Annex 1

Guidelines on Application for Key Special Project (Smart Agriculture) under the 2022 Guangdong Key Field R&D Program "Precision Agriculture and Ecological Green Technology"

The Key Special Project (Smart Agriculture) under the 2022 Guangdong Key Field R&D Program "Precision Agriculture and Ecological Green Technology" (hereinafter referred to as the "Project") is launched based on local agricultural characteristics and competitive industries to promote the mechanization, modernization and intelligent transformation of agriculture. The Project is also designed to empower the agricultural production and operation patterns with the next-generation information technologies, thus helping build a modern and eco-friendly agricultural production model featuring high efficiency, productivity, quality, and safety. By leveraging key technologies of smart agriculture, the Project focuses on technical research and demonstration of fruit, vegetables, tea, rice, livestock, etc., with an aim to boost the application of agricultural information technologies, agricultural mechanization and intelligent transformation, lead agricultural development, and ultimately ensure food safety.

The Project consists of 7 sub-projects. Applicants will be enrolled on merit. An application must cover all the research content and assessment indicators of the target sub-projects listed below. The technology application and demonstration of

the sub-projects will be carried out in Guangdong. In principle, each sub-project will be assigned to only 1 applicant, except under a circumstance where multiple applicants for the same sub-project have outstanding review results and different technical routes. For each sub-project, the implementation period is 3-5 years, the number of application organizations should be no more than 6 and the number of individual participants should be no more than 15.

Sub-project 1: Smart control and management of orchards in Lingnan (No.20220209)

1. Research content

In view of the fact that the production at orchards in Lingnan is labor-intensive, this sub-project focuses on the following research targets: Transform the tree shape for higher photosynthetic efficiency, regulate the balance between nutritional and reproductive growth. Build a digital model for the growth cycle of local distinct fruit to standardize production management. Develop a real-time big data processing technology for smart orchards, develop a precise management and control platform for smart orchards, and select demonstration orchards for achievement application.

2. Assessment indicators

(1) Achieve breakthroughs in 3-5 key technologies, such as tree shape transformation for higher photosynthetic efficiency, refined regulation of nutritional and reproductive growth, digital modeling of a fruit growth cycle, and standardized management of vacant lots.

(2) Develop 1-2 edge and terminal intelligent orchard patrol devices, as well as 1 smart orchard precise management and control platform based on big data processing technology.

(3) Select more than 2 agricultural science and technology parks or modern agricultural industrial parks as demonstration bases for achievement application.

3. Selection method, funding amount, and requirements

(1) Selection method: on merit

(2) Funding amount: no more than RMB 5 million

(3) Requirements: The applicant must be an industry-university-research consortium led by an enterprise.

Sub-project 2: Smart production, harvesting, and transportation of open-field-cultivated gourds (No. 20220210)

1. Research content

In view of the fact that the open-field-cultivated gourds in southern Guangdong mature in different time and require heavy harvesting work, this sub-project focuses on the following research targets: Develop low-cost methods and equipment for lossless monitoring of fruit maturity, analyze key factors affecting fruit maturity, build a growth model based on fruit yield and key quality, establish big-data-based product knowledge graphs. Develop a standardized agronomic management technology model that can align the fruit maturity and match the application of agricultural machinery, develop a typical decision-making model and precise control equipment for smart gourd production, develop mechanized harvesting equipment and field transportation equipment. Integrate and build an intelligent

production system for open-field-cultivated gourds, and select demonstration bases for achievement application.

2. Assessment indicators

(1) Achieve breakthroughs in 3-4 key core technologies such as lossless monitoring of gourd maturity, big-data-based knowledge graphs, intelligent production management. Formulate 1 set of technical standards for the planting of gourds with a similar maturity.

(2) Develop 1-2 sets of precise control equipment for gourds cultivation. Develop 1-2 sets of harvesting and field transportation equipment.

(3) Select more than 2 agricultural science and technology parks or modern agricultural industrial parks as demonstration bases for achievement application. Reduce the costs of fertilizer and water management and harvesting labor by 40% compared with traditional production patterns.

3. Selection method, funding amount, and requirements

(1) Selection method: on merit

(2) Funding amount: no more than RMB 5 million

(3) Requirements: The applicant must be an industry-university-research consortium led by an enterprise.

Sub-project 3: Industrialized, efficient grafting technology and equipment (No. 20220211)

1. Research content

Given that the current fruit and vegetable grafting is faced with challenges such as dependence on manual work, low productivity, and lack of fast grafting equipment, this sub-project

focuses on the following research targets: Develop an efficient automatic production model integrating automatic grafting and grafted seedling cultivation. Develop technologies for grading picking of grafted seedlings, high-speed synchronous automatic grafting, and high-density healing. Develop high-speed grafting equipment. Develop an efficient, automatic conveying and healing equipment system. Integrate the technologies of high-speed automatic grafting, efficient logistics transportation, and efficient healing, develop a complete set of equipment systems for efficient, industrialized grafting of solanaceous fruits and vegetables, and select demonstration bases for achievement application.

2. Assessment indicators

(1) Establish 1-2 efficient, industrialized grafting models. Achieve breakthroughs in 3-4 technologies such as grading picking of grafted seedlings, high-speed synchronous grafting, and high-density healing of grafted seedlings.

(2) Develop 1 high-speed grafting equipment system for solanaceous fruits and vegetables. Develop 1 set of large-scale and efficient three-dimensional grafting and seedling healing technologies. Develop 1 large-scale mobile seedbed conveying unit plus 1 healing chamber for grafted seedlings.

(3) Select more than 2 leading agricultural enterprises or seedling production bases as demonstration bases for achievement application.

3. Selection method, funding amount, and requirements

(1) Selection method: on merit

(2) Funding amount: no more than RMB 5 million

(3) Requirements: The applicant must be an industry-university-research consortium led by an enterprise.

Sub-project 4: Intelligent picking and precise quality control of high-quality famous tea (No. 20220212)

1. Research content

Given that the tea industry is faced with challenges in precise picking and quality control, this sub-project focuses on the following research targets: Develop technologies for the growth consistency and precise quality control of tea leaves. Develop the technology for fast, large-scale tea quality inspection based on data on tea polyphenols, free amino acids, and caffeine. Develop mechanized tea leaf picking equipment and supporting technologies based on intelligent identification and precise positioning. Develop a comprehensive check and grading technology based on the appearance and quality of tea leaves, and the tea leaf grading equipment. Develop an intelligent picking and precise quality control system for high-quality famous tea, and select demonstration bases for achievement application.

2. Assessment indicators

(1) Achieve breakthroughs in 5-6 key core technologies such as tea growth consistency and precise quality control, inspection of tea bud growth and quality, intelligent identification and precise positioning of tea buds, and rapid grading of tea leaves.

(2) Develop 2 tea leaf picking and grading devices based on intelligent identification and precise positioning.

(3) Select more than 2 leading agricultural enterprises or high-tech enterprises as demonstration bases for achievement application.

3. Selection method, funding amount, and requirements

(1) Selection method: on merit

(2) Funding amount: no more than RMB 5 million

(3) Requirements: The applicant must be an industry-university-research consortium led by an enterprise.

Sub-project 5: Precision rice farming technology and intelligent equipment (No. 20220213)

1. Research content

Considering that the rice farming industry in Guangdong is faced with challenges such as low level of mechanization and lack of intelligent planting equipment, this sub-project focuses on the following research targets: Combine agricultural machinery and agronomy and develop precision seedling raising and transplanting technologies such as efficient sowing and growing of hybrid rice and dense seedling planting and transplanting of conventional rice. Develop precision direct seeding technologies such as pneumatic precision rice seeding and low-altitude drone precision seeding. Develop technologies such as rapid detection of field seedling emergence and visual positioning for automatic seedling replenishment. Develop new-type intelligent equipment such as a complete set of precision seedling raising and transplanting equipment, pneumatic precision direct seeder, unmanned seed drill, and lightweight automatic seedling replenisher, and select demonstration bases for achievement application.

2. Assessment indicators

(1) Achieve breakthroughs in 6-8 key core technologies such as precision seedling raising, dense seedling planting, rapid detection of field seedling emergence, visual positioning for seedling replenishment, pneumatic precision seeding, and low-altitude row seeding by drone.

(2) Develop 4-6 new types of equipment, such as a complete set of precision rice seedling raising equipment, pneumatic precision direct seeder, unmanned row seeder, and automatic seed replenisher.

(3) Select 2-3 national experimental stations for rice farming, or rice farming industrial parks or science and technology parks at the provincial/ministerial level or above as demonstration bases for achievement application.

3. Selection method, funding amount, and requirements

(1) Selection method: on merit

(2) Funding amount: no more than RMB 6 million

(3) Requirements: The applicant must be an industry-university-research consortium.

Sub-project 6: Industrialized healthy breeding technologies for multi-floor pig houses (No.20220214)

1. Research content

Given the pig breeding industry is faced with challenges such as lack of land, low utilization of flat breeding space, and low level of digitalization, this sub-project focuses on the following research targets: Develop technology and equipment for intelligent, dynamic collection of data such as pig behavior, and

temperature, humidity, light and air quality of different areas, under the multi-floor, single-floor closed-space and high-density breeding modes, build an early warning model for pig growth, health, and pig house environment control. Develop technology for intelligent regulation of environment in different functional areas and nutrition in different growth stages of pigs, as well as key technologies such as refined biosafety control and early warning under the industrialized closed-space mode. Develop a complete set of IoT-based breeding control equipment, and a system for mobile monitoring of pig health and behavior based on the biological characteristics and behavioral habits of pigs. Develop a digital and intelligent management and control platform for the whole process of pig production, and select demonstration bases for achievement application.

2. Assessment indicators

(1) Achieve breakthroughs in 4-6 key technologies such as perception of abnormal pigs under closed-space and high-density breeding modes, dynamic perception and online analysis of regional environmental indicators, intelligent control of multi-floor pig houses, precise group feeding, and feed-to-meat ratio monitoring.

(2) Build 1 comprehensive healthy breeding process model for pig houses. Integrate 1 intelligent environmental control system suitable for healthy breeding in multi-floor pig houses. Establish 1 intelligent biosafety early warning platform for multi-floor, closed-space, free-range pig houses. Formulate 2-3 standards for precise environmental management and multi-floor breeding.

(3) Select 1-2 industrialized pig farming enterprises as demonstration bases for the application of the developed digital and intelligent management and control platform. Improve the breeding efficiency and profitability by more than 10%.

3. Selection method, funding amount, and requirements

(1) Selection method: on merit

(2) Funding amount: no more than RMB 5 million

(3) Requirements: The applicant must be an industry-university-research consortium led by an enterprise.

Sub-project 7: Smart evaluation and precise application of important inputs for the prevention and control of livestock and poultry diseases (No. 20220215)

1. Research content

Given that China's livestock and poultry industry lacks technologies for on-site, real-time disease detection, rapid evaluation of drug and vaccine effects, and precise drug selection and intelligent application, this sub-project focuses on the following research targets: Develop intelligent point-of-care testing (POCT) equipment based on time-resolved fluoroimmunoassays (TRFIAs), conjugated enzyme, chemiluminescence, etc., as well as supporting detection technologies. Develop technologies for rapid, lossless evaluation of drug quality and rapid detection of antibacterial drug susceptibility. Develop technologies for precise administration of drugs for prevention and control of different animal diseases based on the pharmacokinetic-pharmacodynamic model. Develop intelligent equipment for on-site precision drug delivery and robots for daily immunization of

livestock and poultry. Build a database of pathogens and drug-resistant bacteria covering major breeding areas in Guangdong. Establish a smart platform for the animal disease prevention and control inputs, and select demonstration bases for achievement application.

2. Assessment indicators

(1) Develop 1-2 sets of POCT equipment for livestock and poultry diseases, and 3-5 supporting technologies for intelligent detection.

(2) Achieve breakthroughs in 3-4 key technologies such as rapid lossless evaluation of the quality of major livestock and poultry drugs, rapid detection of antibacterial drug susceptibility, and precise drug administration. Develop 1-2 sets of intelligent equipment for on-site drug administration.

(3) Build 1 database of pathogens and drug-resistant bacteria covering major breeding areas in Guangdong. Build 1 comprehensive platform for smart medication.

(4) Select more than 3 large-scale group breeding enterprises as demonstration bases for achievement application. Reduce the incidence of major animal diseases by 5%-8%, the use of veterinary antibiotics by 20%, the resistance rate of major pathogens by 20%, and the cost of vaccines and drugs by 20% in the demonstration bases.

3. Selection method, funding amount, and requirements

(1) Selection method: on merit

(2) Funding amount: no more than RMB 5 million

(3) Requirements: The applicant must be an industry-university-research consortium.