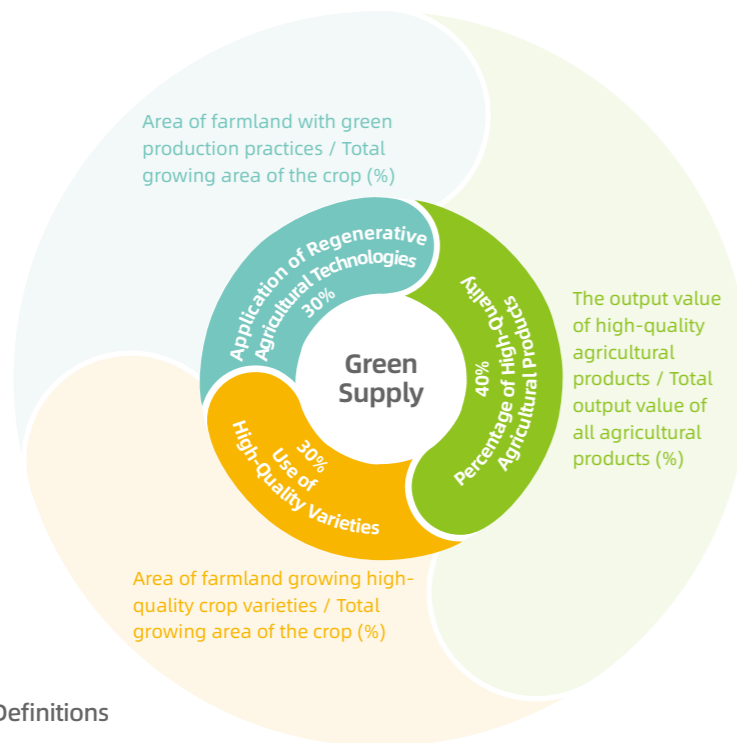
Green Supply

The National Green Development Plan for Agriculture during the 14th Five-Year Plan Period puts forward a development goal that prioritizes the “significant increase in the supply of green products”. This plan seeks to accelerate the implementation of standardized and green agricultural production, significantly improve the quality and safety of agricultural products and the proportion of branded agricultural products, and greatly enhance the influence of agricultural ecological services.

Adhering to the guidance of “quality and green agriculture”, MAP actively integrates and promotes green production technologies and practices. These practices include promoting variety screening, quality improvement, brand building and standardized production, and the application of regenerative agricultural practices, to encourage the development of green, high-quality, branded and specialty agricultural products.



Indicators



Indicator Definitions

- Application of Regenerative Agricultural Technologies**
 Regenerative agricultural practices include conservation tillage (no tillage or less-tillage, straw covering, green covering, etc.), soil testing and fertilizer formulation, and green crop protection (physical and biological), etc. During the survey, areas with one or more such practices are considered as areas with regenerative agricultural practice.
- Percentage of High-Quality Agricultural Products**
 The ratio of the output value of high-quality agricultural products to the total output value of all agricultural products. The term “high-quality produce” used in the survey refers to product produced with premium-pricing orders.
- Use of High-Quality Varieties**
 High-quality varieties refer to crop varieties that have valid national or provincial approval for growing in suitable ecological areas.

Survey Findings

Average improvement with MAP services for Application of Regenerative Agricultural Technologies **24.28%**

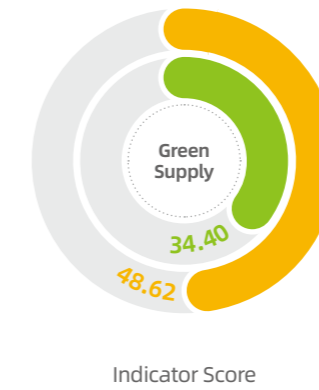
Average improvement with MAP services for Percentage of High-Quality Agricultural Products **3.27%**

Average improvement with MAP services for Use of High-Quality Varieties **7.23%**

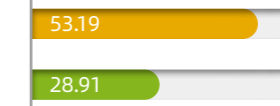
Average improvement with MAP services for field crops **19.90%**

Average improvement with MAP services for cash crops **24.52%**

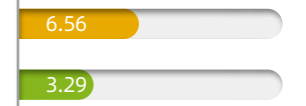
Average improvement with MAP services for specialty crops **27.32%**



Application of Regenerative Agricultural Technologies (%)



Percentage of High-Quality Agricultural Products (%)



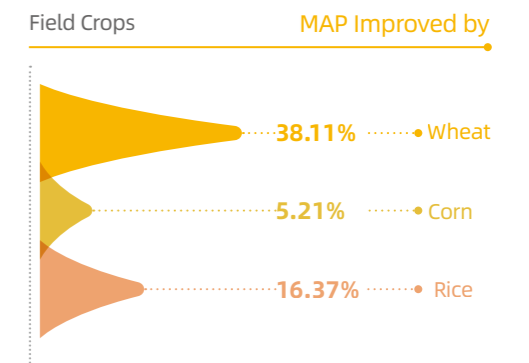
Use of High-Quality Varieties (%)



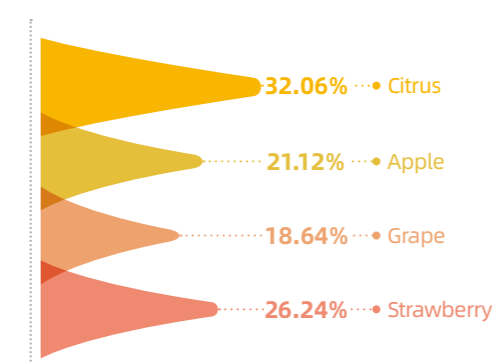
Indicator Interpretations

Application of Regenerative Agricultural Technologies

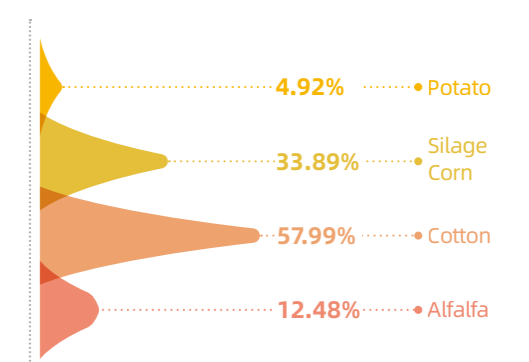
Adapting to different crops and climate conditions, MAP actively promote regenerative agricultural practices, such as conservation tillage, crop rotation and intercropping, green covering and straw return, and green crop protection in different areas, so as to restore and enhance soil health, adapt to climate change, conserve water resources, Application of regenerative agricultural technologies not only promotes the production of green and quality agricultural products, but also contribute to carbon capture and reduction of GHG emissions.



Cash Crops



Specialty Crops



Application of Regenerative Agricultural Technologies Green Coverage in Winter Contributes to Carbon Reduction and Soil Protection in North China

Since 2021, the MAP Pingyao Service Center has been actively exploring the high-efficiency crop rotation of "triticale + corn" in two years in accordance with local light and heat conditions, which are not sufficient to support two crop cycle per year. The triticale MAP introduced from Mexico is cold and disease resistant, and has enough competitive advantages in growth and no need for pesticide weeding during the growth cycle, providing an effective way to protect the farmland environment and solve the problems of soil nutrient depletion and diseases and pests damage caused by continuous farming. In addition,

green coverage in winter also helps mitigate the soil erosion caused by wind during winter.

This practice not only increases the yield per unit area by growing another feed crop on winter fallow fields, but also helps improve the multiple crop index of local crops. MAP has developed a new path of green and high-quality development to help farmers increase income and achieve greater prosperity, and was highly recognized by local government and growers.



Local government representatives and growers visit the demonstration farm



Triticale Harvest

Percentage of High-Quality Agricultural Products MAP beSide: Full-Process Traceability Underpins Product Quality

In Rui'an City, Zhejiang Province, MAP authorized local farmers to grow two proprietary cauliflower varieties - the Yellow Cauliflower and the Purple Cauliflower.

Combining premium varieties with scientific management, the two colorful specialty cauliflower varieties became highly favored by consumers with their rich content of nutrients such as cauliflower anthocyanin and beta-carotene.

Production Planning



MAP agronomists worked together with local farmers to conduct field soil sampling and pest and disease research to select the most suitable planting plots, and developed customized planting and harvesting plans according to the characteristics of the plots.

Cultivation Technologies



MAP introduced a number of farming machinery, such as automatic seeding and breeding machine, furrowing rotary tillage fertilizing machine, transplanting and planting machine, agro spray drone, and cauliflower harvester, which not only enabled scientific fertilization, but also significantly boosted productivity by developing an agricultural machinery production mode that is suitable for strip fields.

Process Management



MAP beSide has stringent standards and requires full-process growth data of the cauliflower, to ensure the "from farm to fork" whole-process quality control that consumers can trust.



MAP beSide yellow and purple cauliflowers

Use of High-Quality Varieties Improving Variety Structure for Higher Yield and Better Quality

In Anlu City, Hubei Province, MAP integrated the resources including village collectives, large seed companies and other parties, to provide centralized seed supply, services and marketing support to 333 ha of land in 50 villages, aiming at helping farmers have higher productivity and more income.

MAP introduced the Quanyou 607 high-quality hybrid rice variety for large-scale promotion to solve the problem of fluctuating yields and unstable quality of local rice production that caused by too many varieties. MAP cooperated with the local leading enterprise Hefeng Grain and Oil to launch the

Deanfu organic fragrant rice with full-process traceability to achieve "premium price and high quality".

Local farmers commented that "Previously, as an individual grower, we could make RMB19,500 per ha after spending RMB15,000 on agro inputs. After we signed the contract with MAP this year, our yield increased to over 9,000 kg/ha, and we expected to earn RMB22,500 per ha of farmland. Moreover, our village collective can also get an income of RMB4,500 per ha."



Yield survey of rice varieties



Rice yield evaluation

Looking Forward

In 2022, based on its profound understanding of green and sustainable agriculture, MAP vigorously explored ways to promote the efficient use of land and water resources, reduced and efficient use of fertilizers and pesticides, the cultivation of Superior Varieties, Quality Improvement, Brand Building and Standardized Production (VQB-S), and the application of other agricultural green technologies. These efforts have achieved great results in terms of improved resource efficiency, higher yield and income, as well as reduced greenhouse gas emissions.

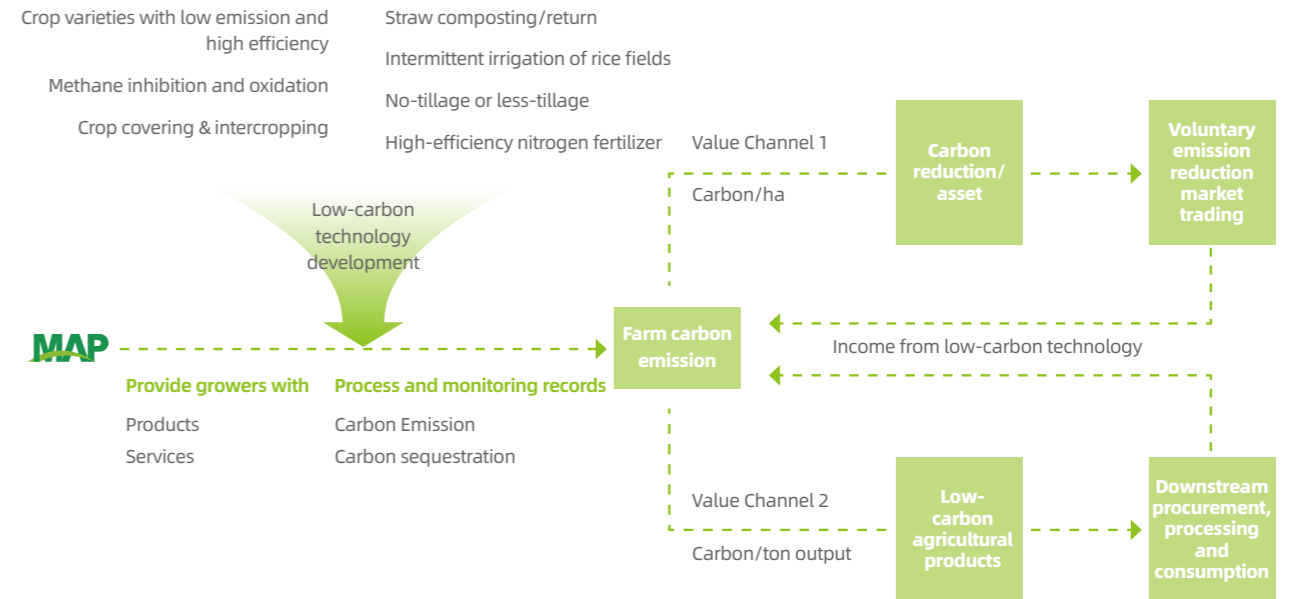
Based on the survey results, compared with cash crops, field crops and specialty crops have a higher degree of scale operation and a higher Green Index score, indicating a relatively higher level of green and high-quality development. However, the overall Green Index scores of the three types of crops are all below 50, which means that there is still room for improvement.

2022 Green Index Score by Crop



In the future, MAP will continue to leverage its advantages of full industry chain, actively develop and apply regenerative agricultural technologies, provide full process agricultural services to help ensure food security, resource security, and ecological security, and actively explore and practice the MAP green and low-carbon model, contributing to the green and high-quality development of China's agriculture by helping farms in China reduce carbon emissions while increase efficiency.

The MAP Green Low-Carbon Model



About this Report

Reporting Period

The survey data in the report was collected from July to September 2022, mainly covering the full growth period of crops in 2021. All other data cited was as of the end of December 31, 2022 unless otherwise noted.

Source of Data

During the research, the following areas have been surveyed:

- Wheat:** Anhui, Hebei, Henan, Shandong, and Shaanxi;
- Corn:** Anhui, Gansu, Hebei, Henan, Heilongjiang, Jilin, Liaoning, Inner Mongolia, Ningxia, Shandong, Shaanxi, and Xinjiang;
- Rice:** Anhui, Heilongjiang, Hubei, Hunan, Jilin, Jiangsu, Liaoning, Sichuan, and Chongqing;
- Citrus:** Fujian, Guangdong, Guangxi, Hunan, Jiangxi, Sichuan, Yunnan, and Chongqing;
- Apple:** Gansu, Shandong, and Shaanxi;
- Grapes:** Anhui, Guangdong, Guangxi, Hebei, Jiangsu, Sichuan, and Yunnan;
- Strawberry:** Anhui, Henan, Jiangsu, and Shandong;
- Potato:** Inner Mongolia;
- Silage Corn:** Jilin and Inner Mongolia;
- Cotton:** Xinjiang; and
- Alfalfa:** Inner Mongolia.

Number of Valid Questionnaires

Crop	Valid Questionnaires	MAP Farmers	Non-MAP Farmers
Wheat	352	184	168
Corn	764	431	333
Rice	517	336	181
Citrus	370	280	90
Apple	278	203	75
Grape	108	77	31
Strawberry	110	79	31
Potato	47	23	24
Silage Corn	94	52	42
Cotton	87	53	34
Alfalfa	44	29	15
Total	2,771	1,747	1,024

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