South-South Cooperation on Science and Technology to Address Climate Change

Applicable Technology Manual Agriculture and Forestry

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Recycled Paper

3rd Edition

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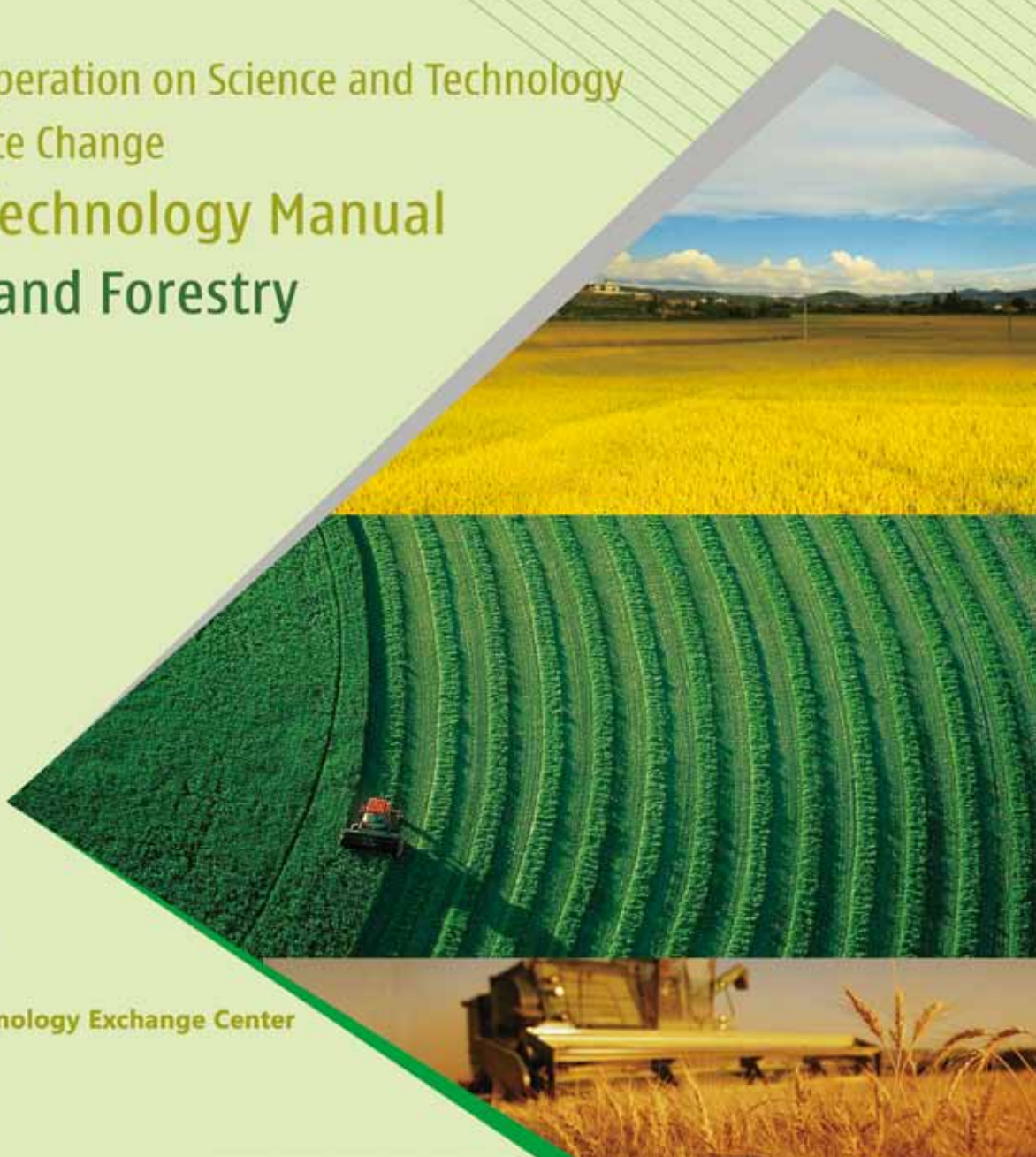
South-South Cooperation on Science and Technology to Address Climate Change

Applicable Technology Manual

Agriculture and Forestry



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China Science and Technology Exchange Center

3rd Edition

South-South Cooperation on Science and Technology to Address Climate Change

Applicable Technology Manual

Agriculture and Forestry

Editorial Board

The Editorial Board appreciates comments and suggestions from the readers.

Introduction

This Manual provides the information of applicable technologies to address climate change, aiming at facilitating cooperation among developing countries in addressing climate change through joint research and development, technology transfer and dissemination, training, building indigenous technological capability.

The editorial board released 1st edition of the Manual at UNFCCC COP16/CMP6 in Cancun, 2010, and released the 2nd edition at UNFCCC COP17/CMP7 in Durban, 2011. The released editions are the comprehensive volume, consisting of about 140 technologies in different areas. According to users´ feedback, the editorial board has revised the 3rd edition and released the compact disc instead of paper. The 3rd edition consists of three volumes in the field of renewable energy, agriculture and forestry, water resources and environmental protection respectively. Each volume covers about 100 technologies.

Hard copies, either CD or printed brochures, could be distributed only to limited readers, while it is made more accessible to wider audience by be published on the network/website. In order to contribute to further improving the capacity of developing countries in addressing climate change and promoting sustainable development, Ministry of Science and Technology, China has launched the Network/Platform for International Science and Technology Cooperation: Address Climate Change and Achieve Sustainable Development. With the goal of promoting knowledge diffusion, technology development and transfer, information sharing, the Network/Platform is an open, non-profit Platform to facilitate international science and technology cooperation for the benefit of all users from the world. The PDF version of the Manuals is available for download from the website (http://www.actc.org.cn) of the Network/Platform.

Partners from developing and developing countries, international organization and other stakeholders are warmly welcome to join us in building up this Network/Platform.

More information, please visit http://www.actc.org.cn.

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Disclaimer

Table of Content

South-South Cooperation on S&T to Address Climate Change

Applicable Technology Manual Agriculture and Forestry

Agricultural technologies

Agriculture is fundamental to human survival. It is also the most vulnerable sector to climate change. Today, the world is still facing severe food challenges, with nearly 1 billion people living in hunger. The application of water-saving technologies for drought resistance, cultivating technologies for yield increase, plus the use of resistance varieties and environment-friendly fertilizers will not only increase developing countries' adaptation capacity to climate change in the agricultural sector, but also holds the key for poverty alleviation in these countries and the achievement of UN Millennium Goals.

1. Drip irrigation technology

Technology overview

Functions and use: Drip irrigation is a partial irrigation technology which slowly drips filtered water at a certain pressure into the plant roots via a drip irrigation system and water dropper.

Technical information: (1) 16mm built-in drip irrigation pipe with cylindrical dripper: flow rate: 3.0L/H; dripper interval: 30-100cm; and wall thickness: 0.8-1.2mm. (2) 16mm built-in drip irrigation belt with flat dripper: flow rate: 2.0L/H; 3.0L/H; dripper interval: 20-100cm, and wall thickness: 0.2-0.6mm. And, (3) 16mm single wing labyrinth dripper belt: flow rate: 2.8L/H; dripper interval: 30cm; and wall thickness: 0.2mm.

Scope of application: (1) Irrigation of field crops such as cotton, potato, pepper, tomato, maize, vegetables, etc. (2) irrigation of facility agriculture, such as greenhouse vegetables, flowers, seedlings, etc. (3) irrigation of cash trees and fruit trees, such as jujube, apricot, apple and peach trees, sugar cane, shelter belts and urban greening zones.

Technological features: (1) Water saving: usually saves 30-50% more water than ground irrigation; (2) even irrigation: drip irrigation evenness can usually reach 80-90%; and (3) yield enhancing: drip irrigation can duly supply water and fertilizer to the crop root zones, causes no soil compaction and can increase yield by over 30%.

Status of application

Has been promoted and applied; can be put into industrial production in developing countries; ready for use after simple training; inexpensive to use, high initial input cost but low subsequent use cost, and users can carry out their own maintenance.

Each year, the technology provider directly transfers agricultural 16mm built-in drip irrigation belts with flat drippers to Thailand for vegetable and flower irrigation; transfers set technology and equipment to Mongolia for grassland irrigation; and transfers set technology and equipment to Cuba for sugar cane irrigation.

Technology Provider

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2. Highly-efficient, water-saving field drip irrigation technology

Technology overview

Functions and use: This technology can meet the moisture and nutrient demands of crops at the correct time and in the right amount and provide a favorable growing environment in terms of the water, fertilizer, air and heat needed for field crops. It can speed up the crop development process, significantly enhance yield, improve agricultural product quality and greatly increase the efficiency of water and fertilizer use.

Technical information: Saves water by 30-50% increases the efficiency of fertilizer use by 10-15%, increases yield by 15-20% and raises quality grade by 1 class.

Scope of application: Field crops, melons, fruit and vegetables in arid regions.

Technological features: It is a controllable, precision irrigation technology that achieves high-efficiency water and fertilizer coupling. It can meet the moisture and nutrient needs of crops at the correct time and in the right amount with the added advantages of being simple to operate and convenient to manage.

Status of application

Has been promoted and applied; can be put into industrial production in developing countries; mature product; special training is required before use; high initial input cost but low subsequent use cost, and users can carry out their own maintenance.

This technology has been promoted and applied in Uzbekistan, Tajikistan, Pakistan, Zimbabwe, Benin, Togo and other countries over an area of over 10,000 Mu (one Chinese Mu is about 1/15 of a hectare), saving water by 40-50% and enhancing yield by around 50%.

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3. Drought adaptation technology

Technology overview

Functions and use: properly integrates different drought-resistant technologies, including soil moisture monitoring and forecasting, balanced fertilization, straw mulching, membrane mulching, furrow planting, conservation tillage, rainwater harvesting and storage, drought-resistant chemical seed coating and integral regulation and control of water and fertilize, and selects drought-resistant species to form a water-saving technology system according to the local conditions of the dry farming.

Scope of application: Adapted to promote in the arid and semi-arid area.

Technological features: The integration of various technologies, simple to use, low cost, high output, water-saving and drought-resistant.

Status of application

Has been promoted and applied; can be put into industrial production in developing countries; mature product; ready for use after simple training; and low cost.

Technology Provider

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Irrigation and water-saving farming

4. Field under-film drip irrigation technology

Technology overview

Functions and use: Field under-film drip irrigation technology places the drip emitter under a plastic film to irrigate. By providing a timely and proper amount of irrigation for crops, it increases crop yield and quality and generates more income.

Technical information: save water by 40%~50%, raise fertilizer use efficiency by more than 30%, control soil salinity, improve land use efficiency by 5~7%, cut power costs by 20~40%, raise crop yield by around 30% and increase income by over $500 per hectare.

Scope of application: This technology is mainly for use with field crops, vegetables and fruits, fruit trees, ecological forest, greenhouses, desert afforestation, barren hill afforestation and so on.

Technical features: Simple, low cost, high output, water-saving and drought-resistant.

Status of application

Has been promoted and applied; can be put into industrialized production in developing countries; simple training is required; low use cost; and free from maintenance.

The technology provider has implemented water-saving drip irrigation projects in the following countries: Tajikistan (>800ha), Kazakhstan (1,000ha), Uzbekistan (100ha), Pakistan (100ha), Zimbabwe (30ha), Angola (33 ha), Togo (400ha) and Benin (200ha).

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5. Field film mulching crop cultivation and yield-enhancing echnology

Technology overview

Functions and use: A crop plantation technology for dryland regions. The principle of this technology is to create alternating furrows and ridges, cover the ridges with film and plant crops in the furrows. Smooth film surfaces are used to redistribute and gather natural rainfall, and concentrate water around the seeds sowed in the furrows. This can effectively use small rainfall resources, notably improve moisture supply in dry farmlands and help crop growth. It can be used for corn, potato and other crops.

Technical information: (1) Select crop and prepare land. Dry flat land or terrace, mainly beans, wheat and potato crops; (2) Apply manure. Mainly use household manure at an amount of 3,000Kg per Mu (one Chinese mu is 1/16 of a hectare), with a combination of N, P and K fertilizers. (3) Select good seed. Early maturing or medium early maturing varieties; (4) Erect ridges. Use row markers to mark rows, with a width of 40cm for small rows and 70cm for big rows and a row height of 10cm. (5) Spread films. (6) Sow seed at appropriate times. Make point sowing in plantation holes, 3-5cm deep. 2 seeds in each hole and use fine sand or grass ash to seal holes. Cultivation density: 3,000-4,000 plants/mu (plant spacing x row spacing = 32-40cm x 55cm).

Scope of application: Suitable for promotion and application in semi-arid and arid regions with an annual rainfall of 300-350mm.

Technological features: Simple, feasible, low cost, high yield, water saving and drought-resistant.

Status of application

Has been promoted and applied; can be commercialzed in developing countries; simple training is required; low user cost; and maintenance-free.

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6. Water-permeable film mulching-based dryland high-yield cultivation technology

Technology overview

Functions and use: Adopts 1400mm-wide water-permeable film and three-row precision planters, applies sufficient base manure at one time, performs furrow opening, sowing and film covering at one time and allows due sowing. A wavy plantation zone is formed after seedlings are placed. It can gather micro rainfall to the crop roots, create a relative micro ecological environment with relatively favorable moisture, nutrient, air and heat and solve the problem of drought and moisture deficiency in crops.

Technical information: Water-permeable film width: 1400mm; depth: 0.006mm, and offering such features as water penetration, moisture retention, micro aeration, anti-aging and low pollution. Dryland corn yield is usually not below 1125kg/ha, with a maximum of over 15000kg/ha, 30% higher than dryland covered with ordinary film mulching and 100% higher than dryland without film mulching.

Scope of application: In cold regions with a total annual rainfall of >350mm, it can meet the water demand of high-yield corns. This new technology solves the difficult problem of moisture deficiency and can make full use of small rainfall resources and turn them into effective water for crop use.

Technological features: In ″VVV-shaped″ mulching, the 1400mm water-permeable film can push away dry soil at the surface and allow seeds to be sowed in wet soil, thus forming a micro porous green house. This helps fast seedling budding and causes no seedling burning. After seedlings are formed, the water-collecting furrows can gather small rainwater resources for high-efficiency utilization, equivalent to 2 times that of irrigation. This changes dryland into irrigated land.

Status of application

Has been promoted and applied; can be put into industrial production in developing countries; mature product; simple training is required; low user cost; and users can perform their own maintenance .

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7. Hybrid rice technology and hybrid corn technology

Technology overview

Functions and use: Use different hybridization advantages of rice varieties to increase unit yield and improve rice quality. To a certain extent, hybrid varieties can resist low temperature, pests and other disasters and require low pesticide usage. Use different inbred advantages of corn varieties to increase corn yield, resilience and quality.

Technical information: Hybrid rice can increase unit area yield by 20-50% over conventional rice. Super hybrid rice can achieve a unit yield of 12 tons/ha. Hybrid rice can endure air temperatures below 5-10℃ or above 40℃ and offers a high disease (pest)-resistant capacity. Good hybrid corn seeds can increase yield by 10-30% over ordinary varieties.

Scope of application: Though different types of hybrid rice and corn varieties have their own particular regions, hybrid rice and corn technologies apply to all rice-growing regions.

Technological features: The advantages of hybrids are a general law of nature. After successfully achieving rice three-line and two-line support, hybrid rice technology has been widely accepted and used and been tremendously successful. Rice and corn hybridization advantages are mainly reflected in nutritional, reproductive, resistance and quality advantages.

Status of application

Mature product; ready for use after special training; high initial input cost but low subsequent use cost; and maintenance personnel need to be trained or a maintenance station needs to be established.

The technology has been widely used in a number of countries in Southeast Asia and Africa.

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8. Wide-applicability rice variety

Technology overview

Functions and use: II You 838 is a new hybrid middle-season rice variety bred using hybrid breeding technology and radiomutagenesis. It can increase yield by 50% over Shanyou 63, the most widely planted variety at present.

Technical information: Planted as a middle-season rice, it has a total growth period of around 150 days, 1-3 days longer than Shanyou 63. With a plant height of 110-115cm, it has a strong resistance to lodging and a high seed setting rate. Its rice grains are translucent, with a small white belly. With a brown rice rate of 80.5%, it offers a better rice quality than Shanyou 63. Its rice plague resistance and field resistance are also better than those of Shanyou 63. It usually has a yield of 600-650Kg/mu(one Chinese mu is around 1/15 of a hectare), with the maximum at 800Kg/mu.

Scope of application: II You 838 is now one of the most adaptable rice varieties in the world. It is suitable for plantation in most regions in both hemispheres. Incomplete statistics show that from 1995 to 2000, II You 838 was planted over an accumulated area of over 150 million mu (one Chinese mu is around 1/15 of a hectare) in China, to become the most planted rice variety after Shanyou 63 in China. For several consecutive years, it is one of the most widely planted rice of the main varieties in China.

Technological features: High climatic adaptability, drought- and cold-resistant, superior rice quality and high yield.

Status of application

Can be put into industrial production in developing countries; special training is required.

II You 838 is a pilot variety which the Chinese government promotes worldwide. It has been planted in over 50 million mu in Bangladesh, Pakistan, Nepal, Myanmar, Malaysia, Guinea, Brazil, Peru and other countries. Among them, Viet Nam, by introducing the variety, has changed from a grain importer into a grain exporter.

Technology Provider

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9. Super hybrid rice variety

Technology overview

Functions and uses: fine rice variety.

Technical indicators: High yield, good quality, and strong adaptability. Under general fertility and cultivation conditions, the effective panicles per hectare may reach 1.65 million, 300 spikelets per panicle, and the 1000-grain weight is about 26g. The chalky grain rate of the rice is low; the rice is soft and delivers good palatability.

Application scope: suitable for developing and developed countries.

Features: large panicle, fewer tillers, lodging resistance; suitable for planting methods such as direct seeding or mechanized manipulating.

Status of application

The product is mature. No training is needed. The use cost is low. Maintenance by the customers is permitted.

Technology Provider

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10. Hybrid rice plantation technology

Technology overview

Functions and use: Hybrid rice variety offers high yield, good adaptability and resistance to pests and can increase yield to over 20% more than that of conventional rice. Hybrid rice variety supporting plantation technology can improve both yield and efficiency.

Technical information: (1) Hybrid rice variety maintains a yield level of 40-47Kg/ha; (2) high-yield hybrid rice plantation supporting technology can increase yield by over 10%; (3) hybrid rice seed production technology produces a high breeding yield of 200Kg and can produce over 250Kg of seeds.

Scope of application: Asia, Africa, South America and Pacific island countries.

Technological features: This technology features wide applicability, good yield and efficiency enhancing effect and higher overall quality of rice. Its advantages over general conventional varieties include large yield potentials, less seed usage and better seed production technology.

Status of application

Has been promoted and applied; ready for use after simple training; inexpensive to use and maintenance personnel need to be trained or a maintenance station needs to be established.

The hybrid rice technology was put into pilot use in the Philippines, Morocco and Mali in 2009. It involved experimentation with and demonstration of hybrid rice varieties and small-scale plantation and breeding technology.

Technology Provider

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11. Xindong 20 fine wheat variety and cultivation technology

Technology overview

Functions and uses: to promote the high-year technology of fine wheat variety and carry out large-scale development.
Technical indicators: the average yield per mu is 477.6kg.
Application scope: desert oasis irrigation zones.
Features: combine the high-yield, high-efficiency wheat technology system, management technology system and economic benefit assessment of the wheat production technology to form the critical technology for high-year and high-efficiency wheat production in the desert oasis irrigation zone.

Status of application

The technology has been put into use. Simple training is needed. The initial investment is large. The subsequent use cost is low. Maintenance by the customers is permitted.

Technology Provider

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12. High-temperature resistant, high-yield hybrid new rice variety II You 52

Technology overview

Technical indicators: (1) Yield: Average yield of 596.18 kg per 667m2,an increase of 4.60% compare to the check of II You 838; The yield per 667m2 in production test was 581.99 kg, an increase of 6.89% compare to II You 838. (2) heat resistance: the ability of the heat resistance was class 1, 2 levels higher than that of II You 838. In the demonstration projects in different regions, the variety shows a high seed setting rate and strong resistance to higher temperatures.

Application scope: applicable to the rice planting areas, especially the areas where the daily average temperature is higher.

Features: the product has such characteristics as high yield, resistance to higher temperature and low cost.

Status of application

The product has been put into use, may be industrialized in the developing countries and is mature. No training is needed. The use cost is low. The product is maintenance free.

Technology Provider

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13. Anti-scab or -sheath blight wheat varieties

Technology overview

Functions and use: Anti-scab or -sheath blight wheat varieties can be used in wheat production or as resistance sources to genetically improve wheat varieties.

Technical information: Reaches medium resistance to scab or sheath blight and generates yield equivalent to that of the control varieties.

Scope of application: These varieties can be put into pilot plantation in winter or spring wheat regions with warm winters.

Technological features: Disease-resistant varieties can reduce pesticide use, save agricultural cost, reduce pollution and increase yield.

Status of application

Mature product; simple training is required; low user cost; and users can perform their own maintenance.

Technology Provider

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14. New sweet and glutinous maize variety

Technology overview

Functions and use: The new sweet and glutinous maize variety can be used to produce or process fresh and edible fruit and vegetable products, such as fast-frozen maize, tinned maize and maize drinks. These can also be used as the raw material for other deep processing products.

Technical information: Possesses overall fine qualities, such as high yield, superior quality and resistance to disease. But, different varieties adapt differently to temperature.

Scope of application: Suitable for plantation in temperate, tropical and subtropical regions.

Technological features: The variety has reached or topped the high yield and disease resistance performances of US varieties and offers competitive price advantages in the market.

Status of application

Has been promoted and applied; can be put into industrial production in developing countries; mature product; ready for use without training; inexpensive to use; and maintenance-free.

The variety has been put into pilot plantation in Southeast Asian countries such as the Philippines and Malaysia. It has also started to be promoted for use in the Philippines, with an annual plantation area of over 200ha.

Technology Provider

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15. Safe, high-efficiency tropical vegetable production technology

Technology overview

Functions and use: This technology can improve the year-round supply of tropical vegetables, enrich varieties and increase returns from plantations.

Technical information: Uses multiple-resistant and superior-quality vegetable varieties suitable for tropical eco-environmental conditions, integrates intensive breeding, water-saving irrigation, efficient water and fertilizer use, facility plantation and other advanced technologies, and can increase yield by over 20% and economic returns by 30% over traditional plantation techniques.

Scope of application: Suitable for tropical regions in the South Pacific island countries, Southeast Asia, Africa and Latin America.

Technological features: Simple technology, and high practicality; small investment, and high returns; and strong regional applicability and suitability for tropical regions.

Status of application

Has been promoted and applied; can be put into industrial production in developing countries; ready for use after simple training; high up-front cost but low cost of use, and users can carry out their own maintenance.

Technology Provider

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Crop breeding

16. Sugar cane cross breeding technology and new sugar cane variety

Technology overview

Functions and use: (1) Mature sugar cane hybrid breeding technology and new sugar cane variety breeding technology; and (2) new sugar cane variety output, which increases yield for farmers and brings more economic returns to sugar companies.

Scope of application: Sugar cane breeding and planting countries and regions around the world. Especially applicable in Southeast Asian and African countries.

Technological features: Flowering induction is the foundation of the breeding of new sugar cane varieties. The promotion and application of new sugar cane varieties is an important technological basis for ensuring the renewal of sugar cane varieties and hence the sustainable development of the sugar cane industry.

Status of application

Has been promoted and applied; mature product; special training is required before use; high initial input cost but low subsequent use cost, and users can carry out their own maintenance.

Every year since 2005, the technology provider has provided 10 new sugar cane varieties to the Philippines. In 2009, it dispatched technicians to offer sugar cane hybrid breeding technology training to sugar cane breeding personnel in Myanmar and conducted comparative experiments and the regional piloting of 5 sugar cane varieties. It has also provided new sugar cane varieties to Thailand and Cambodia.

Technology Provider

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17. Tillage-free rice production technology

Technology overview

Functions and uses: tillage-free rice production, reducing labor force input.
Technical indicators: reduce labor force input by more than 2 persons.
Application scope: rice.
Features: welcomed by the farmers.

Status of application

The technology has been put into use and may be industrialized in the developing countries. Simple training is needed. The initial investment is large. The subsequent use cost is low. The technology is maintenance free.

Technology Provider

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Crop breeding

18. Rice seeding technology and complete equipment

Technology overview

Functions and uses: the combined planting equipment is capable of continuous soil spreading, planting, soil covering and watering; the rice seed germination, rapid root-promoting and seedling technology and equipment ensure the seedling germination rate; the shed disk seedling technology optimizes supporting production equipment, reduces the costs, and improves the seedlings quality; the double membrane seedling technology reduces the seedling cost, and allows for simple operation and easy management.

Technical indicators: Planting productivity, germination rate, seedling.

Application scope: rice planting, germination, root-promoting, seedlings, etc.

Features: simple operation, easy management, cost savings.

Status of application

The technology has been put into use, may be industrialized in the developing countries and is mature. Simple training is needed. The initial investment is large. The subsequent use cost is low. Maintenance by the customers is permitted.

Technology Provider

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19. Basmati rice variety improvement

Technology overview

Functions and uses: High-quality rice, resistant to drought, high temperature, diseases & pests and lodging, suitable for planting in Southeast Asia, Hainan, Guangdong, Guangxi and other tropical and subtropical regions.

Technical indicators: in trial planting in Sanya, the yield reaches 1370 kg / mu; in planting by the farmers in accordance with the conventional practice, the yield reaches 800 kg / mu. Plant height: 90cm.

Application scope: suitable for planting in Southeast Asia, Hainan, Guangdong, Guangxi and other tropical and subtropical regions.

Features: strong stress resistance; reduce the pesticide use and environmental pollution. Preserve the quality of the Basmati variety to the extent possible.

Status of application

Mature products; no need of training; low use cost; maintenance-free.

Very good results are achieved by planting in Indonesia. The President of Indonesia spoke highly of the variety.

Technology Provider

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Crop breeding

20. C53 Stress resistant cabbage variety C53

Technology overview

Functions and uses: C53 features strong resistant to head splitting and continuous field harvesting capability. It is strongly resistant to pest, which may reduce the number of times of pesticide application. Moreover, it offers strong resistance to high temperature and drought.

Technical indicators: it takes about 70 days from planting to harvest, which is similar to that of the control Xiaqiang, and C53 is an early-maturing autumn cabbage variety. The growth trend of the cabbage plant is moderate, the leaves are gray and heavily waxy, the head is round and compact, the stem is less than half of the height of the head. It is strongly resistant to high temperature and head splitting, virus disease and black rot in the field, pesticides and drought and the yield is about 3000kg per mu.

Application scope: main cabbage planting areas such as India and Pakistan as well as areas in relative shortage of agricultural water resources.

Features: the variety features strong resistance to head splitting and continuous field harvesting capability. It is strongly resistant to pests, which may reduce the number of times of pesticide application. It offers strong resistance to high temperature and drought.

Status of application

The technology may be industrialized in the developing countries and is mature. No training is needed. The use cost is low. Maintenance by the customers is permitted.

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21. Water saving irrigation technology of rice through soil compaction

Technology overview

Functions and uses: the technology uses the stamping equipment for stamping of the rice field to compact the soil layers 5m underlying the farming layer, therefore reducing the penetration coefficient of the soils and reducing the deep layer seepage loss of the irrigation water. The technology is mainly used for water-saving irrigation of rice.

Technical indicators: the technology produces an about 30% savings on water consumption, increases the yield by about 10%, and achieves the environmental benefits of reducing the agricultural pollution effectively.

Application scope: water-saving irrigation of sandy rice fields with high penetration performance.

Features: the technology is easy to use, cost-effective, requires only once-off compacting and is free from subsequent maintenance, therefore reducing the loss of fertilizers with water and pollution from agricultural sources without producing negative impact on the growth of the crops in the areas that adopt the alternative farming system.

Status of application

The technology has been put into use. Simple training is needed. The use cost is low. The technology is maintenance-free. It has been put into use in the paddy field areas in Jiangsu

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Crop breeding

22. Yunshu, a new potato variety

Technology overview

Functions and use: A new quality potato variety which can be used for chips and fresh vegetable. It achieves a chip quality equivalent to that of Atlantic Potato and can be used for chip processing.

Technical information: Plantation density: 3,500-4,000 plants/mu; domestic manure: 1.5t/mu(one Chinese mu is around 1/15 of a hectare) and compound manure: 100-150kg/mu, to be applied as base manure before plantation; improved mid-season tillage, weeding, irrigation, flood drainage and other field management measures; yield can reach 1.5-2t/mu, and commodity chip ratio: around 80%.

Scope of application: Suitable for plantation in Vietnam, Cambodia, Laos, Thailand, Myanmar and Southeast Asian countries.

Technological features: Yunshu 301 offers good chip quality, equivalent to that of Atlantic Potato; good adaptability, and high resistance to the latest epidemic diseases; and high yield. With low plantation cost and easy species transfer, Yunshu 301 can promote the development of the potato plantation industry in Southeast Asia.

Status of application

Can be put into commercial production in developing countries; simple training is required; low user cost; and maintenance-free.

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23. Superior quality watermelon, melon, eggphant, fruit and vegetable seeds

Technology overview

Functions and use: Seeds for agricultural production. The main varieties include tomato, eggplant, cantaloupe, broccoli, peppers, watermelon, cabbage and rape. These superior quality seeds can help improve local melon and vegetable plantation and raise a country´ s self-sufficiency in agricultural products.

Technical information: The tomato variety (Pu Hong 909) can produce big red round fruit, with a weight of 130~150g per fruit. After 15 days of storage on shelves, its quality fruit rate can reach 100%, while soluble solid matter content is at 4.6%. Seedling inoculation appraisal shows a physiological rate of high ToMV resistance, CMV resistance and high resistance to leaf mold disease. Spring plantation can produce a yield of over 5,000Kg/mu. Cross-winter, long-cycle plantation yield in contiguous greenhouses can reach 16kg/m^2. Hu Qie 2 is a hybrid eggplant variety with a high resistance to cold. It produces long fruits, with an average longitudinal diameter of 27.6cm, an average traverse diameter of 5.4 cm and an average weight of 209g per fruit. With good shape and purple skin, Hu Qie 2 eggplants are highly glossy and have green sepals.

Scope of application: The tomato variety (Pu Hong 909) is suitable for plantation on protective land and year-around plantation. Hu Qie 2 is a cold-resistant hybrid variety suitable for winter and spring plantation in greenhouses and protective lands and over long cycles.

Technological features: The tomato variety (Pu Hong 909) is characterized by strong growth, high purity, even-sized, high pass rate after cleaning and packaging and excellent field fruit setting performance. Its fruits are even in size and free from fruit shoulders and have a good color and taste. Hu Qie 2 is of an unlimited growth type and has a strong continuous fruition capacity. Its eggplants make a good commodity, are transportation-durable and boast excellent overall performance.

Status of application

Mature product; simple training is required; low use cost; and users can carry out their own maintenance.

Pilot planting has been successively carried out in modern agricultural demonstration zones in North Korea and the Seychelles. The variety grown in North Korea has an increased yield of 200% over local varieties, comes with high purity and are even-sized. The variety used in the Seychelles features high resistance to diseases, uniform fruits with an average weight of 160g and a soluble solid matter content of over 4.6%. With good performance, it increases yield by over 100% over local varieties and is very popular with the local population. A large number of superior quality melon and vegetable seeds have been provided to a big farm in Angola. These mainly include tomato, eggplant, cantaloupe, broccoli, peppers, watermelon, cabbage and rape seeds.

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Agricultural machinery

24. Mobile spray irrigation technology (SJP series mobile spray irrigation machine)

Technology overview

Functions and uses: the mobile spray irrigation system mainly consists of the pump station, water pipe, water supply hydrant and mobile spray irrigation machine and is generally suitable for land plots where the slope is no more than 25°, the investment per acre is RMB700-750, the effective utilization ratio of water is more than 85%, the irrigation uniformity is 85% and the service life of the machine is more than 8 years.

Technical indicators: Working pressure: 0.4Mpa, water spray volume: 28-39m3 / h, range: 34-44m, walking speed :0-60 m / h, irrigation efficiency : 3-9 acres / hour, uniformity ≥ 80-85%, power 15Kw, pump lift: 80m, whole machine weight: 280Kg

Application scope: may be used for large-area of field crops such as sugarcanes, pastures and maize as well as orchards, tea farms, and commercial trees. Moreover, it can be used for the maintenance of urban greening and sports ground lawns.

Features: Energy efficient, lightweight and practical, small size:

Status of application

The product has been put into use. Simple training is needed. The use cost is low. Maintenance by the customers is permitted.

Has launched 5000 acre mobile irrigation of sugarcane farms in Benin and Togo.

Technology Provider

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25. Multifunctional flat die pellet mill

Technology overview

Functions and use: The mill is used to press into form all kinds of material particles, including fodder and forage pellets, organic manure, mixed organic and inorganic particles, wood chips, vinasse, fruit shells, straws and other biomass fuel particles, rubber and other particles.

Technical information: Production capacity (kg/h): depends on model and material, output: ≥800; total installed capacity (kW): depends on model; power:≥22; flat die diameter (mm): ϕ400, ϕ600, ϕ800 and ϕ1000.

Scope of application: Used for the granulation and formation of all kinds of industrial and agricultural wastes.

Technological features: One machine with multiple functions, wide range of applicable raw materials, and low water content and reduction ratio requirements for raw materials. Wide diameter roller, high output, high pellet rate, even pellets, and high pellet strength. Stable equipment running, low noise, good reliability, low fault rate and low power consumption per tonnage. A unique tangential discharge mode is adopted to effectively prevent pellet breaking. Automatic control, easy control and steering, low labor intensity and convenient maintenance and clearance. Overall casing cast, firm structure and equipped with heavy-duty thrust bearing to bear large axial loads. A forced lubrication system is adopted, which has a high and long service life. The roller and template are resistant to wear and have a simple structure. The template can be used on both sides. Supporting parts are cheap, and operating cost is low. Based on the needs, an adjustable speed feeder and steam conditioner may be fitted.

Status of application

Has been promoted and applied; can be put into industrial production in developing countries; simple training is required; low cost of use; and maintenance personnel need to be trained or a maintenance station needs to be established

Excellent use in Malaysia, showing reliable performance.

Technology Provider

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Agricultural machinery

26. Feed extruder

Technology overview

Functions and use: This machine integrates raw material expansion and finished product expansion functions. By changing configuration, it can extrude Soybean meal, corn flour, rice bran, cottonseed meal, rapeseed meal, soybean meal, non-protein nitrogen (corn urea), fish meal, animal waste and other raw materials. In addition, it can also be used for pre-treating raw materials for oil and fat processing.

Technical information: power of main machine: > 75Kw; and yield: 1000-6000Kg/h.

Scope of application: various feed plants and breeding farms.

Technological features: Rational design, compact structure, outstanding performance, a wide-range of suitable raw materials, high efficiency, convenient adjustment and maintenance, low fault rate and easy operation; wearing parts are made of special wear-resistant alloy materials. Special consideration is given to develop multi-functionality. All major components enjoy greater strength and a longer service life; a removable durable bushing made of special materials is installed inside the extrusion chamber. Users do not need to replace the whole chamber, thus reducing component use cost. The bearing box and the rack are cast as a whole and equipped with heavy thrust bearings to ensure stable equipment running and a long service life; there is an optional iron-removing device to remove alien iron matter from feed materials; a double layer, heat insulated stainless conditioner can be used to regulate water and steam supply and produce better conditioning and extrusion effect; and a forced lubricating oil cooling and filtering system is adopted for the bearing box to prolong the bearings´ service life.

Status of application

Has been promoted and applied; can be put into commercial production in developing countries; simple training is required; low user cost; and maintenance personnel need to be trained or a maintenance station needs to be established.

The machine has been well used in Indonesia, the Philippines among other countries.

Technology Provider

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27. Large sprinkler technology and equipment

Technology overview

Functions and uses: the large sprinkler includes round sprinklers and lateral move sprinklers. As the large sprinkler is practical, advanced, can spray evenly, save energy and water, and features high degree of automation and adaptability , good comprehensive utilization performance as well as high utilization ratio, it is widely used in irrigation of farm land.

Technical indicators: main technical indicators of the lateral move sprinkler: Model DPP-L; system length (m): 65 ~ 500; span (m) :30,40,50; end cantilever length (m) 5,10,15; maximum climbing ability (°) ≥ 5; water spray volume (m3 / h) 50 ~ 400; spray uniformity coefficient ≥ 0.90.

Application scope: the unit is suitable for irrigation of cotton, potatoes, grains, legumes, vegetables, sugar cane, pasture and other commercial crops, fruit trees, nurseries, as well as desertification control projects.

Features: (1) the sprinkler saves water by 30-50% than the surface irrigation, increases the yield by 35-40%, and saves efforts by 25-90%; (2) high degree of mechanization and automation, one person can control 2-8 sprinklers.

Status of application

The technology has been put into use and is mature. Simple training is needed. The initial investment is large. The subsequent use cost is low. Maintenance by the customers is permitted.

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Agricultural machinery

28. Precision rice hill-drop drilling machine

Technology overview

Functions and uses: used for accurate planting of rice.

Technical indicators: 2-5 seeds per hole, the acceptable level reaches more than 90%, the empty hole rate is less than 5%, the operating width is 2-2.4m, the distance between the rows is 20-30cm (optional), and the hole-to-hole distance is adjustable between 15-25cm.

Application scope: rice production process.

Features: save labor, save time and save efforts. The precision rice hill-drop drilling machine consists of two parts: the power part and working part. The power part adopts the ride-type rice planter chassis, the working part consists of the seed distributor, skid plate, and small floating plate and is connected to the power part by means of 3-point suspension.The seed distributor is driven by the power output shaft, adopts the brush for cleaning the seed and skid plate for trenching and performs simulated operations through the small floating plate sensor to prevent sludge.

Status of application

The product is mature. Simple training is needed. The initial investment is large. The subsequent use cost is low. Training of the maintenance personnel or establishment of maintenance points is needed.

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29. R&D and demonstration of key technologies for entire-process mechanized production of potato

Technology overview

Functions and uses: (1) combined potato planter and fertilizer machine: used for potato planting, fertilizing operations, able to complete the trenching, planting, fertilizing, spraying (optional), earthing and other operations at one time. (2) Combined potato harvester: used for combined potato combine harvesting, able to complete digging, separation, cleaning or transportation, loading and other operations at one time. Tracted by the tractor.

Technical indicators: (1) combined potato planter and fertilizer machine: drive: traction; power: ≥80kW; number of operation rows: 4; distance between rows: 800mm and 900mm; spacing: adjustable between 140-450mm; maximum discharge amount of fertilizer: 1350kg/hm2 (when the distance between the rows is 900mm); operating speed: 1.8-2.8km / h; re-planting, missing planting rate: ≤ 3%; quantity of seeds carried: 2000kg; operational efficiency: 0.8-1.2hm2/h. (2) combined potato harvester: drive: traction; Power: 80-90kW; number of operation rows: 2; distance between the rows: 80-90cm; digging depth: harvesting width: 1600mm; net harvesting rate: ≥ 98%; potato injury rate: ≤ 5%; Impurity rate: ≤ 3%; operating efficiency: 0.3-0.6hm2/h.

Application scope: (1) Soil requirements: Various soil types, soil moisture content ≤ 10%,the soils shall be free from excessive compaction. (2) Seed quality: 45-50g / piece. (3) Requirements for distance between the rows: 80cm or 90cm. Features: combined potato planter and fertilizer machine: (1) precision sowing; (2) seeds and fertilizers sown separately to prevent seed damage; (3) the distance between the rows for planting, plant spacing, quantity of fertilizer applied are adjustable, equipment offers high adaptability; (4) to ensure accurate planting of potato pieces to the center of the furrows; (5) meet the needs of high-earth operations of potato production and is applicable to a variety of soil conditions.

Combined potato harvester: (1) reduce the digging resistance and power consumption; effectively separate the potatoes from the soils and stones to reduce tuber damage; (3) the lifting and loading mechanism adopts the centralized, real-time control device to improve the work efficiency and reduce the work hours; (4) protect the potato skin and effectively reduce the potato injury rate;5) may fold and unfold freely to allow for rapid loading of the potato tubers.

Status of application

The technology has been put into use. Simple training is needed. The use cost is low. Maintenance by the customers is permitted.

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Agricultural machinery

30. Anti-drift sprayer

Technology overview

Functions and uses: The sprayer uses the anti-drift baffle cover to poke crop canopy, increase the penetration of droplets, therefore effectively reducing the droplet drift loss. It features low cost, easy modification, and convenient transportation.

Technical indicators: Spray range: 6m; baffle width: 45cm; nozzle release angle: 45; deposition rate: ≥ 60%; drift loss rate: ≤ 30%

Application scope: prevention and control of pests and diseases of high stubble, low-stalk crops such as wheat.

Features: In addition to tilting the baffle to guide the flow, the sprayer pokes the crop canopy during the operation process so that the droplets can better penetrate and deposit, resulting in an obvious increases in the droplets depositing on the middle and lower parts of the canopy, which is not only conducive to target prevention and control, but also effectively reduces the drift loss.

Status of application

The product has been put into use. No training is needed. The use cost is low. Maintenance by the customers is permitted.

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31. Orchard automatic target sprayer

Technology overview

Functions and uses: an accurate, high-efficiency pesticide application machine that is used for prevention and control of pests and diseases in orchards. By turning conventional contact spray into automatic target spray, the spray improves the pest/disease prevention and control effects, and the effective utilization ratio of the pesticides reaches 55%; the pesticide use decreases 30-50%, reducing the pollution by the loss of pesticide to the environment and improving farm produce safety; the operating efficiency increases 60-85% and a 40% savings on water is achieved.

Technical indicators: target recognition spacing:≤0.3 m; target recognition distance: 2-10 m(adjustable); minimum pass-through spacing during operation: 1.5 m; effective bonding rate: 55.4%; production efficiency: 25 acres/hour.

Application scope: pesticide/disease prevention and control in orchards.

Features: (1) automatic detection and spray control of fruit tree targets: effectively realize directional precise spray of the fruit tree targets, therefore effectively avoiding invalid spray of the spaces between the fruit trees and increasing the effective utilization ratio of the pesticides. (2) electrostatic spray system: increase effective deposition of the droplets, and reduce pesticide wastes and environmental pollution caused by the drift of fine droplets. (3) by turning the fruit tree leaves using the powerful air flow generated through high-speed rotation of the axial flow fan, the ability to penetrate through the canopy; in particular, the bonding of the droplets on the back side of the leaves is obviously improved. (4) Utilizing the low volume spray technology, the spray volume is obviously reduced and the utilization ratio of time is improved, ensure the operating efficiency of the machine.

Status of application

The product has been put into use. Simple training is needed. The use cost is low. Maintenance by the customers is permitted.

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Agricultural machinery

32. Uniform pressure stabilizing boom sprayer

Technology overview

Functions and uses: the motor-knap uniform pressure stabilizing boom spray has a small two-stroke gasoline engine to provide power, a pressure regulation device is mounted on the mine to adjust and stabilize the pressure so that the inch switch can control the opening/closing of the liquid way in a safe and rapid manner. Multiple spray devices are equally spaced on the boom, the spray height may be adjusted, different models of fan shaped nozzles, anti-drift nozzles, cone-shaped nozzles may be replaced rapidly. The machine may avoid the operation method of ´Zigzag movement˝ , which is replaced by straight-line spray, therefore achieving full-area uniform operation of the small knap sprayer, increasing the effective utilization ratio of the pesticides, and reducing environmental pollution.

Technical indicators:≤2kW; operating pressure: 0.2-1.5MPa; variation coefficient of distribution uniformity of spray volume≤0.15； spray range of boom：1-3m; amount of pesticides applied per unit area: 150-300L/hm2。

Application scope: prevent and control of pests/diseases of fruit trees and field crops.

Features: (1) The boom spray system is adopted on the small knap sprayer to overcome the problem of uneven pesticide application due to ˝zigzag˝ operation of traditional nozzle and improve the working efficiency and spray quality of the small machines remarkably. (2) The small knap sprayer adopts the pressure regulation/stabilizing device to ensure the spray pressure is stable and adjustable during the operation process, therefore ensuring spray at stable pressure and increasing spray uniformity.

Status of application

The technology has been put into use. Simple training is needed. The use cost is low. Maintenance by the customers is permitted.

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33. Cyclic sprayer

Technology overview

Functions and uses: the cyclic sprayer, used in combination with 18.4kW（25HP） and above wheeled-type tractor, is suitable for applying pesticides, bactericides and other liquids in the fence-type orchards and is an advanced, practical, cost-effective, reliable new orchard pesticide application machine.

Technical indicators: lost pesticide droplets retained and recovered≥40%;cyclic utilization ratio of pesticides≥60%; operation speed 2-5km/h;operation width: 0.5-2m; amount of pesticides applied: 300-600L/hm2; demonstration area: 80hm2.

Application scope: pest/disease prevention and control of fence-type orchards.

Features: by using the anti-drift cover on the fruit trees, spraying is done in a confined space to reduce the loss and settlement of the droplets in the non-target areas. In the meanwhile, the pesticide liquid recycling system retains, collects and recycles the pesticide liquid not that has not settled on the target, therefore increasing the effective utilization ratio of the pesticide and reduce the pollution caused by the pesticide.

Status of application

The product has been put into use. Simple training is needed. The use cost is low. Maintenance by the customers is permitted.

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Agricultural machinery

34. 2BMG-Series tillage-free fertilizer seeder

Technology overview

Functions and uses: No-till seeding is one of the major conservation-oriented tillage technologies promoted by the Ministry of Agriculture. Long-term implementation of tillage-free planting technologies is of great practical significance for dust control, improving the agro-ecological environment and promoting sustainable agricultural development.The 2BMG series tillage-free wheat fertilizer seeder is one mechanical means to implement the technology.

75-375 kg/hm2。Technical indicators: (1) power: 44kW or more; (2) number of rows planted: 14-28 rows; (3) spacing: 16,19 cm (adjustable); (4) planting depth: 2-7cm; (5) fertilization depth: Planted 3-6cm; (6) variation coefficient of consistency of planting quantity of the rows: ≤ 3. 9% (legumes); (7) variation coefficient of consistency of stability of the total planting quantity: ≤ 1. 3% (legumes); (8) the amount of fertilizer applied: 75-375 kg/hm2.

Applications: The equipment can be used for no-till planting of wheat, barley, rape and so on in arid and semi arid regions.

Features: use the controlled-toothed type planter and corrugated disc for residue cutting, double disc for trenching and planting, soil covered and suppressed hollow rubber wheels till-free trenching system to ensure seed quality, reasonable configuration, reliable operation and high adaptability.

Status of application

The product has been put into use and may be industrialized in the developing countries. Simple training is needed. The initial investment is large. The subsequent use cost is low. Maintenance by the customers is permitted.

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35. Combined rice and wheat harvester

Technology overview

Functions and uses: the combined rice and wheat harvester finishes the harvesting, transport, threshing separation, cleaning and bagging operations at one time. It is suitable for harvesting wheat, rice, and harvesting the rape and other crops after replacing the cutting table. The threshing is complete, the loss is small and the threshed stems are spread on the field in strip.

Technical indicators: (1) Power: 44kw; (2) Mass of the machine: 3200kg; (3) Cutting width: 8. 2m; (4) operating efficiency: 5-7 acres / hour; (5) type of running gear: Self-propelled rubber track; (6) Total loss rate: Wheat ≤ 1. 5%, rice ≤ 2. 5%; (7) Impurity rate: wheat rice ≤ 2%; (8) Breakage rate: ≤ 1. 5%

Application scope: used for harvesting crops such as rice, wheat and rape in paddy fields and dry fields. With the rubber track running gear, the harvester is suitable for paddy field operations, has a strong pass through capability and may operate normally in fields where the sludge depth is less than 20cm.

Features: (1) using transverse axial roller, the threshing is complete and the loss is small. (2) With the double-rolling roller, the harvester delivers a strong processing ability and the grains are clean. (3) The operating efficiency is high and produces a 4% saving on the harvesting cost per acre. (4) The harvesting loss is small, and a saving of 10kg is achieved on the harvesting loss per acre.

Status of application

The technology has been put into use and is mature. Special training is needed. The use cost is low. Maintenance by the customers is permitted.

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Agricultural machinery

36. Paddy field laser leveling technology and machine

Technology overview

Functions and uses: used for the leveling operation of the paddy fields with water prior to planting, transplanting, spraying and throwing for rice planting in paddy fields.

Technical indicators: (1) production efficiency: generally

greater than 3 acres/hour; (2) leveling accuracy: smaller than 3cm; (3) leveling width: 3m.

Application scope: used for leveling of paddy fields with water where the sludge depth is less than 45cm.

Features: (1) the position of the leveling spade has the automatic adjustment system in the vertical and horizontal directions; (2) the machine is equipped with the main drag plate and auxiliary drag plate to level the mud spilling from the leveling spade; (3) the leveling accuracy and efficiency are high.

Status of application

The product is mature. Simple training is needed. The initial investment is large. The subsequent use cost is low. Training of the maintenance personnel or establishment of maintenance points is needed.

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37. Sheller

Technology overview

Functions and uses: have such functions as bran suction, dust collection, shelling, separation and sorting, etc, is equipped with the vibrating sieve to complete the shelling, separation and sorting operations at one time, and is optionally equipped with the diesel engine, gasoline engine and motor as the power. The machine can be used for shelling of crops such as rice, wheat, broomcorn, barley, soybean, soya bean and rape, etc.

Technical indicators: total loss rate: 0.3; breakage rate: 0; impurity rate: 1.0

Application scope: may be used in the mountainous areas, hilly areas and plains and operate on the yards and fields.

Status of application

The product is mature. Simple training is needed. The initial investment is large. The subsequent use cost is low. Training of the maintenance personnel or establishment of maintenance points is needed

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Agricultural machinery

38. Corn sheller

Technology overview

Functions and uses: have such functions as bran suction, dust collection, shelling, separation and sorting, etc, is equipped with the vibrating sieve to complete the shelling, separation and sorting operations at one time, and is optionally equipped with the diesel engine, gasoline engine and motor as the power. The machine can be used for shelling of crops such as rice, wheat, broomcorn, barley, soybean, soya bean and rape, etc.

Technical indicators: total loss rate: 0.3; breakage rate: 0; impurity rate: 1.0

Application scope: may be used in the mountainous areas, hilly areas and plains and operate on the yards and fields.

Status of application

The product is mature. Simple training is needed. The initial investment is large. The subsequent use cost is low. Training of the maintenance personnel or establishment of maintenance points is needed

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39. Key technology of air-suction precise sowing mechanization

Technology overview

Functions and uses: used for precise sowing of large seed crops.

Technical indicators: power（kW）: 59; number of operation rows: 6; distance between the rows（mm）: 450-750; land wheel diameter （mm）: 740; adjustment range of planting and fertilization application depth:（mm）: 0-70; seed tank capacity （L）: 32; fertilizer tank capacity （L）: 320; operating efficiency （hm2/h）: 2.1-3.6。

Application scope: used for planting such crops as maize, soybean, peanut, sunflower, spinach beet and broom corn, etc.

Features: (1) wide application scope. This machine may be adjusted in the distance between rows in the range of 450-750mm according to different needs, and the planting transmission may obtain 24 transmission ratios through the gear box to meet different spacing requirements and adapt to the seeds of different crops planted and various operation environment. （2） separation of the seeds from the fertilizers: the fertilizers are applied on the side of the seeds to prevent burning of the seeds/seedlings; （3） reliable transmission. Planting and fertilizer placement are driven by two wheels, the height of the pattern of the land wheel is moderate to reduce displacement and ensure the accuracy of spacing;（4）precise planting. The precise seed sowing system is adopted and is reliably sealed to ensure that sufficient negative pressure is generated to suck the seeds. The excess seed removal device is designed to ensure that each hole of the sowing plate sucks one seed to achieve precise planting;（5）consistent planting depth: the planting depth limiting wheel is linked to the seed sowing trenching disc to ensure consistent planting depth.

Status of application

The technology has been put into use. Simple training is needed. The use cost is low. Maintenance by the customers is permitted.

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Agricultural machinery

40. Suspended sprayer

Technology overview

Functions and uses: mainly used to apply the chemical herbicides, pesticides or micro fertilizers. The sprayer is widely used for pre-planting soil treatment, weed killing during the seedling stage, and prevention and control of diseases and pests of crops such as soybeans, wheat, maize, rice, cotton and potato and plants such as Chinese medicinal herbs and pasture.

Technical indicators: power（kW）: 80-220; pesticide tank capacity (L): 1000-1500; spray range (m): 21; spray atomization angle （℃）: 110;diaphragm pump discharge（L/min）: 210; maximum speed（r/min）: 540; maximum pressure （MP）: 1.5-2.0; operating pressure （MP）: 0.3-0.5; operating efficiency （hm2/h）:10-14.7

Application scope: applicable to pesticide spray operations of ultra-long land plots of the flatland and hilly areas onto various crops such as maize, wheat, rice and potato.

Technical indicators: （1）wide spray range, high operation efficiency, and convenient and rapid use; （2） 4-stage filtering so that the nozzle will not be clogged; （3）high atomization uniformity that meets the European and American standards; （4）the mixing system adopts bi-directional configuration: back flow and high pressure mixing to ensure the pesticides are applied uniformly; （5）The spring shock absorber and 4-lever balancing mechanism to eliminate the shock resulting from non-flat ground and improve the balance/ stability of the sprayer.

Status of application

The product has been put into use. Simple training is needed. The use cost is low. Maintenance by the customers is permitted.

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41. 9SL2000 feed processing unit

Technology overview

Functions and uses: used to process powder compound feed.

Technical indicators: Production capacity kg / h: 1500-2500; total installed capacity kw: 11. 95; power consumption per ton of material (kwh / t): ≤ 6; mixing uniformity variation coefficient (CV): ≤ 8; Dimensions (mm): 3414 × 1447 × 2904; unit weight (kg): 980.

Application scope: used for small feed processing plants and breeding farms.

Features: (1) the whole set of equipment adopts optimized modular design; (2) reasonable design, compact structure, low use cost, easy and reliable installation; (3) controlled via the cabinet; the control circuit, in addition to short-circuit and relay protection, also has motor and sequence interlock protection functions; (4) the manufacturing operations are safe and convenient

Status of application

The product has been put into use and may be industrialized in the developing countries. Simple training is needed. The use cost is low. Maintenance by the customers is permitted.

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Agricultural machinery

42. Total mixed ration (TMR) feed mixing wagon

Technology overview

Functions and uses: the equipment is the equipment used for preparing the total mixed ration of ruminant animals such as diary cows and beef cattle. Its function is to actually weigh, thread, blend and mix all kinds of cattle feed ingredients in diet formulations and is the critical equipment adopting the TMR of the modern ranches. TMR can inhibit gastric acid poisoning in cattle, increase feed intake and improve cattle health status, help increase milk yield, and promote beef cattle fattening.

Technical indicators :(1) mixing method: Vertical / Horizontal; (2) way of walking: Fixed / traction; (3) mixing time: 4-8min; (4) Auxiliary power: Different models have different power, not less than 11kw.

Application scope: various ruminant animal breeding farms.

Features: High-speed, large power screw output ,combination of movable knife and fixed knife; ability to quickly and efficiently cut the whole bundle of forage in various forms; the vertical "step wound" spiral cone has the pulse and gentle stirring effect, and the materials are fluffy and breathable after mixing ; as there is no dead corner in the mixing chamber, materials residues can be prevented effectively and feedstuff hygiene can be best ensured; the standard discharge door adopts the modular design , allows discharge on the left or right side; the accurate weight measurement device

ensures the best nutritional balance in the diet; the molded pyramid-shaped mixing chamber is durable, and can effectively help forage cutting; the wear rate of the quick-wear parts such as the movable knife is low and their service life is long.

Status of application

The product has been put into use, and may be industrialized in the developing countries. Simple training is needed. The initial investment is large. The subsequent use cost is low. Maintenance by the customers is permitted.

The product has been exported to Asian countries such as Japan and South Korea. The product features advanced technologies, safe and reliable performance and operates in good condition.

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43. Tropical agricultural and forestry pest (mite) pollution-free prevention and control technology

Technology overview

Functions and use: The tropical agricultural and forestry pest (mite) pollution-free prevention and control technology includes effective bio-pesticide target technology, physical and ecological regulation technology and mite-resistant variety breeding and utilization.

Scope of application: Tropical crops and forests.

Technological features: Environment-friendly, and sustainable for use.

Status of application

Can be put into industrial production in developing countries; ready for use after simple training; low cost of use, and users can carry out their own maintenance.

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44. Mycorrhizal breeding technology

Technology overview

Functions and use: Arbuscular mycorrhizal fungi (AMF) is a microorganism in the rhizosphere. In symbiosis with the host plant, it has the effect of enhancing the host´s absorption of P, K and other beneficial elements and improving salt drought tolerances. When used in the breeding of vegetables, fruit trees and other nurseries, it can increase seedling survival rates and reduce water and manure usage.

Technical information: The technology takes soil which contains high-infection-rate plant roots and mycorrhizal spores as the inoculation agent. High infection rate refers to the fact that the susceptible crop roots have a mycorrhizal infection rate of over 70%, an infection intensity of over 40% and a relative mycorrhizal rate of over 20%.

Scope of application: Nursery and organic plantation of horticultural and garden plants.

Technological features: (1) Improves the efficiency of water and manure usage under organic cultivation conditions in greenhouse soil, increases vegetable yield and improves the nutritional value of vegetables; (2) Enhances vegetables´ salt and drought tolerance and is suitable for use in saline soils. While reducing soil-borne diseases, it also significantly improves the root environment for vegetables.

Status of application

Has been promoted and applied; ready for use without training; inexpensive to use, and maintenance-free.

The South Valley University in Egypt has introduced this technology to breed vegetables and has improved local vegetable salt and drought tolerance, yield and quality. The technology is now under further promotion and application.

Technology Provider

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45. Vegetable fertilizer, water and air integrated application device

Technology overview

Functions and use: The vegetable fertilizer, water and air integrated application device releases CO_2 gas fertilizer to greenhouse vegetables, and supplants fertilizer liquid, water and oxygen to their root system. When plants need irrigation and fertilizer, the fertilizer liquid can enter the drip irrigation system through a Venturi suction tube and promote plant growth.

Technical information: water saving, fertilizer saving, yield enhancement, resistance enhancement and vegetable quality improvement. It can increase a net income by RMB1,000-3,000 per mu (one Chinese mu is around 1/15 of a hectare) over conventional production and produce significant social, economic and ecological benefits.

Scope of application: This technology features low application cost, easy operation and wide raw material sources and can be promoted in greenhouses. It can be used in the plantation of vegetables as well as melons, strawberries and fruits. It can greatly improve vegetable yield and quality.

Technological features: (1)low-cost and easy CO_2 supply to greenhouses, improving vegetable yield and quality; (2)fertilizer can be directly supplied to vegetable roots to meet the vegetables´ fertilizer and water demand; and, (3) low-cost fertilizer and water application to vegetables, improving the effect of fertilizer and the vegetable root environment.

Status of application

Has been promoted and applied; can be put into industrial production in developing countries; ready for use without training; low cost of use, and users can carry out their own maintenance.

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Soil amendment and fertilizer

46. Compound organic and inorganic water-retention agent and water-retention fertizlier production technology

Technology overview

Functions and use: Agricultural water-retention agents can improve moisture use efficiency and increase crop yield. Meanwhile, this technology combines water-retention agents and fertilizers to develop water-retention, control fertilizer release and achieve integrated moisture and fertilizer control. In addition, it improves the efficiency of moisture and fertilizer use and notably improves agricultural output and returns.

Technical information: The compound organic-inorganic water-retention agent reduces acquisition cost by over 30% while retaining the same moisture retention performance (or with a fall of less than 10%). But, it improves salt tolerance and fertilizer retention and ensures integrated moisture and fertilizer control with the fertilizer as the carrier. Easy to operate, it can cut water and fertilizer use by 10-30%.

Scope of application: Agriculture, forestry, gardening and other plantation industries.

Technological features: This project breaks away from the current model of spatial separation between moisture and fertilizer and integrates moisture, nutrient supply and control into one body. It can make great savings on manpower and materials and achieve integrated moisture and nutrients under different spatial and time conditions.

Status of application

Has been promoted and applied; can be put into commercial production in developing countries; mature product; ready for use after simple training; low user cost; and users can perform their own maintenance .

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47. Buffalo cross-breeding technology

Technology overview

Functions and use: Use of the cross-breeding of superior quality milk-producing buffalos (by breeding bulls or frozen sperms) and swamp buffalos to improve milk production, improve milk-producing buffalos and thus increase economic returns in the buffalo industry.

Technical information: The first-generation swamp-type buffalo hybrids have an increased milk output from 500kg-800kg to over 1,300kg during one lactation period of their parents, while the second generation takes it to 1500kg-2000kg.

Scope of application: The buffalo industry.

Technological features: Notably improves the milk output of swamp buffalos and solves the problem of no breeding returns during most of the off seasons.

Status of application

Has been promoted and applied; simple training is required; high initial input cost but low subsequent use cost; and users can perform their own maintenance.

Technology Provider

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48. Incubation equipment

Technology overview

Functions and uses: Automatic equipment that provides suitable temperature, humidity and fresh air for incubation of breeding eggs of poultries and can be used for the incubation and hatching of chickens, ducks, geese, quails, ostriches, pigeons, and peacocks, swans.

Technical indicators: (1) egg capacity: 96 -90720 eggs; (2) temperature control range: 31.5-39.5℃; (3) temperature resolution: 0.10℃; (4) humidity control range: 40-80RH; (5) humidity resolution: 1RH; (6) egg turning angle: 45±2。

Application scope: Fully automatic hatching of various poultry eggs.

Features: The incubation equipment is capable of automatic control of the whole set of equipment heating system, fan stirring system, egg turning system, ventilation system and humidification system, collection of embryonic life information through various modules, embryo weight loss control, carbon dioxide concentration control and collection of embryo surface temperature to provide the best incubation environment and therefore achieve the best hatching results.

Status of application

Has been promoted and applied; can be put into industrial production in developing countries; mature product; simple training is needed; low use cost, and users can carry out their own maintenance.

Technology Provider

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49. Artificial fish seedling breeding technology

Technology overview

Functions and uses: Through the artificial breeding technology, induce the developed and mature broodstock to lay eggs and therefore acquire fish seedling of even size in large quantities for aquatic breeding.

Technical indicators: Build a set of fish seedling breeding facilities, including the broodstock cultivation pond, egg laying pond, hatching equipment and seedling cultivation pond; to maintain the egg laying rate, fertilization rate and hatching rate above 70% through the implementation of the whole set of technologies such as broodstock cultivation and selection, selection and injection of the spawning agent, induced spawning, artificial fertilization and hatching management.

Application scope: May be used for the breeding of a wide variety of major fish species.

Features: Optimize such technology procedures as broodstock cultivation, induced spawning and artificial hatching, control the main influencing factors during the procedures to increase the egg laying rate, fertilization rate and hatching rate, and therefore increase the seedling yield.

Status of application

Has been promoted and applied; mature product; simple training is needed; high initial input cost but low subsequent use cost; low use cost; maintenance-free.

International training classes have been carried out for more than 30 years, more than 1200 learners from over 90 countries have attended the training courses, and the technology has been put into use in some countries. For instance, in India, the fish seedling hatching facility is designed again, further technology improvements are made, the hatching rate reaches 90%, and the survival rate of the broodstock increases from less than 10% to more than 70%.

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Animal breeding

50. Artificial breeding and new rearing technology of tropical marine commercial shellfish

Technology overview

Functions and uses: The technology is a key technology for the rearing of tropical marine commercial shellfish, including the location of the rearing environment, microalgae culture, artificial breeding technology, rearing technology during different stages, prevention and control of disease. Depending on the status of shellfish resources of the coastal developing countries, the development and rearing technology of tropical marine shellfish of high commercial value may be chosen to turn it into an effective industry of economic growth. The tropical marine commercial shellfish mainly include scallops, abalone, oysters and clams, etc, which can be a main source of protein for the coastal developing countries.

Technical indicators: (1) the survival rate of culturing juvenile (2-3cm) is above 30%; (2) the survival rate of culturing juvenile is above 60%; (3) The growth speed increases by at least 15%.

Application scope: Suitable for tropical coastal or island developing countries, especially countries that abound in tropical marine shellfish resources. The shellfish species include scallops, oysters, abalone, giant clam etc., and the tropical developing countries that take the breeding of tropical shellfish as the source of protein, process and export the tropical shellfish.

Features: The technology is a key technology for artificial breeding and rearing is practical, cost-effective and may generate returns rapidly.

Status of application

The technology may be industrialized in the developing countries. Special training is needed. The use cost is low. Training of the maintenance personnel or establishment of maintenance points is needed.

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51. PCR based rapid detection method of cattle sexed semen separation purity

Technology overview

Functions and uses: the separation of X and Y sperms represents the most effective gender control method at source that select livestock of different genders by separating the transmission of sperms to meet the production needs and may be well applied in the livestock production. Moreover, as the accuracy of separation of the X and Y sperms is directly related to the result of gender control, a rapid and accurate assessment is helpful for optimizing and improving the separation method, increasing the credibility of the gender control technology, and promoting and popularizing sexed semen in the market.

Technical indicators: able to complete the PCR based amplification detection within 1 hour, implement the technology process through existing lab instruments and conventional reagents, detect clear specific amplification products in the X and Y sperms without the need of double amplification using the internal standard. The size difference between the male and female products is 63bp. The statistical analysis of the sperm separation accuracy is performed through detection of the gender of a single sperm.

Application scope: applicable to bio-molecular detection such as gender determination of cattle sperms and related cells during the sperm formation process.

Features: the technology uses a single PCR to determine the gender of a single sperm, and infers the accuracy of sperm separation through statistical analysis. The method is simple and practical, the conventional reagents and instruments used reduce the determination cost, shortens the detection time, and simplifies the technical process, and ordinary technicians may perform operation on the site. It has advantages over the flow cytometer analytic method, real-time quantitative PCR method, and fluorescence in-site hybridization method.

Status of application

The technology has been put into use. Special training is needed. The use cost is low. Maintenance by the customers is permitted.

Technology Provider

Technology Provider

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52. New toxicity-free feedstuff additive Quinocetone

Technology overview

Functions and uses: disease prevention and promote growth.

Technical indicators: (1)"Quinocetone" has a clear chemical structure; (2) the growth-promoting effect is obvious, the weight gain rate for pigs, chicken, fish reaches 15%, 18% and 30%, it can reduce the incidence of diarrhea by 50-70%; (3) no acute, subacute, accumulative, sub-chronic, chronic toxicity, no teratogenic, mutagenic and carcinogenic effects; (4) little absorption by the animals.

Application scope: Pig, chicken & duck and aquatic breeding.

Features:（1）good anti-bacteria and growth-promoting effects, no toxicity, no teratogenic, mutagenic and carcinogenic effects, no residue, no hazard and wide application scope;（2）simple production, convenient use and easy promotion.

Status of application

The product has been put into use and is mature. No training is needed. The use cost is low. The product is maintenance free.

Technology Provider

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53. Modern standard fishing farm construction

Technology overview

Functions and uses: To build modern standard seawater/freshwater fishing farms for breeding and demonstration.

Technical indicators: May build 2 large seedling farms (one seawater seedling farm and one freshwater seedling farm) to provide fish seedling guarantee for the fishing farms, surrounding fishing farmers and restoration of local ocean resources, and build 2 modern ocean fishing research centers (one seawater research center, one freshwater research center) and supporting feed mills; with the increase in the varieties of fish bred and the yield, a refrigerator and aquatic product processing plant will be built to meet the needs of local consumers and export.

Application scope: Aquatic breeding.

Status of application

The technology has been put into use, may be industrialized in the developing countries and is mature. Special training is needed. The use cost is low. Training of the maintenance personnel or establishment of maintenance points is needed.

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Animal breeding

54. Prevention and control of piglet yellow & white diarrhea, weaned piglet diarrhea and piglet edema disease

Technology overview

Functions and uses: non-antibiotic treatment, broad-spectrum treatment and preventive approach of strategies of bacterial diseases of livestock and poultry, and efficient control of piglets yellow and white diarrhea, diarrhea in weaned piglets and piglets edema disease.

Application scope: piglet yellow & white diarrhea, weaned piglet diarrhea and piglet edema disease.

Features: the high-tech biological reagent developed based on the receptor blocking technology is used to control bacterial diarrhea in piglets caused by bacterial infections. In comparison with conventional genetic engineering vaccine (commercial) or self-developed inactivated vaccine, it offers effects directly and rapidly. The product features short production cycle and low cost.

Status of application

The product may be industrialized in the developing countries and is mature. No training is needed. The use cost is low. Training of the maintenance personnel or establishment of maintenance points is needed.

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55. Complete breeding system

Technology overview

Functions and uses: The complete breeding equipment meets the automatic and integrated breeding requirements through automatic control of the feedstuff, drinking water and environment in the poultry housing. In addition to making the best use of the resources in the poultry housing, reducing the waste, and cutting down on the breeding cost, the system can increase the breeding density, reduce the labor strength, the labor force needed and the paths of diseases transmission.

Technical indicators: (1) poultry housing environment controller: temperature control function: measurement range: 2-40℃; accuracy: 1℃. Humidity control function: measurement range: 30RH-90RH accuracy: 5RH25℃. Lighting control function: the poultry housing environment controller controls the lighting automatically in accordance with time parameters set. (2) computer terminal control function and remote control center function. (3) material supply system performance: material supply productivity: ≥2000kg/h. (4) feed system performance: feed productivity of a single material line: ≥600kg/h。 (5) drinking water system performance: the nipple drinker shall not leak water when in standstill for 10h. (6) exhaust regulating system performance: has the automatic and manual start device

Application scope: Large-scale poultry breeding.

Features: can adjust the temperature and humidity in the poultry housing to ensure ventilation; start and stop material supply to the poultry housing regularly each day. Can ensure the entire breeding process from one-day chicken to adult chick and meet the demands of the live poultry for drinking water; capable of remote control.

Status of application

The technology has been put into use, may be industrialized in the developing countries and is mature. Simple training is needed. The use cost is low. Maintenance by the customers is permitted.

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Animal breeding

56. Integrated control technology of turbot diseases

Technology overview

Functions and uses: Used for turbot disease control.

Technical indicators: utilizing the technology for healthy breeding of turbot, the disease incidence decreases 21.1%, the average cure rate reaches more than 80%, the survival rate reaches 97.2%～99.8%, and the yield per unit reaches 23.5 kg/m2。

Features: Comprehensive and systematic research of various turbot diseases and their prevention and control technologies are carried out from the perspective of epidemiology, etiology, pathology, prevention and control drugs, immunity enhancers and water quality purification, and Chinese herbal medicines are developed. The technology reduces the use of formaldehyde and antibiotic, improves the quality of commercial fish and conserves the ecological environment.

Status of application

The technology has been put into use. Special training is needed. The use cost is low. Training of the maintenance personnel or establishment of maintenance points is needed.

Technology Provider

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57. Biological agent for the prevention and control of gooseparvovirus (gosling plague)

Technology overview

Functions and uses: Gooseparvovirus and Muscovy duck parvovirus have long been the main epidemic etiologies that prevent healthy development of the goose and Muscovy duck breeding industry. The application of the series biological agents for the prevention and control of gooseparvovirus and Muscovy duck parvovirus offers an effective solution for the control of infection and spread of gooseparvovirus and Muscovy duck parvovirus.

Technical indicators: When used in breeding gooses, the live vaccine for gosling plague can effectively control the infection and spread of gooseparvovirus and Muscovy duck parvovirus.

Application scope: Goose and Muscovy duck breeding areas.

Features: When the live gosling plague vaccine is used in adult gooses, the gosling incubated from the hatching eggs laid by the make goose may acquire strong resistance to the gooseparvovirus during the period of time from 15 days after the injection of the vaccine until the entire. Egg-laying season. Equal immunity effects may be achieved by giving the vaccine in the gosling through subcutaneous injection, eye drop, nose drop or atomization in the epidemic areas or non-epidemic areas within 48 hours after coming out of the shell. When given in the infected gosling flock for emergency prevention, the effects are good. The above product is safe, effective, easy to use and cost-effective.

Status of application

The technology has been put into use. Simple training is needed.

The use cost is low. Maintenance by the customers is permitted.

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58. Technology for prevention and control of the hydatid disease in livestock

Technology overview

Functions and uses: The hydatid disease is commonly called echinococcosis and is a common parasitic disease in livestock caused by the echinococcus granulosus. The domestic shepherd dog as the final host of the echinococcus granulosus is the main source of spread of the hydatid disease.Through control of parasites prior to the imago period, it is possible to eliminate the spread of the eggs without intervention during the larval stage so as to rapid the effects of rapid control. ″To kill the parasites on a monthly basis″ represents a complete parasite killing method prior to the imago period, a pathogenic parasite killing method as well as one of the most effective methods to cut off the cyclic chain of the pathogen. Where the parasite killing frequency and ratio of effective parasite killing (shall not be less than 70—80% and 95% respectively) are ensured, the method may clean the human/livestock environment and realize rapid and effective control to ensure that the domestic shepherd dogs are free of parasites shortly after the measures are taken.

Technical indicators: In accordance with the prevention and control strategy of ″monomorphic elimination of pathogen″ and control mode of ″killing the parasites on a monthly basis and giving drugs to each dog″, both the drug giving density and the drug taking rate″ shall reach 80%.

Application scope: Goats and dogs, etc.

Features: To control the spread of the hydatid disease by blocking the cyclic chain of the echinococcus granulosus.

Status of application

The product is mature. Simple training is needed. The use cost is low. The product is maintenance-free.

Technology Provider

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59. Anti-virus veterinary drug hypericin

Technology overview

Functions and uses: Used for the treatment of viral diseases such as avian flu, avian infectious bronchitis, infectious bursal disease, and calf diarrhea.

Technical indicators: The content of hypericin in hypericum perforatum whole plant is very low, only XX ‰.The yield of raw extracts separated using the technology may reach 1.2 of the whole plant.

Application scope: Viral diseases of domestic and wild animals.

Features: Safe and efficient without residues.

Status of application

The product may be industrialized in the developing countries. Simple training is needed. The initial investment is large. The subsequent use cost is low. Maintenance by the customers is permitted.

Technology Provider

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Animal breeding

60. Macrobrachium rosenbergii breeding technology

Technology overview

Functions and uses: breeding of Macrobrachium rosenbergii. Widely known as the ″king of fresh prawns″, Macrobrachium rosenbergii has such features as rapid growth, large size, wide range of food, easiness to breed, short breeding cycle, strong adaptability and resistance to diseases, and is a breeding variety of great commercial value.

Technical indicators: the breeding cycle is about 120 days, and the average yield per mu is 250kg.

Application scope: suitable for countries and regions where the water temperature may be maintained above 20℃ during the breeding period. Macrobrachium rosenbergii can be bred manually in different types of freshwater or brackish water.

Features: (1) short cycle. (2) low cost: the total breeding cost per kilogram of macrobrachium rosenbergii is about 15 Yuan. (3) low requirements for breeding environment: can be bred in ordinary ponds suitable for fish breeding.

Status of application

The technology has been put into use. Simple training is needed. The use cost is low. The technology is maintenance free.

So, the technology has been applied successfully in Viet Nam, Bangladeshi and Italy.

Technology Provider

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61. Technology for synchronous oestrus of sheep and goats

Technology overview

Functions and uses: Used for synchronous oestrus of sheep and goats

Technical indicators: after treatment, the rate of synchronous oestrus reaches more than 90%.

Application scope: Large-scale sheep or goat breeding farms.

Features: Simple and practical.

Status of application

The technology has been put into use, may be industrialized in the developing countries and is mature. Simple training is needed. The use cost is low. The technology is maintenance free.

Technology Provider

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Animal breeding

62. Detection of neospora caninum in diary cow abortion

Technology overview

Functions and uses: The technology is used for the detection of the neospora caninum in the diary cows and is the enzyme-linked immunosorbent assay (ELISA) of the neospora caninum in the serum and plasma samples of the ruminant animals.

Technical indicators: utilizing the indirect ELISA, the known pathogen is an exquisite antigen (recombinant antigen) developed using the vitro recombination technology. The 96-well micro-plate detachable plate is used, the wells in the odd number rows of the plate are enveloped by the recombinant GST-tNcSRS2 protein, and the wells in the even number rows are enveloped by the GST protein. Upon operation, add the diluted serum to be tested before the secondary antibody is added. Display the color using the substrate TMB after washing thoroughly. Measure the absorbance (OD value) using the enzyme-labeled instrument. The intellectual property rights will not be affected.

Features: The technology delivers a high detection rate, high specificity, low cost, high repeatability, and allows for easy operation. It is not only suitable for on-site rapid testing of a large number of samples, but also suitable for individual farmers.

Status of application

The technology may be industrialized in the developing countries. Simple training is needed. The use cost is low. Maintenance by the customers is permitted.

Technology Provider

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63. Bovine and ovine embryo transplantation technology

Technology overview

Functions and uses: Used for expanded breeding and new variety cultivation of fine individual bovines and ovines.

Technical indicators: 6-7 useful embryos may be acquired from each donor bovine, 5-6 useful embryos from each donor sheep, and 10-15 useful embryos from each donor goat; the pregnancy rate of the fresh embryos after transplantation is 60%; the survival rate of the embryos after freezing is 85%; the pregnancy rate of the frozen embryos is 50%.

Application scope: Farmland and individual livestock breeding farms

Features: highly efficient, cost-effective and practical.

Status of application

The technology has been put into use and may be industrialized in the developing countries. Special training is needed. The initial investment is large. The subsequent use cost is low. Training of the maintenance personnel or establishment of maintenance points is needed.

Technology Provider

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Animal breeding

64. Technology for integrated prevention and control of diseases in sea cucumber breeding

Technology overview

Functions and uses: Used for prevention and control of diseases in sea cucumber breeding.

Technical indicators: This technology can ensure that the yield per acre of outdoor sea cucumber breeding pond reaches 600kg, the survival rate of breeding reaches 80%, and the cure rate of indoor seedling preservation during the winter reaches 80% or greater.

Features: Comprehensive and systematic research of various diseases of sea cucumber and their prevention and control technologies is carried out from the perspective of improving the breeding environment, screening the drugs that kill the pathogens and increasing the ability of the sea cucumber to resist diseases, R&D and clinical trials of the prevention and control drugs are carried out, and the technologies for antibiotic free prevention and control of drugs in sea cucumber breeding are developed.

Status of application

The technology has been put into use. Special training is needed. The use cost is low. Training of the maintenance personnel or establishment of maintenance points is needed.

Technology Provider

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65. Water quality monitoring system for aquatic breeding

Technology overview

Functions and uses: The system maintains the breeding water quality in the best growth environment of the aquatic products based on the water environment monitoring data such as water temperature, dissolved oxygen, ph value, turbidity and water level through the intelligent software platform by means of RTU controlled water feed/discharge, water heating and oxygen enrichment so as to achieve the objective of high yield, high efficiency, safety and high quality.

Technical indicators: Able to monitor the dissolved oxygen, ph, conductivity, turbidity, water temperature, water level and other water quality parameters closely related to breeding; can control the oxygen enrichment, heating and circulation system of the breeding ponds.

Application scope: integrated aquatic breeding.

Features: the entire system uses wireless node to avoid the inconvenience caused by wiring to breeding operations and prevent system failure due to the lines; the wireless system uses the global free public frequency band (2. 4GHz), reducing the operating costs of traditional forms of transmission; the nodes allow for easy installation without restrictions on the size of the distribution points, and it is easy to add or remove nods ; the system integrates the feedback on the ON/OFF status of the fan pump, therefore increasing the reliability of the control system.

Status of application

The system has been put into use. Simple training is needed. The initial investment is large. The subsequent use cost is low. Training of the maintenance personnel or establishment of maintenance points is needed.

Technology Provider

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Animal breeding

66. Engineering technology for micro-organism fermentation bed of hazard-free pig breeding

Technology overview

Functions and uses: Used in the large pig farms. The micro-organism fermentation bed decomposes and absorbs the manure discharged by the pigs during the bedding process, discharges the manure-free sewage to allow for pollution-free, discharge-free and odor-free clean production, control the environmental pollution caused by pig breeding at source, improve the pig housing environment so as to achieve the objective of breeding pigs in a environment friendly manner.

Technical indicators: the concentration of microbial agents reaches 200 million / gram.

Application scope: Large-scale livestock/poultry breeding enterprises.

Features: (1) decompose the pig manure, and remove odor and pollution; (2) biological prevention and control to control pig diseases; (3) promote health and reduce the use of drugs; (4) healthy breeding and labor-saving; (6) replace the raw materials and obtain raw materials locally; (7) Turn the resources into high quality fertilizers.

Status of application

The technology has been put into use. No training is needed. The use cost is low. Maintenance by the customers is permitted.

Technology Provider

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67. Platichthys stellatus and barfin flounder seedling breeding and rearing technology

Technology overview

Functions and uses: The large-scale seedling breeding technologies such as controlled egg laying of reproduction and hatching of high quality fertilized eggs of the platichthys stellatus broodstock, the temperature, light and hormone regulated gonadal development, artificial egg taking, fertilized egg hatching and seedling rearing technologies of the barfin flounder broodstock are developed. The platichthys stellatus belongs to the large flatfish family, and is a rare euryhalic, cold water specie featuring fast growth and strong resistance to diseases. The barfin flounder features delicious taste and rich nutrients, are transportation and freezing resistant, preserves the meat quality after being refrigerated, and is the main source of high class raw fish fillets. The barfin flounder is a large cold water benthic flounder featuring fast growth, low temperature resistance, excellent stress resistance, tender meat, delicious tastes and rich nutrients.

Technical indicators: platichthys stellatus: the breeding/seedling scale reaches more than 1,000,000 fish, and there are the pond, net cage, factory and freshwater breeding modes and technical specification. Barfin flounder: maintain 1100 broodstock, and rear 800,000 seedlings per year. The maturity rate reaches more than 70%; the average weight per fish reaches 50g; the fish is grown in 9 months, the average weight per fish reaches 640g and the survival rate is 86%.

Application scope: platichthys stellatus may take food in water at 3℃～28℃ and may be bred in seawater and freshwater and in large water areas. The water temperature and salinity suitable for the growth of Barfin flounder is 13-20℃ and 25-35 respectively.

Status of application

The technology has been put into use. Simple training is needed. The use cost is low. Maintenance by the customers is permitted.

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68. Technology for integrated prevention and control of diseases in sea cucumber breeding

Technology overview

Functions and uses: Used for prevention and control of diseases in sea cucumber breeding. 7 new diseases of sea cucumber are discovered and named, the etiological and pathogenic is completed, and 8 technology products are developed successfully.

Technical indicators: This technology results are used for demonstration of healthy breeding and integrated disease prevention and control of sea cucumber. It can ensure that the yield per acre of outdoor sea cucumber breeding pond reaches 600kg, the survival rate of breeding reaches 80%, and the cure rate of indoor seedling preservation during the winter reaches 80% or greater.

Application scope: Used for the prevention and control of diseases in sea cucumber breeding.

Features: Comprehensive and systematic research of various diseases of sea cucumber and their prevention and control technologies is carried out from the perspective of improving the breeding environment, screening the drugs that kill the pathogens and increasing the ability of the sea cucumber to resist diseases, R&D and clinical trials of the prevention and control drugs are carried out, and the technologies for antibiotic free prevention and control of drugs in sea cucumber breeding are developed.

Status of application

The technology has been put into use. Special training is needed. The use cost is low. Training of the maintenance personnel or establishment of maintenance points is needed.

Technology Provider

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69. Use of probiotics in production

Technology overview

Functions and uses: Add probiotics that are good for animals such as lactic acid bacteria such and bacillus to the feedstuff to replace the antibiotics for protecting health, preventing and treating diseases. This product has no residue in animal products, which is conducive for healthy growth of the animals.
Technical indicators: 1‰ probiotics is added to the animal feedstuff to achieve the objective of protecting the health and preventing diseases of the animals and increase the economic benefits by about 10%.
Application scope: pig, chicken and cattle breeding.
Features: The production of the products is simple, the investment in equipment is small, and the product may be produced in the small-to-medium laboratories. The product is a probiotics that is made by blending different bacteria and the economic return is significant.

Status of application

The technology may be industrialized in the developing countries. Simple training is needed. The use cost is low. Maintenance by the customers is permitted.

Technology Provider

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Animal breeding

70. Artificial pearl oyster seedling, rearing and pearl cultivating technology

Technology overview

Functions and uses: used to cultivate and produce high quality pearls, including the selection of the pearl oyster breeding farms, seedling farm construction, food culture, artificial seedling cultivation, and technology for pearl breeding and cultivation during different stages. The technology is used to cultivate Pinctada maxima, Pinctada magaritifera,Pteria penguin,Pinctada fucata martensii and other commercial shellfish.

Technical indicators:（1）the survival rate of the pearl oyster seedling（2-3cm）is above 30%;（2）the survival rate of breeding of pearl oyster is above 60;（3）The successful pearl cultivating rate of pearl oyster is above 45%.

Application scope: Suitable for countries that abound in tropical marine pearl oyster resources, tropical coastal or island countries that export high quality pearl oysters produced to earn foreign exchange.

Features: Low cost, fast return and significant economic benefits

Status of application

The technology has been put into use and may be industrialized in the developing countries. Simple training is needed. The use cost is low. The initial investment is large. The subsequent use cost is low. Training of the maintenance personnel or establishment of maintenance points is needed.

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71. Paperboard partitioned cocoon holder

Technology overview

Functions and uses: Used for cocooning of domestic silkworms. It replaces the plastic nest, centipede nest to reduce the cocoon pressed by cocooning frame and yellow spotted cocoons and improve the quality of the domestic silkworms.

Technical indicators: weight per piece:240g ± 5g; outline dimension:Length: 54cm ± 0.5cm, width: 39cm ± 0.5cm, height: 3cm ± 0.1cm. it may be made of fully wood pulp craft paper and yellow paperboard after strict sterilization with alcohol.

Application scope: Suitable for cocooning of grown silkworms in the silkworm rearing areas.

Features: The product can withstand folding, is free from delamination and deformation once affected by moisture, and may be used for more than 5 years. Using the food grade adhesive, it is free from bad smell, and the hole entering rate of the grown silkworms may reach 90%.

Status of application

The product is mature. No training is needed. The use cost is low. The product is maintenance-free.

Technology Provider

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72. Livestock breeding technology-embryo transplantation technology

Technology overview

Functions and uses: Use to accelerate the breeding of more fine breeding livestock and the core breeding group. Select and breed the male breeding livestock, cultivate the prime core female livestock and accelerate the seedling process.

Technical indicators: number of embryos that can be used for the first time≥5 ， fertilization rate of fresh embryos ≥50%, fertilization rate of frozen embryos ≥40%。

Application scope: diary cows, beef cattle, sheep, goats, red deers, and mule, etc.

Features: The embryo transplantation technology has entered the stage of rapid industrialized application; the transplantation operation is simple and feasible. The timing is critical and the requirements for the cattle tissue are high, realizing rapid enlargement of the fine breeding livestock population and replacement of the seedlings each year.

Status of application

The technology has been put into use, may be industrialized in the developing countries and is mature. Special training is needed. The initial investment is large. The subsequent use cost is low. Maintenance by the customers is permitted.

Technology Provider

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73. Labor-saving silkworm table

Technology overview

Functions and uses: This table enables the rearing of grown domestic silkworms with the standard silkworm rearing facilities designed using the plastic woven silkworm net and woven cloth, plastic rope, iron rings and self-made bamboo standard. It replaces the traditional method that rears the silkworms in the silkworm basket, is labor-efficient.

Technical indicators: (1) the size is 1.2m × 2.5m, and the area per set is 30m2; (2) the wefts o the silkworm table net are made of flat silks while the warps are woven using single and double silks without disconnection; (3) the silkworm table ring is welded using steel wires; (4) the silkworm table rope is made of multiple strands of anti-slip new white flat silk strings.

Application scope: Used for rearing of grown silkworms in the silkworm rearing areas and fully automatic cocooning using the paperboard partitioned cocoon holders.

Features: With such characteristics as small footprint, small investment, scientific planning of the area of cocoon rearing bed and quantity of mulberry supplied, labor saving, time saving, resistance to diseases, mice and damages, the table has been widely used in the major silkworm rearing areas.

Status of application

The product is mature. No training is needed. The use cost is low. The product is maintenance free.

Technology Provider

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Animal breeding

74. New tussah variety “Longcan I”

Technology overview

Functions and uses: New tussah variety used for both the silks and silkworm chrysalis

Technical indicators: The variety determined is a green/yellow system, bivoltine and late-maturing. The number of eggs laid per spawn is 320, the good silkworm pupa rate is 91.3%, the yield per unit is 831.8kg and the average increase in income per bundle is RMB665.The weight per 1000 cocoons is 11.44kg, the length per 1000 cocoons is 1136m, the length of unbroken cocoon filament is 853m, the dry weight of raw silk is 76.29g, the recovery rate is 67.45%, the weight per 1000 fibers is 125.58g, and the raw silk size is 6.73 denier.

Application scope: Suitable for silkworm rearing in bivoltine areas.

Features: The variety features large cocoons, thick cocoons, long silks, large quantity of silks and high yield, etc.

Status of application

The product has been put into use and is mature. No training is needed. The use cost is low. The product is maintenance-free.

Technology Provider

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75. Potato processing technology and small-and-medium sized processing equipment sets

Technology overview

Functions and use: Potato processing technology and equipment mainly include starch and refined starch processing (including fast food vermicelli and miscellaneous fast food grain bean vermicelli), small food processing (including biscuit, non-fried baked food, fried chips, compound chips, and low temperature, vacuum chips), instant noodle processing, and total vermicelli and its application product processing. Such technology and equipment can be widely used to process such potato crops as sweet potato, potato, canna and cassava. In the food processing field, the technology and equipment can be used with rice, maize, wheat and vegetables to develop all kinds of highly adaptable nutritious and health-enhancing products.

Technical information: Sweet potato and potato starch whiteness can respectively reach 70% and over 85%.

Scope of application: Various types of small foods produced from fresh potatoes and total starch can be used as a full variety of feature food and convenience foods. Potato starch and its variants are widely used in the processing of instant vermicelli, instant noodles and baked food as well as in the paper-making, textile, pharmaceutical and agricultural fields. Total starch is an important basic raw material for food processing and food making.

Technological features: This technology features a close combination of varieties, agricultural production, preliminary processing and deep processing. It has been successfully promoted and used and offers such features as small investment and fast returns.






Status of application

Has been promoted and applied; can be put into industrial production in developing countries; ready for use after simple training; inexpensive to use, and users can carry out their own maintenance.

The technology provider has transferred 6 sets of potato starch vermicelli processing machinery to North Korea, all with good application and effect.

Technology Provider

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76. Jun-cao (mushroom) technology

Technology overview

Functions and use: Use Jun-cao (mushroom) to plant edible fungi and medicinal fungi and produce fungal feed and fungal manure, and develop a new green industry — the Jun-cao industry; ″using grass to replace wood″ to change the traditional edible and medicinal fungi plantation practice and fungal industrial development model, organically combine fungal production with environmental protection, and achieve the sustainable development of the fungal industry; develop Jun-cao fungal feed and fungal manure, and expand ways to utilize Jun-cao and fungal waste; research and develop deep processed products from Jun-cao medicinal fungi, and push forward the development of the medicinal fungi industry; breed and plant special superior quality Jun-cao, and provide quality grass species and plantation technologies for conserving soil and water, improving soil fertility and preventing land desertification; and, provide superior quality raw materials and integrated technologies for developing biomass materials (compound fiber board materials, pulp and so on) and biomass energy.

Technical information: (1) One hectare of Jun-cao can produce 270-333kg of fresh mushrooms. Jun-cao plantations of edible fungi and medicinal fungi have a short production cycle. (2) Edible fungi grown on Jun-cao has a high coarse protein content as well as other nutritional ingredients and a heavy metal content noticeably lower than that specified in the international standard. (3) Jun-cao has a soil-holding capacity 15 times higher than that of agricultural crops. In the Jun-cao plantation region, summer ground temperature at noon can be 10-15℃ lower, humidity up by around 30%, surface runoff down by 30% and soil erosion

down by 78%. Each year, it can reduce soil loss by 300kg/ha and absorb 400kg/ha of carbon dioxide. And, (4) high-yield Jun-cao has a biogas output of 548 m^3/t (including 55% of methane), with a calorific value of 3,800-4,000Kcal/kg. One hectare of high-yield Jun-cao is equivalent to the power output of 230-260kg of raw coal.

Scope of application: The technology can be used in mountainous regions where there are D. dichotoma, Neyraudia reynaudiana, Miscanthus, reed and other wild Jun-cao or regions where there are elephant grass, broad leaf paspalum, Alfalfa, Clover Series or stalks (waste). It is mainly applied in the fields of edible fungi, medicinal fungi, health food, biomedicine, fungal feed, biological manure, biomass materials, soil and water conservation and desert control.

Technological features: Change traditional plant-animal dual agriculture into plant-fungi-animal tripartite agriculture, organically combine social, economic and ecological effects together, develop a circular economy and create the Jun-cao industry, a new high-yield, superior-quality, and high-efficiency ecological industry.

Status of application

Has been promoted and applied; can be put into industrial production in developing countries; mature product; ready for use after special training, inexpensive to use, and users can carry out their own maintenance.

Currently, the technology provider has established or is setting up Jun-cao technology cooperation bases in Rwanda, Papua New Guinea, Lesotho, South Africa, Fuji and other countries, with a total investment of RMB181 million. Among them, it has been successfully promoted and applied in Papua New Guinea, Rwanda, South Africa and Lesotho. The Jun-cao industry has become an important industry for increasing local quality food supply, creating job opportunities, reducing poverty, improving the ecological environment and developing the agricultural economy, attracting high attention from local governments and international organizations. The technology provider has also trained 1,144 students from 80 countries on 6 continents.

Technology Provider

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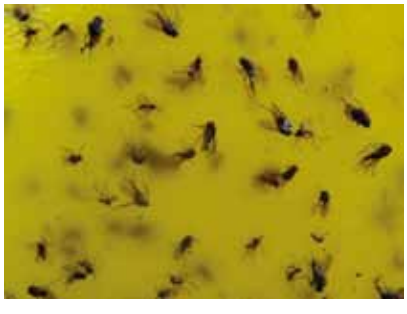
South-South Cooperation on S&T to Address Climate Change

Applicable Technology Manual
Agriculture and Forestry

Forestry technologies

Forests are critical carbon sinks on earth. They can clean the air, preserve water, protect bio-diversity and increase incomes for the poor. In the past ten years, 13 million hectares of forests are destroyed each year due to human activities or natural causes. To nurture and protect forests can facilitate sustainable development of every country.The technologies for forestation, afforestation, bamboo utilization and forest management will play an important role in the protection, rehabilitation and appropriate use of forests.

77. Non-Poisonous insect glue and its application technology



Technology overview

Functions and use: Use non-poisonous insect glue to make various insect glue boards, traps and catchers, combine it with colors or attractants to dynamically monitor, prevent and control pests.

Technical information: (1) Control crawling pests on tree trunks, such as pine caterpillar Drosicha Kuwana, with a control effect of over 90%; (2) Control pests with color preferences, such as fungus gnat, delia and aphids, with a control effectiveness rate of over 90%; and (3) in combination with attractants, control boring pests, such as Golden Delicious apple fine grain moth and pear moth, with a control effect of over 80%.

Scope of application: Various kinds of crawling and flying pests

Technological features: Non-poisonous, harmless, low cost, convenient to use, and suitable for pest control in organic food production bases.

Status of application

Has been promoted and applied; can be put into industrial production in developing countries; mature product; ready for use after simple training, inexpensive to use, and maintenance-free.

The technology has been transferred to and widely used in Iran, Japan, South Korea and Saudi Arabia.

Technology Provider

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Pest monitoring and control

78. Rubber tree pest integrated control technology

Technology overview

Functions and use: Integrated control of rubber tree pests.

Technical information: Integrated rubber tree pest control system for different growth stages; pest monitoring and forecasting; level of economic damage; control indicators and compound control indicators.

Scope of application: Rubber tree pest control in tropical regions.

Technological features: (1) Increases control effect by 10.5% and economic returns by 21.3% and lowers control costs by 20.5% over conventional methods. Meanwhile, saves pesticide usage. (2) Establishes rubber anthracnose, root disease and brown skin disease forecast models, hazard loss estimation models and control indicators. Average pest forecast accuracy: > 88%, and can offer effective disease control guidance; and (3) Ju Ling, an efficient chemical pesticide powder which can concurrently control rubber powdery mildew and anthrax and Xiu Ning, a pesticide which can control several root diseases and powdery mildew, have been developed and produce better control effects than conventional pesticides.

Status of application

Can be put into commercial production in developing countries; special training is needed; high initial input cost but low subsequent use cost; and maintenance personnel need to be trained or a maintenance station needs to be established.

Technology Provider

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79. Jiaduo solar frequency oscillated insecticidal lamp

Technology overview

Functions and uses: The solar panel converts light into electricity, and outputs safe voltage, which saves the energy and power and is cost-effective. The product provides the areas that were forced to give up pest trapping and killing with lamps due to shortage in power supply previously with an advanced prevention and control tool.

Technical indicators: (1) control area (acres): 60-80; (2) storage battery: 12V / 24AH; (3) service life (years): 10-15; (4) Solar panel: monocrystalline silicon 40W; (5) impact area (m2): 0.2--0.46.

Application scope: The lamp can be widely used in agriculture, forestry, vegetables, tobacco, warehousing, wine brewing, garden, orchard, urban landscaping, aquaculture, especially in the areas affected by thee bollworm. It can trap and kill 1287 kinds of pests: ① soil pests: Beetle, mole crickets, cutworms; ② rice pests: rice stem borer, yellow rice borer, rice borers, plant hoppers, leaf hoppers; ③ cotton pests: Cotton bollworm, tobacco budworm, pink bollworm; ④ vegetable pests: Diamondback moth, vegetables borer, beet armyworm; ⑤ fruit pests: Borer, smoking fruit moth, peach punctiferalis; ⑥ forest pests: Pine moth, moth, fall webworm, satin moth, Anoplophora glabripennis, spring looper, pine beetles and other 1287 kinds of pests.

Features: 1. solar power source that is energy efficient and environmental friendly; 2. Advanced ecological safety feature: kill the harmful pests and protect the useful pests to maintain the balance of the ecological system; 3. unique frequency oscillated insecticidal lamp. The technology is granted national utility model certificate, patent number: ZL02213023.3. It is the sole frequency oscillated patent technology protected by the patent law of China.

Status of application

Has been promoted and applied; can be put into industrial production in developing countries; no training is needed; low use cost; high initial input cost but low subsequent use cost; users can carry out their own maintenance.

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80. The comprehensive control technology of banana wilt

Technology overview

Functions and uses: Explore methods of pathogen removal or reduction in the disease area according to the relationship between the pathogen, host, environment and disease. Through soil improvement, changes in soil C, N ratio and pH, etc, create the ecological and environmental conditions that are conducive to the growth of banana but are not favorable for the occurrence of banana wilt, select the disease resistance varieties, try safety and reliable chemicals at proper times during the early stage of the disease, enhance water and fertilizer management, divert clean water source to implement low –pressure micro spray irrigation, reform the farming practice and implement scientific cultivation to reduce the incidence and spread rate of banana wilt significantly and achieve good socio-economic benefits.

Technical indicators:1、virus affected plant killing technology; 2、soil improvement technology that reduces the amount of pathogens in the virus affected soils；3、disease-resistant banana varieties screening; 4. chemical control techniques;5.Establishment and demonstration of comprehensive banana wilt control technology.

Application scope: applied to banana wilt disease prevention and control.

Features: reduce the incidence and spread rate of banana wilt.

Status of application

The technology has been put into use. Simple training is needed. The use cost is low. Training of the maintenance personnel or establishment of maintenance points is needed.

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81. 6HY series fog machine

Technology overview

Functions and uses: The fog-carrying pesticide application method is a method that turns the pesticide into fog suspending in the air that may be bonded to the targets evenly, therefore offering very good pesticide/disease prevention and control effects. It has such characteristics as light weight, ease of use, high productivity and extensive application. The fog particles it applies are small size, may diffuse and spread with air, and have very strong penetrating and bonding performance.

Technical indicators: Spray volume: 25-42L / h, fuel consumption: 8. 8-2L / h, prevention and control efficiency: 50-60 acres / h.

Application scope: The effects are remarkable for pesticide/disease prevention and control in forests and rubber forests, especially on slopes and location with poor road conditions. Moreover, it can be used for pesticide/disease prevention and control of tall crops in farmlands and crops cultivated in greenhouses as well as quarantine, disinfection and sterilization of warehouses and urban public health facilities.

Features: a. Even diffusion, high bonding rate, good prevention and control effects, little pesticide residue and pollution; safety, low labor intensity and high efficiency; c. low dose.

Status of application

The product has been put into use and is mature. Simple training is needed. The use cost is low and maintenance by the customers is permitted.

Technology Provider

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82. LED insecticidal lamp

Technology overview

Functions and uses: The product uses particular wavelength emitted by the low-carbon energy saving LED light source , which produces a strong phototaxis, wave taxis, color trend, and taxis on the insects to lure insects to fly toward the light source in disorder and therefore achieve the purpose of killing pests .It is a physical pest control method.

Technical indicators: 1, frequency-oscillated trapping and controlling technology; 2, trapping light: Low-carbon energy saving LED light source; 3, impact area: ≥ 0. $2m^2$; 4, grid voltage: 3200 ± 110V; 5, automatic protection on rainy days; 6, insulating ring; 7, control area: 30 to 60 acres / light; 8, supply voltage, frequency: 220V, 50Hz; 9, insulation resistance: ≥ 2.5MΩ; 10, Power: ≤ 30W.

Application scope: Can be widely used in agriculture, forestry, animal husbandry, fisheries, vegetables, tobacco, tea, herbs, gardens, orchards, urban greening, aquaculture, wine brewing, storage, quarantine and other fields.

Features: 1.Ability to trap and kill many pest species in large quantities in an energy-efficient manner; 2. ability to reduce pesticide residues, delay the occurrence of pest resistance and increase vegetable and crop quality; 3, provides an material guarantee for reliable pollution-free green food.

Status of application

The product has been put into use, may be industrialized in the developing countries and is mature. Simple training is required. The subsequent use cost is low. Training of the maintenance personnel or establishment of maintenance points is needed.

Technology Provider

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83. Jiaduo frequency oscillated insecticidal lamp

Technology overview

Functions and uses: The lamp is a physical prevention and control method that traps and kills the pests through phototaxis of the pests. Utilizing the strong phototaxis, wave taxis, color trend and taxis information of the pests, it sets the wavelength, waveband, and frequency of the lights within a particular range, lures the adult pests to fly to the lamp by means of light (short distance) or wave (long distance) plus the taxis information generated by the pests. Moreover, the lamp is provided with a frequency oscillated high voltage grid so that the pests fall into the pest bag below the lamp and are killed.

Technical indicators: 220V/30W, manufactured in accordance with national standard.

Application scope: The lamp can be widely used in agriculture, forestry, vegetables, tobacco, warehousing, wine brewing, garden, orchard, urban landscaping, aquaculture, especially in the areas affected by thee bollworm. It can trap and kill 1287 kinds of pests: ① soil pests: Beetle, mole crickets, cutworms; ② rice pests: rice stem borer, yellow rice borer, rice borers, plant hoppers, leaf hoppers; ③ cotton pests: Cotton bollworm, tobacco budworm, pink bollworm; ④ vegetable pests: Diamondback moth, vegetables borer, beet armyworm; ⑤ fruit pests: Borer, smoking fruit moth, peach punctiferalis; ⑥ forest pests: Pine moth, moth, fall webworm, satin moth, Anoplophora glabripennis, spring looper, pine beetles and other 1287 kinds of pests.

Features: 1. Rain-proof; 2. Lighting-proof; 3. Safety. 4. Unique technology system that can trap and kill pests under all weather conditions; 5. The technology is granted national utility model certificate, patent number: ZL02213023.3. It is the sole frequency oscillated patent technology protected by the patent law of China.

Status of application

The product has been put into use, may be industrialized in the developing countries and is mature. The use cost is low. The initial investment is large. The subsequent use cost is low. Training of the maintenance personnel or establishment of maintenance points is needed.

Technology Provider

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84. 6HW series high-range low-volume sprayer

Technology overview

Functions and uses: The 6HW series high-range low-volume sprayers are used to apply the pesticide droplets atomized via the pesticide supply and atomizing systems by means of the strong axial flow generated by the axial flow fan to tall trees to achieve the objective of pest/disease prevention and control.

Technical indicators: Fog spectrum range: 50-150 μ m, vertical range: 20-45 m, horizontal range: 30-90 m; prevention and control efficiency: 6-40 ha / h

Application scope: Used for pest/disease prevention and control of tall trees, and may be used for locust control of crops of large farmlands and grassland,

Features: a. utilizing the low-speed wind tunnel test method, the relationship between droplet operation and air speed, and the law of droplet deposition are obtained. The technology features low dosage, high utilization ratio of the pesticides, low environmental protection and prevention and control cost; b.high degree of automation, low labor intensity and remote control; c. Moreover, the sprayer is design independently, delivers high installation flexibility and may be mounted on different types of vehicles to reduce the investment.

Status of application

The product has been put into use and is mature. Simple training is needed. The use cost is low and maintenance by the customers is permitted.

Technology Provider

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85. Technologies of bamboo cultivation and comprehensive processing and utilization

Technology overview

Functions and use: Through reconstructing natural bamboo forest or new bamboo forest, implement categorical bamboo forest operations and directional nurturing and improve the business goals and returns of bamboo forests: bamboo forests for medicinal and edible uses with the goal of getting maximum economic returns; and, conservation of bamboo forests, water-nurturing of bamboo forests, soil and water conservation of bamboo forest and carbon sink of bamboo forest with the goal of get maximum ecological benefits. Processed bamboo products include both traditional daily use products and industrial integrated processing and utilization products with higher added values, such as bamboo plywood, bamboo flooring, bamboo matting, bamboo shoots, bamboo charcoal, bamboo paper and bamboo biomass energy.

Scope of application: Developing countries in Asia, Africa, Latin America and the South Pacific

Technological features: The technology is simple, easy to learn, feasible, practical and cheap. It supports forestry to form an integrated system of plantation, processing, industry and market. In particular, the timber processing and utilization technology provides users with rich and diversified world product and helps them to solve livelihood problems, reduce poverty and create wealth. It is very suitable from a practical point of view in developing countries.

Status of application

Has been promoted and applied; can be put into industrial production in developing countries; mature product; ready for use after special training, inexpensive to use, and users can carry out their own maintenance.

The bamboo plantation, processing and utilization technology has been promoted and applied in Rwanda, Uganda and Kenyan in Africa, Brazil, Argentina and Mexico in Latin America, Vietnam and India in Asia and Fuji in the South Pacific. Good results have been produced.

Technology Provider

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Forest management, plantation, tree variety breeding

86. Organic light medium processing and mass Propagation of seedling technology

Technology overview

Functions and uses: To manufacture organic light medium for forest seedling production and flowers and vegetables plantation by means of agricultural and forestry wastes, such as bark, sawdust, straw, fruit skin and core, etc., using fast and efficient fermentation of microbial agents. In the meanwhile, the biodegradable nursery containers - non-woven, paper pulp cup (plug) may be used to cultivate good seeds with well developed and balanced root systems.

Technical indicators: rapid processing technology of organic medium of forestry wastes :1）the organic matters decompose more than 150% times faster than the traditional compositing process, the rate of loss of the organic matters is reduced by 40% folds, and the processing cost is reduced by 15-20% folds. 2）light organic substrate cultivation techniques of tree seedlings: determine the formula for cultivating the organic medium according to different seedling specifies ; the degradation rate of the nursery container exceeds 95%, and the root system of the seedlings is more than doubled.

Application scope: Can be used for organic substrate culture and factory production of tree seedlings, flowers and vegetables.

Features: 1. Effective solve the problem of environmental pollution caused by agricultural and forestry wastes and increase the utilization ratio of resources; 2. Replace peat

soil to meet the needs of factory-based seedling cultivation and flowers/vegetables for organic substrate; 3. Through nursery with light organic substrate and degradable nursery containers,the root system of the seedlings is well developed and balanced, and the seedlings are transplanted directly with the containers without the rejuvenation period.

Status of application

Has been promoted and applied; can be put into industrial production in developing countries; mature product; simple training is needed; low use cost; users can carry out their own maintenance.

Technology Provider

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Forest management, plantation, tree variety breeding

87. Coffee varieties and plantation technology

Technology overview

Functions and use: Drought- and rust-resistant fine coffee variety and high-yield and high-efficiency plantation technology. Through building high-efficiency, high-yield coffee gardens, it is possible to achieve substitution plantation, beautify the environment, reduce soil and water loss, increase job opportunities and income.

Technical information: The coffee variety is drought and rust resistant. The technologies include: coffee breeding technology, manure application technology, coffee garden field management and pest control technology, and preliminary coffee processing technology.

Scope of application: Suitable for tropical countries, especially tropical countries in South Asia and Southeast Asia.

Technological features: This technology is suitable for plantation in mountainous regions. It does not compete for land with grain production, thus not affecting grain security. Easy to grasp, the technology is suitable for industrialized plantation and development in developing countries.

Status of application

Has been promoted and applied; simple training is needed; high initial input cost but low subsequent use cost; and maintenance-free.

Technology Provider

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Forest management, plantation, tree variety breeding

88. Plantation and utilization technologies for Euphorbia Tirucalli (milk bush) Forest

Technology overview

Functions and use: Milk bush is a fast-growing organic energy tree species which contains rich hydrocarbon-type inflammable organic matter. It is suitable for development in tropical and southern subtropical regions. Its leaf liquid can be used to produce biological diesel fuel or serve as a raw material for biogas fermentation. With a high biogas production capacity, it can be used in rural energy development programs in developing countries.

Technical information: Milk bush has an annual biomass output of 45 tons/ha. Used for biogas production, this can generate 6,300m^3 of biogas a year, equivalent to an annual power output of 10,647WKh.

Scope of application: Suitable for national rural energy forest farms in tropical and southern subtropical regions.

Technological features: Milk bush is drought-resistant. By combining high output (biogas) tree species plantation with biogas utilization, it is of great significance in solving rural energy problems in poor countries in Africa and Asia. Milk bush is easy to grow and manage, while biogas technology is also a mature technology. Their combination will offer milk bush notable advantages in practical use and promotion.

Status of application

Can be put into commercial production in developing countries; simple training is needed; low use cost; and users can perform their own maintenance.

Technology Provider

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89. Forestry and vegetation restoration technology for arid regions

Status of application

Has been promoted and applied; ready for use after special training; low user cost; and users can perform their own maintenance .

Technology Provider

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Technology overview

Functions and use: Drought is a worldwide problem. Semi-arid and arid regions accounts for 1/3 of the total land area in the world, covering over 50 countries and regions. Vegetation restoration has long been a difficult issue in ecological reconstruction. Almost 60 years of research has led to an effective solution to the problem of low vegetation survival rate and formed serial supporting technologies.

Technical information: Forest survival rate: > 80%; and three-year vegetation retention rate: 75%.

Scope of application: semi-arid and arid regions.

Technological features: Rational supporting technologies, simple operation, low cost and high success rate.

Forest management, plantation, tree variety breeding

90. Desert shrub drought resistance evaluation system and fine variety breeding technology

Technology overview

Functions and use: Shrub tree species play an important role in sustaining the stability of desert ecosystems. The technology provides a theoretical basis and technical means for vegetation restoration in semi-arid and arid desert regions with an annual rainfall of under 300mm.

Technical information: The indicators of this technology include: (1) Establishment and evaluation of a drought resistance indicator system for shrub tree species, including integrated testing and evaluation at morphological, physiological and molecular levels; (2) seed garden construction and management techniques; and (3) fast seedling breeding and quality evaluation techniques.

Scope of application: The technology applies to semi-arid and arid desert regions with an annual rainfall of under 300mm.

Technological features: Has created standardization and technological systems for desert shrub anti-drought mechanisms and evaluation and seed garden construction and fast breeding, offers major social, economic and ecological benefits, and can be promoted in developing countries on a large scale.

Status of application

Has been promoted and applied; can be put into commercial production in developing countries; mature product; simple training is needed; low use cost; and maintenance-free.

Technology Provider

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91. Hole enclosure method-based water-saving and drought-resistant fixed seedling plantation technology

Technology overview

Functions and use: water-saving, plant hole micro-environment-improving, suitable for fixed seedling plantation in regions experiencing seasonal droughts.

Technical information: cuts water consumption by 50%, and fixed seedling survival rate is over 96%.

Scope of application: Fixed seedling plantation and afforestation in seasonally arid regions.

Technological features: Water- and labor-saving, high survival rate and zero pollution.

Status of application

Has been promoted and applied; can be put into industrial production in developing countries; ready for use after simple training; low use cost; and maintenance-free.

Technology Provider

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Forest management, plantation, tree variety breeding

92. Breeding and high-yield cultivation techniques of fine varieties of Xinjiang black currant

Technology Provider

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Technology overview

Functions and uses: The black currant fruit is rich in essential amino acids, flavonoids, vitamin C and zinc, calcium and other trace elements (vitamin C content is 30 times the level of apple, ranking 1st among the fruits) , is a third generation high-nutrition fruits. Black currant offers unique flavor, high processing performance and pigment content, can be processed into juice, jam, wine and a variety of drinks, and is also an important industrial raw material from which vitamins, natural pigments, and precious spices are extracted.

Technical indicators: For high-yield cultivation of new varieties of black currant, the period to attain production is 3 years, the average yield of fresh fruits is 500kg, the output value per mu is RMB1500, and the income per mu is RMB1300.once the 10,00mu pilot production base attains production, the annual output value will reach RMB15 million, the economic benefit will reach RMB13 million. The average number of seedlings produced per nursery is 6000, the output value per mu is RMB6000, and the income per mu is RMB4790; the annual output value of the 300mu nursery is RMB1.8 million, and the economic benefit is RMB1.43 million.

Application scope: Used for the breeding of fine varieties of black currant to increase the yield.

Features: The technology was granted a Level II Prize for Scientific and Technological Progress, and two scientific and technological achievements of Xinjiang Uygur Autonomous Region and, Level II Prize for Scientific and Technological Progress of Changji.

Status of application

The product is mature. Simple training is needed. The use cost is low. The initial investment is large. The subsequent use cost is low. Training of the maintenance personnel or establishment of maintenance points is needed.

93. In vitro propagation technology of wood plant

Technology overview

Functions and uses: Large scale in vitro propagation of wood plants.

Technical indicators: explants, establishment of the explants in vitro, shoot production from established explants, shoot multiplication from the sub-cultured shoots, rooting of the sub-cultured shoots, transfer of propagules to soil, and management technology of the main forest, fruit and ornamental tree species. The survival rate is above 80%.

Application scope: Rapid propagation of fine wood plants, such as Neolamarskia cadamba, Santalum album, Eucalyptus, Rhododendrons, Jujube and so on.

Features: Mature and Experienced technology with a large plant tissue culture and in vitro propagation lab. Can providing technical training and construction design of in vitro propagation lab or plant.

Status of application

The technology may be industrialized in the developing countries. The technology is mature. Special training is needed. The use cost is low. Maintenance by the customers is permitted.

Technology Provider

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Forest management, plantation, tree variety breeding

94. High quality, high-yield production technology of seedless grapes

Technology overview

Functions and uses: (1) harmless, high-yield production technology demonstration/promotion and technology training of grapes. To form a harmless production technology system made up by high-yield varieties, harmless planting and harmless pest/disease prevention and control technologies in Turpan by focusing on the harmless standardized planting management technologies, fertilizer and water management technologies of grapes and main pest/disease prevention and control technologies of grapes, improve the quality and storage performance of the seedless white grapes, increase the yield per unit area to more than 1500kg, bring the quality of the products to meet the harmless and green food standards, and the total demonstration area to 300,000mu. Carry out training of the harmless production technologies. The total number of people trained will reach 150,000 and the number of copies of training materials distributed will reach 200,000. (2) double-layer trellis grape planting technology transformation and demonstration. The first-ever double-layer trellis structure of grapes invented in China increases the commercial value and yield of the grapes significantly and increases the yield by more than 30%. Demonstration of the double-layer trellis planting technology of grapes is carried out and the demonstration area reaches 10-30 mu。 (3) establish the green food grape production base. Establish a 10,000mu green food grape production base, test the air, water quality, soil and other environmental factors of the base, which shall meet the requirements of the Technical Requirements for the Environment of Production Places of Green Foods and carry out demonstration of production technologies of green foods.

Technical indicators: (1) increase the yield per unit area to more than 1500kg, bring the quality of the products to meet the harmless and green food standards, and the total demonstration area to 300,000mu. (2) the yield of the vineyard that adopts the double-layer trellis increases by 30%, carry out demonstration of double-layer trellis planting technology of grapes. The demonstration area will reach 10-30mu. (3) Establish a 10,000mu green food grape production base, which will produce fresh grapes and dried grapes that will Class A standards. The usage of agricultural pesticides will decrease by carry out demonstration of production technologies of green foods 30% and meet the Technical Requirements for the Environment of Production Places of Green Foods. Carry out demonstration of the production technologies of green foods.

Application scope: Areas where seedless grapes and similar varieties are grown.

Features: High technical content, easiness to learn and good transplantability.

Status of application

The technology has been put into use. Special training is needed. The initial investment is large. The subsequent use cost is low. Maintenance by the customers is permitted. Carry out training in the harmless production technologies. The total number of people trained reaches 150,000 and the number of copies of training materials distributed reaches 200,000.

Technology Provider

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95. Comprehensive technical training class of environment-friendly and high added value bamboo industry

Technology overview

Functions and uses: The bamboo technologies are short-cycle, frequent and fast, simple, easy to learn, feasible, practical and cheap, are very suitable for the current conditions of ″backward economy″ and ″low workforce levels″ in the developing countries and are likely to form an integrated plantation, processing, industrialized and marketing system of the bamboo industry. In particular, the bamboo processing/utilization technology may provide the developing countries with a wide variety of bamboo products. Moreover, the development model featuring China´ s unique forest construction and management experience created by the Chinese government that is dominated by the government, supported by technologies and regulated by the market is very suitable for their conditions and favorable for their development and application.

Contents of lectures: (1) General: Current status and development of bamboo in China and the world; (2) integrated technologies for cultivation of bamboo raw materials : bamboo breeding and nursery, bamboo cultivation (bamboo shoots forest, timber forest, bamboo shoot and timber forests, water and soil conservation forests, energy forests, carbon sequestration forests), bamboo harvesting, storage, bamboo carbon sinks; (3) environment-friendly , high value-added bamboo processing: bamboo biomass, shoot processing, bamboo flooring and compound bamboo flooring, bamboo plywood (plywood, laminated flooring, decorative board, veneer board, peeling board, heavy bamboo flooring, etc.), bamboo curtains, bamboo carpets, bamboo decoration materials and handicrafts, bamboo furniture, bamboo charcoal, bamboo activated carbon and bamboo vinegar, bamboo fiber; (4) bamboo industry policy; (5) market exploration and development.

Target countries in which the students will be enrolled: to enroll students in developing countries worldwide (50 countries).

The desired objective of the training is to enable the learners to understand the current status and development of the bamboo industry, the role of the bamboo industry in promoting socio-economic development and improving the ecological environment, especially its potential significant role in alleviating global climate warming and clean biomass energy development; grasp the key technologies of cultivation and management of the bamboo processing raw material bases as well as the main types of environment friendly and high added value bamboo products in China, for instance, for instance, bamboo flooring, bamboo curtain, bamboo charcoal, and bamboo shoot processing technologies as well as related bamboo related ″3 waste″ treatment technologies; understand the bamboo industry policy of China and the conditions in the international bamboo market to make contribution to allow them use bamboo to provide socio-economic and ecological development and deepen their economic and technological cooperation with China.

Status of application

The technology has been put into use. Special training is needed. The use cost is low. Training of the maintenance personnel or establishment of maintenance points is needed.

Technology Provider

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Forest management, plantation, tree variety breeding

96. Key technologies of efficient cultivation, processing and utilization of lac resources

Technology overview

Functions and uses: The problem of lac quality is solved by means of the lac species resource collection & conservation and domestic technologies, lac production technologies that increase lac production and system benefits and 13 key lac processing technologies, and the refined lac bleaching glue and lac fruit preservative are developed.

Technical indicators: 1. Collect 9 lac insect species, 10 strains and 256 hosts; 2. Find out the kinship among 7 lac insect species and system development; 3. Select and breed 5 lac insect species that are suitable for different regions; develop 9 multi-specie lac production configuration technology; 4. Develop high quality lac pieces and bleaching lac and 7 kinds of lac fruit preservatives and apply for 16 patents.

Application scope: Suitable for application in the South Asia and Southeast Asian countries, especially countries that abound in lac resources.The high efficiency breeding technology of lac resources is mainly used for reforestation projects, regional ecological and economic construction and ecological restoration.The lac processing and utilization technologies are mainly used in forestry chemical, food, drugs and fruit preservation, etc.

Features: Carry out in-depth study of the technology from the perspective of fine variety selection, optimized configuration of varieties, high efficiency cultivation, product processing, new product development, large scale development and standard system construction and solve certain common problems existing in industry development in a well targeted manner.

Status of application

The technology has been put into use, and may be industrialized in the developing countries. The product is mature. Simple training is needed. The use cost is low and it is maintenance free.

Technology Provider

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97. Series low formaldehyde emission urea-formaldehyde resin adhesive technology

Technology overview

Functions and uses: This type of adhesives are used mainly for the manufacturing of E1-E0 environmentally friendly artificial woods. Common problems such as low F / U molar ratio, curing slower than curing of UF resin, bad bonding performance may be solved by the synthesis process, the modifier and different curing systems.

Technical indicators: the formaldehyde / urea (F / U) molar ratio of the series low formaldehyde emission urea- formaldehyde resin is 0.96～1.10, the free formaldehyde emission of the resin itself is less than 0.1, the solid content is 52～65, the curing speed when the composite hardener glue is used is 60～120s, the pH value is 8.5～9.0, and the storage period of the adhesive is greater than 30d.

Application scope: Used for the manufacturing of particle board, plywood, medium density fiberboard.

Features:NQ-21 is the resin manufacturing through the synthesis of formaldehyde and urea; NQ-22 is the modified urea- formaldehyde resin manufactured by adding a small quantity of melamine（equivalent to 1～3 times the quantity of urea）; NQ-23 is the composite hardener system manufactured by adding additives and a small quantity of melamine modified urea- formaldehyde resin that supplements the resin.

Status of application

The product has been put into use. Special training is needed. The use cost is low. Maintenance by the customers is permitted.

Technology Provider

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Forest fire prevention

98. Shoulder-rocket extinguisher system for forest fire

Technology overview

Functions and use: Used for putting out forest surface fires and can project extinguishing agents to fire sites within a range of 200m. The rocket system disperses high-efficiency extinguishing agents via explosion so as to stop burning chemical reactions and suffocate and put out fire.

Technical information: Projectile diameter: 105mm; combat part length: 530mm; total shell weight: 5.2kg; effective range: ≥200m, and 500m after extended range; extinguishing agent carrying load: ≥2.5kg; launch pre-parathion time: ≤1min; control area ≥50m^2; rocket launcher length: 920mm; rocket launcher´ s total combat mass: 11kg (1 launcher + 1 shell); and initial speed: 60m/s.

Scope of application: Applicable to putting out forest surface fires and while ensuring personal safety, can accurately project dry powder to the fire front and rapidly extinguish fire which cannot be reached by humans.

Technological features: Shoulder-launched, mobile, accurate within 1m over a distance of 200m; safe and self-destruction device attached.

Status of application

Mature product; ready for use after special training; low user cost; and users can perform their own maintenance .

Technology Provider

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Organizations

South-South Cooperation on S&T to Address Climate Change

Applicable Technology Manual
Agriculture and Forestry


中国科学技术交流中心
China Science and Technology
Exchange Center

China Science and Technology Exchange Center (CSTEC)

Founded in 1982, CSTEC is a national independent legal entity in China. Through international science and technology exchanges, CSTEC aims to push forward cooperation between China and the world and propel China´ s socio-economic progress. It has already established partnership with more than 130 organizations and famous enterprises in about 30 countries and regions worldwide. It is playing an important role in scientific communication with countries in America, Oceania, Europe, Asia and Africa, and regions like Hong Kong, Macao and Taiwan. One of CSTEC's major tasks is to push forward South-South S&T cooperation on climate change, and support technology R&D, transfer and training activities among developing countries in this aspect.

www.cstec.org.cn

Chinese Academy of Agricultural Mechanization Sciences (CAAMS)

CAAMS is a comprehensive enterprise, which provides equipment, technological service for the fields of agricultural machinery and food equipment development, mechanical & electric products manufacturing as well as the domestic and foreign trade.

CAAMS functions as the country's representative to participate in the activities of ISO/TC23 for agricultural and forestry tractor and agricultural machinery, and serves as the national standard organization of agricultural machinery and implement. CAAMS is also an authorized State laboratory for the inspection of import and export of Agricultural Commodities under the state Administration for Import and Export Inspection. CAAMS has conducted extensive International exchanges for years. The Center has held several international Conferences, seminars and international training courses of agricultural and food processing machinery technologies facing the developing countries, which has earned great support from the central government.

CAAMS is the largest research organization with the strongest innovation ability engaged in fundamental, application sciences with multiple disciplines, comprehensiveness and gives priority to R&D on modern agriculture equipment while facing the needs of agriculture, countryside and farmers.

1、Main technologies & Products：Tillage machinery, seeding machinery, plant protecting machinery, harvesting machinery, water saving machinery, drying machinery, grassland construction and engineering for animal husbandry， feed processing, agro-products processing, rural energy equipment

2、International Training Program: Entrusted by central government, CAAMS has conducted the international technical training programs from 1989 and received 1000 add members from 70 developing countries. A number of bilateral cooperative projects and international cooperation has been undertaken under the administration of central government.

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Xinjiang Tianye (Group) Co., ltd.

Xinjiang Tianye (Group) Co. Ltd is large state-owned enterprise under The Xinjiang Production and construction Co and one of the China top 500 company. The branch, Xinjiang Tianye Water Saving Irrigation System Company listed in Hongkong in 2006. The group involve in many industries, such as high irrigation irrigation equipments, plastics, chemicals, foodstuffs, thermoelectricity,mine , foreign trade and so on. By the end of 2010, the total assets of group reach to more than 4.2 billion with 40% average development rate. Production capacity of high efficient irrigation equipments, and PVC resin is no 1 in China,which could meet the requirement of 70 million of area for equipments, and the PVC pipeline capacity is 400,000 tons/year. ″Tianye drip irrigation system″ with low price and reliable characters that common Chinese farmer could afford have been applied more than 2.5 million ha, more than any others in the world. It has been spread into more than 29 domestic provinces such as Ginsu, He nan, Hebe, Jilin, Hei Long Jiang, Inner Mongolia, Hai nan etc, and other 13 countries including Kazakhstan, Uzbekistan, Pakistan, Mongolia, Angola, Zimbabwe and so on, the application area reach to 3500 ha. The high efficient irrigation technology is used on not only cotton, tomato, wheat,manse, but also rice, sugar cane, tobacco, soy bean, potato, alfalfa, and most of vegetables such as chilli and onion etc. In green house and orchard good results are achieved. Towards the objective of ″developing with the custom″ and based on many years application, it has been established one complete set of service system including plan and design, equipments supply, construction and organization, guiding and training to serve custom better.

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Institute of Arid Agroecology, Lanzhou University

Effective Utilization of Rainwater and Dryland Agriculture:The solution is to address dryland water stress and drinking water problems, greatly improve the productivity of dryland crops and water use efficiency, and reduce soil erosion and increasing vegetation cover.

2.Crop Eco-Physiology and Germplasm Resource Initiatives

3.Soil Ecology and Plant Nutrient Science

4.Agricultural Ecological Informatics:Combining the 3S system (Remote Sensing, Geographic Information System, Global Position System), ecology model and sensor network technologies, building the dryland agriculture assessment and management system, provide information and assistant tool for policy maker.

5.Vegetation Ecology and Desertification Control

6.Global Change Ecology:We focus on the impacts of climate change on ecosystem and investigation of a sustainable and low-carbon-emission development strategy for these areas.

7.Social Ecology: to ultimately reveals the effects of human social processes on coupling human and natural system.

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Institute of Agricultural Environment and Resource (IAER), Shanxi Academy of Agricultural Sciences

Founded in 1959, the institute mainly engages in the R&D, training and demonstrative applications in sustainable use of soil resources, agro-ecological environment protection, highly efficient use of fertilizers, drought early warning and other related fields.




The achievements in scientific research include more than 70 research achievements, 5 national patents, more than 520 published papers in academic journals, of which 18 papers in SCI, and 58 papers in the journals of national level. A large number of high-tech products are researched and developed. A new pattern, which focuses on both the applied basic research and scientific research conversion, has been gradually formed.

The institute values the international cooperation in research. The collaborative research has been carried out with Japan International Cooperation Agency (JICA), Australia Melbourne University, Dutch Wageningen University, Russian Academy of Sciences Institute of Biology, United Nations Environment Programme (UNEP) and other international organizations. In 2009, the institute has been awarded as the "International Cooperation of Ministry of Science and Technology Base" by Ministry of Science and Technology.

1. Research on sustainable utilization of soil resource

Researches are specific to issues including soil desertification, erosion, deterioration, salinization and pollution.

2. Research on protection of agricultural eco-environment

3. Research on plant nutrition and high-efficiency utilization of fertilizers

Sustainable agricultural development obtained via optimizing nutrition cycling, reducing nutrition input and increasing nutrition utilization efficiency

4. Cooperative research and development of drought early warning

5. Technical training, demonstration, application and propagation

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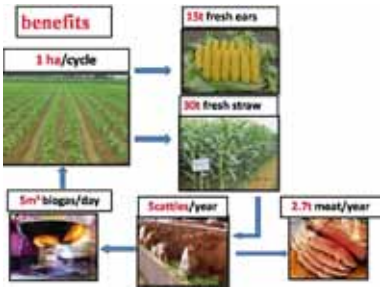
Foshan University

Foshan University is approved to be a full-time comprehensive undergraduate university. International co-operation and exchange link Foshan University to the world. Foshan University has always been actively involved in communication with many higher education institutions across UK, USA, Germany, New Zealand, Australia, Mozambique, South Africa and HK SAR, building up partnerships in the areas of teacher training, disciplinary development, academic exchanges, scientific research and management. Since 2004, Foshan University has been cooperated with Mozambique. During 2006-2008, Foshan University and Mozambique Mondlane University have been cooperated on ″Research on Introduction, Development and Utilization on rice and maize varieties in Mozambique″ , and during 2008-2011, Foshan University and Instituto de Investigacao Agraria de Mozambique (IIAM) have been cooperated on ″Research and Extension on the Key Technology of Grain Production in Mozambique″ supported by Science & Technology Ministry, P. R. China. From 2009, Foshan University has been cooperated with Tshwane University of Technology in South Africa. We are cooperating on ″Research and Extension on the Key Technology of Maize Production in South Africa″ (2009) and ″Studying on the Model of Modern Agricultural Circular Economy in South Africa″ (2010) supported by Science & Technology Ministry, P. R. China. The proposed ″Modern Agricultural Circular Economy″ (MACE) model is very suitable to promote and extend in the tropical and sub-tropical zones in Africa, and can make a huge economic impact. Through 8 years cooperation with Mozambique and South Africa, we have established strong foundation for cooperation in Africa.



Foshan´ s ″Modern Agricultural Circular Economy″ (MACE) model is suitable to promote in the tropical and sub-tropical zones.

(1)Sweet corn production. To produce sweet corn and straw feed to cattle production. sweet corn varieties which can be planted in tropical and sub-tropical zones, 15 tons of fresh ear and 30 tons of fresh straw can be harvested on 1 hectare of land per season;

(2)Cattle production. 30 tons of straw silage fodder can be used to feed a groups of cattle(n=5) per year, producing 2.7 tons of beef per year;

(3)Biogas production. 5 cubic meters of biogas can be produced by using the cattle´ s (n=5) manure per day.

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Agricultural Technology for South-South Cooperation to Deal with Climate Change

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Abstract: The article introduced green technologies such as the water saving irrigation, variety breeding and crop cultivation, waste treatment and utilization and rural sewage treatment technology of agriculture. Green technologies are suitable for the developing countries to cope with climate change. All of those technologies can promote the cooperation between developing countries on technology research, development, transfer and application in the field of agriculture, which also can improve the ability of developing countries to deal with climate change and promote common development.

Kew words: Climate change, South-South cooperation, Agriculture, Green technologies

1. Introduction

The climate changes exerted a great influence upon the world. The developing countries are suffering seriously adverse effect brought by climate change. Many developing countries have great similarities in the natural environment and the stage of development with China, so many technologies, especially green technologies in agricultural field are more targeted and applicable. Developing and promoting green technology in the field of agriculture so as to improve the capability of developing countries to address climate change and achieve common development.

2. Agricultural water-saving irrigation

Agricultural water-saving irrigation techniques include canal seepage control, low-voltage aqueduct irrigation, sprinkler irrigation and micro-irrigation technology. Sprinkler irrigation is ejecting water into the air through the nozzle, and dispersed in the fields uniformly after scattering the water into fine droplets. The uniformity of sprinkler irrigation is 80%-85%, and the water consumption is less 30% -50% than surface irrigation. It may increase crop yields by 10%-30%, and the land utilization rate can be improved about 7%-15% at the same time. In addition, it is suitable for various soil and topography, so it is widely used in developing countries. China Agricultural University has developed “full mobile quick connect large diameter aluminum pipes sprinkler system” in 2003 by the Government of Shanxi Province Science and Technology Progress Award, and achieved good results for agricultural water conservation.

Micro-irrigation is wetting soil near crop root through the irrigation device with a small flow. Micro-irrigation can be divided into drip irrigation, micro-sprinkler irrigation, small tube irrigation and infiltrating irrigation. It would be saving 50%-70% and 15%-20% water compared with surface irrigation and spray irrigation. The pressure could be controlled effectively with a degree of homogeneity 80%-90%. It can not only increase crop yield by 15%-30% than surface irrigation, but also improve the production quality. It is simple management, energy saving, and good control of water and fertilizer, and easy to control weeds, plant diseases and insect pests. It can make use of saline water, adapt to all kinds of complicated terrain and can be easily inbuilt mechanically. “Underground drip irrigation system”, developed by China Agricultural University, passed through technology appraisal hosted by Shanxi Province, with the conclusion for the domestic leading level. Besides, China agricultural university put forward ‘crop root partition alternate irrigation’ for the first time, which has saved 40% of water and open a new way for the northwest agricultural water-saving.

(a) (b)

Fig. 1 Sprinkler irrigation (a) and micro-irrigation (b)

3. Various breeding and crop cultivation technology

3.1 Various breeding

At present, gene engineering breeding technology is one of the most important modern breeding techniques. It obtains good genes in the world as far as possible first [2, 3],and then cultivates new varieties of crops through focusing on the favorable genes in one crop inbred line by various means. These breeding technologies have been widely applied in developing countries. Xu Defang (Shandong Provincial Academy of Agricultural Sciences) cultivated upland rice variety 297 taking advantage of more than 30 copies of ancestor upland rice materials which provided by Professor Li Zichao (China Agricultural University) with 80-90 cm height, more than 2000 grains per panicle, more than 95% seed setting rate. It has been widely planted in Gansu, Ningxia and other regions of China, as well as India, Kenya and other countries.

National Maize Improvement Center of China Agricultural University cultivated Nongda 81, Nongda 95, Nongda 108, Nongda 221and Nongda 2008 by using a number of modern breeding techniques such as genetic engineering. They have ear of 105 cm height, 22-23 leaf , extensive root system, and an average yield of 581.3 kg / 667 m^2.And the most important is strong resistance on drought and disease. These new varieties have been applied widely in Shandong, Henan, Hebei province of China and North Korea, India, Vietnam and other developing countries.

(a) (b)

Fig. 2 Upland rice 297 (a) and Nongda 108 maize (b)

3.2 Crop cultivation

The most critical cultivation techniques are conservation tillage and soil testing and formulated fertilization. Conservation tillage is a new technology response to the area of arid, barren land, low and unstable yields and serious soil erosion. Soil testing and formulated fertilization is a rational fertilization technique which could balance application of fertilizer according to crops needs and production requirements after testing the soil fertility.

It was first proposed by Professor Gao Huanwen (China Agricultural University) that the relationship of conservation tillage and sustainable development of agriculture. Conservation tillage could reduce 25-35% fuel consumption, be up to 70% efficiency of nitrogen fertilizer and save about 20% water in arid regions. Conservation tillage has been promoted in much of China, Africa and Latin American.

Soil testing and formulated fertilization improves 5-10% efficiency of fertilizer, 10-15% increase rate of crops, even up to 20%. It improves not only the fertilizer efficiency, but also the quality of agricultural products by soil testing and formulated fertilization. The technique is applied in developed countries firstly and then promoted in China, India and other developing countries recent years.

(a) (b)

Fig. 3 Conservation tillage (a) and measuring soil fertilizer technology (b)

4. Treatment and utilization technology of agricultural waste

4.1 Rural household biogas digesters

The technology improves upon traditional household biogas digester in China based on national biogas production standard. It can convert human and livestock excrement and crop straws into biogas and thus constitutes ideal biomass energy for energy conservation and emission reduction. Each biogas digester has a volume of 8-10m3. Biogas digester can be built into a “Three-in-One” or “Four-in-One” compound system base along with water closet, kitchen and green house. According to the calculation, a 8 cubic meters of biogas digesters can produce 350 cubic meters methane every year, which can

replace fire wood 2 tons (equivalent to standard coal 0.61 tons), and reduce 2 tons emissions of CO_2. Household biogas is appropriate for tropical, subtropical and temperate rural regions with conditions for livestock breeding in Africa and Asia. It has features such as good heat preservation and high gas output. Rural household biogas has been promoted and applied in developing countries with low operation cost. Users can perform their own maintenance after simply training.

4.2 Biogas engineering

As an effective engineering of treating organic waste, biogas engineering is an important link and technical measure for agricultural sustainable development. The raw materials of agricultural biogas engineering include animal manure, crop straw, weed and agricultural products processing waste. According to the scale of biogas plant, it can be divided into small biogas engineering (with biogas yield 5-150 m^3/d), medium biogas engineering (with biogas yield 150-500 m^3/d), large biogas engineering (with biogas yield 500-5000 m^3/d) and super large biogas engineering (with biogas yield above 5000 m^3/d). By the end of 2010, the number of large and medium-sized biogas project for large-scale farms has reached 4700 in China, and most of them use animal manure as raw materials [4].

Biogas engineering produce biogas digestate, which contains abundant organic matter and a variety of trace elements. There are many comprehensive utilization ways of biogas digestate such as seed soaking, soil basic fertilizer, foliar spraying, etc., but all of the ways need strict inspection and tempered. There are scientific achievements of CAU derived from “research on high-value utilizes technology of biogas digestate” project in “eleventh five-year” national technology support program. This project solved number of key technical problems on high-value utilizes of biogas digestate, such as analysis of main components and bioactive components (MCBAC) in biogas slurry; efficient, low consumed, concentrated and reducing treatment processes of biogas slurry; researches and developments on high-value utilizes products of biogas digestate; researches on land carrying capacity of safely applications with biogas digestate, and so on. Through further promotions and demonstrations, this project has obtained remarkable economic, social and ecological benefits and had broad prospect of applications. Technical achievements reached international advanced level, and can be applied in developing countries.

(a) (b)

Fig. 4 Biogas engineering (a) and biogas digestate fertilizer utilization (b)

4.3 Rural stoves

600 million biomass stoves are used for cooking and heating, mainly in Africa, Latin America and Asia at present. Most of the stoves are traditional stoves and open stoves (without furnace body or chimney), and the situation is very serious lack of efficient and clean cooking stoves [5]. The efficient fuel-saving stoves and semi-gasification stoves greatly improve the thermal efficiency and reduce the emissions of air pollutants.

The innovations of efficient fuel-saving stoves are lower the flame height, furnace volume and increasing block fire ring and so on. New technology improved thermal efficiency to 30% and reduced emissions of air pollutants significantly [6]. During 2004-2008, China Agricultural University carried out a comparative study on indoor air quality in the rural areas of central and western China. It suggests that open stoves is the most serious on indoor air pollution, followed by the traditional stoves, initial fuel-saving stoves and efficient fuel-saving stoves (efficient fuel-saving stoves as shown in Figure 5 (a).

Semi-gasification stove is built on the basis of the direct-fired stove and gasification stove.The biomass fuel combustion in the furnace with primary air entered from grate at the bottom, and secondary air entered from the top of the stove. It improves the thermal efficiency of stoves, and brings a significant reduction of atmospheric pollutants, such as particulate matter and CO emission . In 2012, China Agricultural University carried out a household survey research located at Hubei Xuan’en, and the study found that the semi-gasification stove save 29% firewood and 23% cooking time than the old-fashioned provincial stoves. (Semi-gasification stoves as shown in Figure 5(b)).

(a) (b)

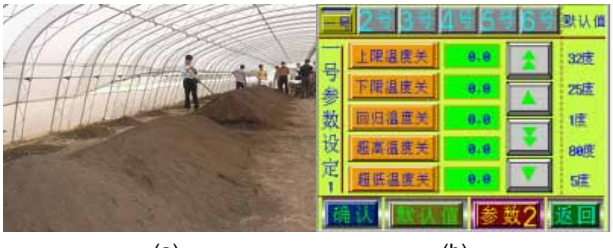
Fig. 5 Efficient fuel-saving stoves (a) semi-gasification stoves (b)

The two advanced stove technology above are both low costs and simple operation, which suitable for rural areas of developing countries, and it is one of the ideal ways to deal with climate change. In 2012, China Agricultural University carried out the "senior training program for design, manufacturing, and performance evaluation of biomass cook stoves" which hosted by Ministry of Education and the Ministry of Commerce. 23 scholars coming from 9 developing countries including India, Mongolia, Uganda, Kenya and so on engaged in the work. The training involved the whole process from the design to the production of biomass stove, and discussion on the advanced concepts stove design and production and the quality standard system are included. The training program provides reference for China-Africa and South-South cooperation.

4.4 Compost

Organic matter can degradate and transform rapidly by the microorganism and enzyme activity in artificially controlled condition, and which will produce large amounts of humus after aerobic treatment and can be used to improve soil quality. It has been widely applied to the treatment of farm livestock, poultry excrement, agricultural wastes and other solid organic wastes [8]. Compost of rural livestock and poultry farm is not only providing organic fertilizer for agriculture but also reducing the pollutant.

The microbial manure fermented with livestock excrement is converting waste from animal into fertilizer of plant. Component Index: Nitrogen≥2%, Phosphorus≥0.2%, potassium≥1%, Organic Matter≥40%, Probiotics≥100 million/g. It is widely-used for treatment of organic wastes such as livestock excrement, crop straw, brewing wastes and organic garbage. It is lower cost, less energy consumption and no secondary pollution. The research of Professor Li Ji (China Agricultural University) on rapid composting technology can reduce compost time to 1 to 2 weeks through biological inoculation, formulation optimization, the control of conditions and equipment innovation, and fits the demand of product market and environmental hygiene standard. Rapid composting greatly reduces the cost and nutrient loss of compost; in addition there are composting process control system, compost recipe software and easy operation management, so it is appropriate for developing countries.



(a) (b)

Fig.5 Compost (a) and automation control system of compost (b)

5. Rural sewage treatment technology

The development of new types of sewage treatment technology is an essential way to improve the environment pollution and better to the climate change situation. Such as constructed wetlands, oxidation ponds and biofilters wastewater treatment technologies are more and more famous for its low investment and operating costs.

5.1 Family constructed wetland technology

The constructed wetlands are designed and built by simulating the natural wetlands which contains synergistic matrix, plants and micro-organisms. The wastewater is purified though physical, chemical, and biological way in ecosystems [9]. Constructed wetlands can be divided horizontal surface flow, subsurface flow and vertical flow constructed wetlands types according to the internal flow characteristics of the water. Family constructed wetland system is a new kind of rural sewage treatment technology developed by China Agricultural University [10]. The modular production type which is less 1500 RMB per unit is low-investment and easy for the long-distance transport. The combination of sedimentation tank and underground vertical flow wetland bed guaranteed the removal efficiency of the wetland bed. It has a stable operation status treatment effect even in the winter because of the 0.5 m insulation layer. The easy-operation

and self-maintenance characters make the system are suit for rural decentralized wastewater treatment [11, 12]. The significant economic, social and ecological benefits were caused by the promotion and application in rural households of northern China.

5.2 Oxidation pond technology

Oxidation pond is an artificial stabilization bio-ponds though appropriate decorated. The Sewage purification principle of organic pollutants is mainly relied on natural biological method in oxidation pond. In recent decades, oxidation pond sewage treatment have successfully applied in more than forty countries and regions from the cold northern part of Sweden, Canada, to the tropical regions of New Zealand, Australia in treating animal husbandry, farming, industry wastewater[13]. The strengthen oxidation pond technology can greatly improve the BOD_5, COD_{cr}, N and P removal efficiency compared with the ordinary single pond. It can also reduce the phenomenon of short flow, improve pond using efficiency and stabilize the effluent water quality which promotes the application of the oxidation pond technology.

5.3 Biofilter technology

Biofilter is a kind of biological treatment technology with soil self-purification principle developed by the original intermittent sand filter and contact artificial filter. The biofilter has an excellent treatment effect without secondary pollution. The strong resistance to loading ensured a stable operation status. Biofilter has a considerable application prospects in developing countries rural sewage treatment situation because of its economic advantages. Combined process of ozone and biological filter [14] is a biodegradation system contains good oxidation ability. What's more, ozone can be used as a strong oxidizing fact which can significantly improve wastewater biodegradability. Ozone process the residual water ozone has a bactericidal effect on microbial.

(a) (b)

Fig. 6 Constructed wetland for rural sewage treatment technology

6. Conclusion

The obvious advantages in agriculture indicated that China is playing a leading and exemplary role for South-South cooperation. The agricultural technologies provided by Chinese experts are simple, practical and economic benefit, and welcomed by the host country government and the local farmers. More and more international has been attracted to the effect and role of South-South cooperation. Nowadays, the independent development ability of recipient country has been improved, and more cooperation been made it more specific for developing countries to respond to climate change. The transfer of technology according to the effects of climate change will improve the ability to adapt of the developing countries. South-South technology cooperation in agriculture are entering a new stage of development.

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Developing Hybrid Rice Technology to Address Global Climate Change

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With the intensification of global climate changing, the grain production worldwide is becoming unstable increasingly. Food safety and the grain supply are big challenges for most developing countries. More and more food must be produced on the limited arable land to meet the requirement of the ever-lasting growing population.

Global climate change has brought unprecedented challenges to the global food production. Climate change refers to, apart from the natural variability of the climate observed over comparable period, the climate change caused by direct or indirect human activity that alters the composition of the earth's atmosphere. It is considered as one of the most dangerous threats to the world environment, human health and welfare and the global economy sustainability.

The reason causing climate change is mainly due to the increase of greenhouse gas in the atmosphere. As we know that 99% of the atmosphere consists of 78% nitrogen and 21% oxygen, which basically have no direct function on climate regulation. A small portion of the gases (including carbon dioxide, methane, nitrous oxide, ozone, water vapor, halocarbon and etc.) in the remaining 1% atmosphere are called greenhouse gases. The reason for the increase of greenhouse gases is that the carbon dioxide is produced when human burns fuels such as coal, oil and natural gas and the plant's capacity of absorbing carbon dioxide is reduced because of the forest destruction.

As agricultural production is closely related to climate, global climate change will lead to increased instability of agricultural production, which mainly shows in: 1) the impact of climate change on crop growth, development and yield, 2) the impact of climate change on crop quality, 3) the impact of climate change on agricultural planting structure distribution, 4) the impact of climate change on agricultural production cost etc. Therefore, how to deal with global climate change in agricultural production? Especially what are the application and research of new technologies of agricultural production that will respond effectively to the global climate change? This essay will elaborate the application of hybrid rice technology to address global climate change, reducing the impact of agricultural production on the climate and environment and other aspects.

1. Cultivate new varieties of hybrid rice and reduce the impact of climate change on agricultural production

The core of promoting hybrid rice technology to address global climate change is how to guarantee the stability of rice production and stable supply of food under the global climate change, especial the extreme climatic condition. Therefore, in the process of breeding new varieties of hybrid rice, we should start from the aspects such as variety yield, resistibility, and resistance to diseases and insect pests to breed new varieties with high and stable yield and good comprehensive resistance, so as to reduce the impact of region's climate change on rice production.

1.1 Cultivate super high-yield variety to reduce the impact of climate change

The invention and application of hybrid rice technology has gone through the period of 50 years. Compared with the conventional rice, the main advantages of hybrid rice are high yield and good resistance. In recent years, due to the global climate change or harm of extreme disastrous weather, the advantages of hybrid rice are affected to some extent. Therefore, we believe that more attention should be paid to the yield index in the cultivation of hybrid rice varieties. That is to breed more super high-yield hybrid

rice varieties, improving the ability of hybrid rice yield on per unit area so as to reduce the adverse effects of climate change. For example, in 2011, the super hybrid rice program that has been implemented by Hunan Hybrid Rice Research Center in China and the pioneer super hybrid rice varieties has been achieved 13.95 ton per hectare on 6.7 hectare for two consecutive years which made the highest rice yield record in history.

1.2 Breeding rice varieties with drought resistance and water-logging tolerance

The study showed that the nature disasters, such as the drought and flooding can caused by precipitation anomalies are the huge risk affecting the rice stable yield. Annual food loss by drought and flood disaster accounts for 10% to 25% of the total food loss by disasters. Cold damage and heat injury formed in abnormal temperature also have significant impact on rice production: at the heading and flowering stage of hybrid rice, increasing 1℃ from the optimum temperature (24℃~ 27℃) to higher temperature, the empty grain rate increases about 1.37% to 6.94 %; decrease 1℃ from the optimum temperature to lower temperature, the empty grain rate increases about 2.5% to 8.58%. At the grain-filling stage, when the daily average temperature is less than the critical temperature of 20 ° C, the empty grain rate increases to 22.8%32.3% from 9.9% 19.9% at the optimum temperature. The experiments of IRRI show that the minimum temperature rises 1℃, rice yield on per unit area declines by 10%. Therefore, new hybrid rice breeding program must focus on the higher yield and multiple-tolerances, especially the characteristics of drought and water-logging tolerance etc.

1.3 Breeding new rice varieties with strong resistance to diseases and insect pests.

The harm of pesticides on the environment is reduced while improving the hybrid rice production. By improving the resistance to plant diseases and insect pests, and enhancing crop's ability to resist diseases and insect pests, it will not only reduce the quantity of pesticide used in hybrid rice production, but also reduce land degradation caused by the pesticides application excessive which caused the contamination of groundwater resources. In addition, by adopting the new hybrid rice with multiple-tolerance to diseases and insects, farmers can reduce the amount of chemical and fertilizers application. By this way, the cost of rice production will be reduced greatly, which can increase the farmers' income indirectly.

2. Adopt new hybrid rice technology to reduce the impact of climate change

For hybrid rice production in response to global climate change, except breeding new varieties with high quality and strong resistance etc, research work should be carried out in reducing water resource waste and fertilizer use and in the application of other green-efficient production technology, to maximize reducing the impact and harm on environment or climate in the rice production process from different aspects.

2.1 Precision irrigation to reduce water wastage

Water application exists everywhere in hybrid rice production process, but it varies in each stage. For example, the lower limit value (accounted for saturated water content) of water content in the soil in each growth stage: 70% to 80 % at early stage of tillering, 60% to 70% at late stage of tillering, 70% to 80% at booting stage, 80% at flowering stage and 70% at the milky stage. Therefore, it is necessary to improve the level of water management in the field, adopting different irrigation measures at different stages to achieve precision irrigation and reducing the waste of water resources.

2.2 Soil testing and formulated fertilization reduces the quantity of using chemical fertilizer in hybrid rice production process and reduce the harm to environment

Soil testing and the formulated fertilization methods are based on soil testing and fertilizer field experiments to explore scientific and rational cropping patterns through the cultivation models or habits, farming systems, soil elements and soil fertility in different regions. Based on the reasonable application of organic fertilizer, the application quantity, time and method of nitrogen, phosphorus, potassium, medium elements, and trace elements is put forward as well. In the process of hybrid rice production, promoting the application of soil testing and the formulated fertilization technology in a large scale plays an important role in reducing fertilizer application in hybrid rice production, and it can reducing the impact of greenhouse gas emission indirectly. Because the producing fertilizer is a process of high energy

consumption, greenhouse gases emitted by fertilizer accounts for 0.6-1.2% of the total global greenhouse gases. The decrease of fertilizer application in hybrid rice production process means the reduction of greenhouse gas emission.

3. Strengthen the process of South-South Technical Cooperation to promote the safety production and supply of food crops

Under the situation of worsening global climate change, relying solely on the power of one or several countries is unimagined. The majority of developing countries must unite to rely on our strengths to jointly cope with the negative impact of climate change. Each member country of the **"South-South cooperation"** should strengthen cooperation: firstly, to carry out active and effective cooperation in the field of agriculture, and establish long-term cooperation mechanism, collect and preserve variety source broadly, work out the active policies of variety source serving for breeding; secondly, actively cooperate with the breeding work to carry out the research of variety source and provide germplasm resources with valuable use to solve problems existing in the production; Thirdly, strengthen the intensity of assessment and preservation of local varieties' germplasm resources, increase the financial investment reasonably, carry out cutting-edge basic research, actively complete intellectual property protection laws and regulations and propel the construction of management integration of breeding, production and promotion; fourthly, actively take the advantage of the network platform, strengthen the scientific and technological cooperation and exchanges of variety source among member countries, reasonably integrate resources, improve the utilization of germplasm resources, and gradually form the regional cooperation, so as to realize the sustainable development of the global seed industry.

In short, under the situation of worsening global climate change, actively and effectively engaging in agricultural production and ensuring the food supply will be a long-term issue that the majority of agricultural scientific workers need to face. In addition to actively strengthen the scientific and technological cooperation and exchanges among different countries, what's more, new rice variety breeding and the application of the efficient and low-carbon agriculture production technology must be think about the relationship between agricultural production and environmental changes systematically and prospectively, to adopt more environment-friendly production technology, adjusting planting structure and mode as well as developing efficient and green organic agriculture, so as to actively address the negative impact of climate change and achieve sustainable development of food safety production.

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