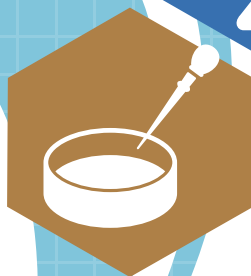




Food Industry Research and Development Institute



FIRDI

RESEARCH · DEVELOPMENT · INNOVATION
SINCE 1965



History

Food Industry Research and Development Institute (FIRDI) is a non-profit legal entity founded in 1965 with financial support from the Canners' Association of Taiwan, Council for International Economic Cooperation and Development (CIECD) and Joint Commission on Rural Reconstruction (JCRR). During its early stage, while assisting domestic can manufacturers in technological research and development to strengthen their international competitiveness, the Institute has successfully developed numerous technologies related to food and bio-industries. FIRDI has now become the most comprehensive food research institution in Taiwan. In addition to assisting the development of bio-industries, the Culture Collection and Research Center was established in 1982 and expanded as a Bioresource Collection and Research Center in 2002. The Center is Taiwan's bioresources bank, and the most comprehensive bioresources center in Asia. In 2005, Southern Taiwan Service Center was established to extend the service to southern Taiwan. In 2011, Ministry of Economic Affairs (MOEA) assigned FIRDI to operate and administrate the research functions of the Chiayi Industry Innovation and Research Center (CIIC) in Chiayi city. The FIRDI Academy was founded in 2015, and aims to become the main center for lifelong learning and academic exchange of Taiwan's food industry.



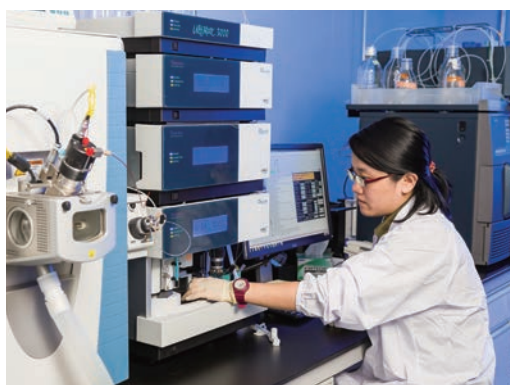
Missions

- To devote R&D in science and technology of food and bio-industries
- To provide technical services to food and bio-industries and to help promote industrial development by investment in innovative food and bio-businesses
- To nurture and train scientific personnel for the food and bio-industries
- To assist food and bio-industries in international information exchange and business development

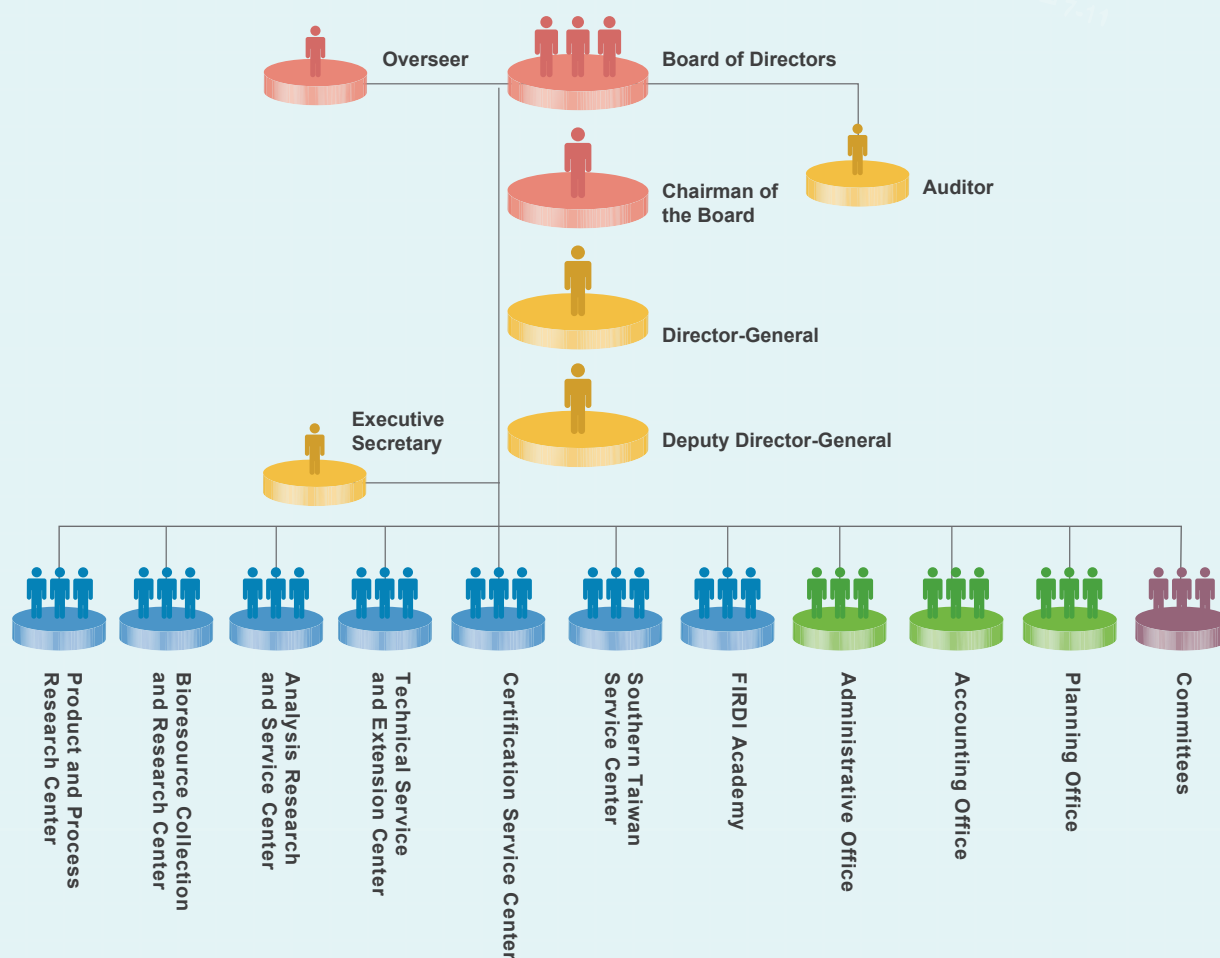
- To become the leading food technology innovation and research institution in Taiwan
- To become the most trusted food counseling and quality assurance institution in Taiwan
- To become the most credible food inspection institution with full research capacity in Taiwan
- To become the lifelong learning institution of the most capable of studying and application for the Taiwan food industry
- To be the navigator for the forward development and the backup for the sustainable development of Taiwan's food industry

Goals

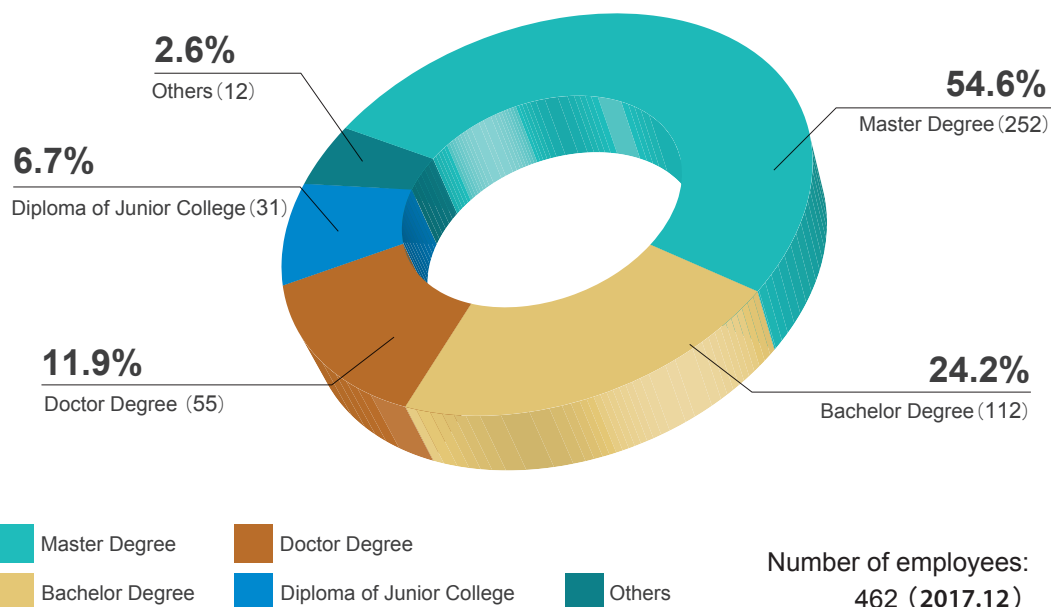
Visions



Organization



Human Resources





Outstanding Research and Service Teams

I Research

Product and process research and development

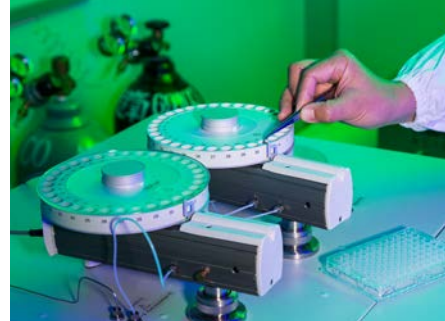
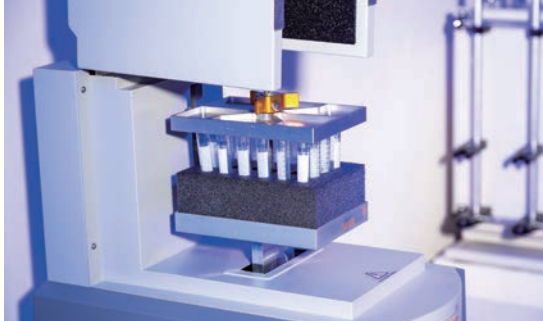
- Keep conducting technology transfer and service to meet the expectation of Taiwan food industry
- Own dozens of domestic and foreign patents of innovative food process and products
- Enhance the diverse application of Taiwan's agricultural raw materials to create value-added products
- Promote innovative food industry of functional lipids, texturized soy protein, dairy and beverage non-thermal processing, and functional ingredients
- Received several awards from MOEA for Technology Development Projects
- Established technology and health oriented platforms for catering and restaurant industry
- Obtained the certification of ISO9001: 2008 Quality Management System by the team conducting the assessment of safety and functionality of health foods
- Is the certification body for health foods accredited by the Health Food Society of Taiwan

Collection and research of bioresources

- Is a bioresources center for industrial purpose with the support of MOEA
- Is a member of the World Federation for Culture Collections(WFCC)
- Is a national authority for the deposit of patent-related biological materials with the support of the Intellectual Property Office, MOEA
- Is a core facility of National Health Research Institute for "Cell Bank"
- Is an "Agricultural Microorganisms Bank" with the support of Council of Agriculture
- Is the most comprehensive systematic bioresources center in Asia
- Establish the "Taiwan Stem Cell Bank"
- Is the first ISO Quality System (ISO 9001) certified multi-functional bioresource center in the world
- Accredited testing laboratories by Taiwan Accreditation Foundation (TAF)
- Accredited reference material producer by Taiwan Accreditation Foundation (TAF) on the basis of ISO Guide 34
- Adopted an intellectual property management system and certified by the Taiwan Intellectual Property Management System

Machinery and processing integration

- Accredited by Ministry of Health and Welfare for aseptic packaging and processing certification
- Accredited by both Ministry of Health and Welfare and Food and Drug Administration, USA for canned food sterilization
- Hygienic design of food machine laboratory received certification from TAF standardized test
- Established European Hygienic Engineering & Design Group (EHEDG) Taiwan Chapter and received The Best Young Regional Section Award Winner 2015
- Established aseptic processing and packaging service platform
- Established canned food sterilization process counseling service platform
- Developed innovative cooking and heating method based on both microwave and traditional energy systems



- Established swift R&D pilot platform for health drinks
- Developed Taiwan's first PET hot-filling machine certified by the Ministry of Health and Welfare
- Was stationed at the Southern Taiwan Innovation & Research Park
- Was stationed at and operated the Chiayi Industry Innovation and Research Center

Analysis

- Appointed and authorized by the Ministry of Health and Welfare as a food hygiene inspection facility
- Recognized by National Treasure Administration's hygiene standards as a certification laboratory for spirit and alcoholic drink
- Accredited by Taiwan Accreditation Foundation ISO 17025 as a testing laboratory
- Received authorization to conduct accredited testing from the Ministry of Health and Welfare (300+ items and TAF (400+ items)
- Recognized by the Brazilian government as a testing laboratory for non-alcoholic beverages, vinegar and alcohol
- Obtained outstanding performance of multiple domestic and overseas proficiency testing programs
- Increased analysis services to cover azodicarboxylic amide, acrylamide, dithio carbamate in pesticide, decanoic acid in royal jelly, urea in chewing gum, nitrate and nitrite in vegetables, methyl yellow and diethyl yellow ... etc.
- Built Chiayi regional food safety inspection service center in the Chiayi Industrial Innovation and Research Center

Consultancy

- Promote quality assurance certification including the Certified Agricultural Standards (CAS) Food System, the Taiwan Quality Food (TQF) Certification, Hazard Analysis Critical Control Point (HACCP), and the Excellent Wine Certification System, in addition to the processed food traceability system and vacuum-packed food inspection registry
- Provide technical assistance to help food manufacturers meet the Good Hygiene Practice (GHP) standards
- Provide inspection service for ISO22000 food safety management
- Promote a cooperative research partnership between the industry and academia
- Provide technical consultancy and troubleshooting service for food manufacturing
- Set up an Industrial Upgrading and Transformation Service Team-Offshore Service Branch, to assist the local food industry in innovative upgrading. The team received an accolade from the 2nd National Industrial Innovation Award-Team Category-Model of Local Industry Innovation Award

Training

- Set up the FIRDI Academy and certified by the Workforce Development Agency's Talent Quality Management System (TTQS) (training institution version)
- Established an education/training and innovative learning platform for food-related industry professionals
- Opened international training classes to establish a food professional exchange platform
- Develop industry-learning networks for interdisciplinary and diverse learning models
- Host license examinations to obtain related certifications and provide professional training for competency identification
- Provide customized education and training services



Technology Research and Application

Product and Processing Research and Development

Products and ingredients

- Prepared foods
- Formulated phytochemical foods
- Vegetarian foods
- Functional carbohydrate ingredients (resistant starch, modified bio-fiber, oligosaccharide)
- Seasoning and spices
- Nutritional and functional peptides
- Functional oils and fats
- Structured lipids
- Healthy cuisines with customized preparation and assembling
- Structured lipids
- High pressure processing foods

Processing technology

- Extrusion technology (vegetable casing, wet-type texturized vegetable protein, kernel-type multigrains)
- Food micronization technology for dietary fiber-rich foods
- Processing technology for resistant starch and oligosaccharides
- Large-scale production of prepared Chinese cuisines
- Processing technology for purine reduction
- Membrane technology for microbe removal
- Processing and product standardization technology for healthy cuisine
- Oil and fats processing and reconstitution technology
- Phytochemical extraction technology
- Modification and formulation technology for functional materials
- High-pressure processing technology
- Ultrasonic-assisted microwave and composite enzyme extraction processes

Risk analysis

- Early food safety monitoring
- Safety and compatibility evaluation of food packaging materials
- Inspection of packaging materials and evaluation of sealing integrity of packaging
- Shelf-life evaluation

Safety evaluation and bio-functionality

- Bio-functionality assessment: provide animal studies for modulation of serum lipid, blood glucose, gastrointestinal function, and/or blood pressure
- Functionality screening: establish platforms for screening antioxidants, anti-inflammatory, immunity, blood glucose regulator, etc.
- Safety evaluation: provide testings for genotoxicity, acute toxicity, and 28-day subacute toxicity, 90-day sub-chronic toxicity, etc.



Systematic Integration and Verification of Processing Equipment

Integration and verification of liquid food filling system

- Sterilization efficiency and microorganism verification technology for manufacturing equipment
- Inspection of hygienic design and sterilization effectiveness for filling system
- R&D and efficiency inspection of aseptic filling system for small-volume glass bottles
- Integration of intense pulse light sterilization modules and filling packaging system

R&D of aseptic processing system

- Aseptic processing and quality management
- Continuous processing of viscous and particle food
- R&D of aseptic filling system

Microwave heating system and application

- Integrated heating technology combining microwave and traditional sources of energy (steaming, frying, hot-air drying, infrared cooking)
- Integration and production of microwave heating

R&D of aseptic processing for functional drinks

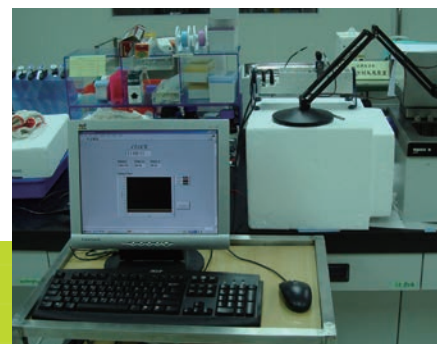
- Assessment of variable decay of nutritional ingredients during processing
- Assessment of additives in functional drinks
- Integration of membrane filtration sterilization and aseptic quantitative mixing for non-heat resistant ingredients
- Product development and pilot-plant production service

R&D of dietary functional drinks

- Process of monodispersity for fine particle formula
- Process of stabilized formula production
- Archive complete formula processing database

R&D of functional packaging

- R&D of aseptic, oxygen scavenger packaging material
- Researches on processing performance and properties of packaging material



Collection and Research of Bioresources

Collection, preservation and identification of bioresources

Microbial resources

- Diverse collection: bacteria, actinomycetes, yeasts, filamentous fungi, mushrooms, and microalgae, etc.
- Culture preservation: freeze-drying, liquid nitrogen freezing, -80°C freezing
- Systematic classification: morphological observation, chemical and physiological and biochemical analysis, DNA barcoding, and molecular biology techniques

Cell resources

- Cell bank: human and animal cell lines, primary cells, serum-free culture, safety and functional assay
- Stem cells: hematopoietic stem cells, mesenchymal stem cells, embryonic stem cells, and induced pluripotent stem cells

Gene resources

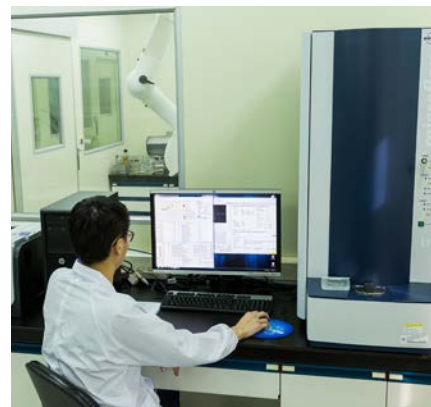
- Genomic library construction: cosmid, cDNA, fosmid, BAC, shotgun libraries, etc.
- High throughput DNA sequencing
- Preservation and management of genomic libraries
- Cloning and expression technology

Development and application of bioresources

- Special collection: microbial banks from special environments
- Culture/Strain screening: isolation, functional screening
- Strain improvement: traditional mutagenesis, genetic modification, and genome shuffling
- Discovery of gene function: in silico genetic screening and database construction, gene cloning and functional expression, and functional genomics
- Fermentation banks: the design, production and customization of fermentation banks of special microorganisms
- Safety assay and bioactivity screening: safety assessment, inhibition of enzyme activities, antimicrobial activity, anticancer activity, and hormonal regulation activity
- Fermentation process: optimization of medium and culture conditions
- Process development: pilot plant fermentation process, downstream processing, and fermentation design
- Product development: enzymes and specialty chemicals, functional foods, probiotic products, edible/medicinal mushrooms for health foods, strains for agro-biotech products, strains for traditional fermented products, functional microbial secondary metabolites, and novel fermented foods

Researches on biotechnology related intellectual property and regulations

- Examining guidelines for biotechnology related invention patents
- Biotechnology related invention patents
- Mechanism for access, transfer and benefit sharing of bioresources
- Regulations on foods derived from genetically modified organisms





Analysis Technology R&D and Service

Nutrition and health care

- **Nutrition analysis:** calories, fat (fatty acid composition), protein (amino acid composition), carbohydrate (sugar, dietary fiber), minerals and micronutrients/vitamins
- **Analysis of functional components:** water-soluble polysaccharides, poly fructose, organic germanium, lycopene, catechin, triterpenoids, flavonoids, carotenoids, anthocyanins, proanthocyanidins, adenosine, glucosamine, phycocyanin, chlorophyll, green algae chlorophyll, indicator of chlorella extract via hot water, squalene, kawachi acid from royal jelly, etc.

Hygiene and food safety

Detection and control of microorganisms

■ Non-pathogenic microorganisms

- Conventional analysis: aerobic plate count, mold count, yeast count, coliform bacteria, *Escherichia coli*, lactic acid bacteria count, aerobic bacterial spore count, thermophilic bacterial spore, Enterobacteriaceae
- Optical density test for pathogen counts in foods

■ Pathogenic microorganisms

- Conventional analysis: *Staphylococcus aureus*, *Salmonella*, *Vibrio parahaemolyticus*, *Bacillus cereus*, *Pseudomonas aeruginosa*, *Streptococcus*, *Escherichia coli*, *Listeria monocytogenes*, *Enterobacter sakazakii*
- Real-time PCR test for pathogen counts in foods

■ Microbial control

- Isolation, identification, tracking and control of spoilage microorganisms
- Sterilization verification of aseptic-packaged products
- Production and shelf life stability test of packaged foods inoculated with indicator organisms

- Evaluation of detergent and disinfectant
- Improvement of food preparation processes and prevention of contaminants

Detection of animal and plant ingredients

- Animal ingredients: pork, beef, veal, chicken, duck, goose, tilapia, milkfish, mackerel, nemipterus
- Plant ingredients: garlic, leeks, shallots, green onions, onion

Detection of food allergens

peanut, gluten, egg (chicken and egg ingredients), milk, crab, mango and duck egg

Detection of hazardous ingredients

additives, pesticides, animal pharmaceuticals, multiple toxins, heavy metals, contaminants and plasticizers

Quality specifications

Detection of food adulteration

vegetarian food, juice concentration, milk, vinegar, honey, bird nest, etc.

Labeling of product specification

- General food items
- Special food items: additives, paraphernalia and packaging, fat content, spirit and alcoholic beverage, rice, water quality

Industrial service

- Planning and set-up of detection and analysis laboratories
- Quality control and technical competence of detection and analysis laboratories
- Food nutrition labeling
- Archiving and application of nutritional content database
- Training of technical personnel
- R&D and application of hygiene control technology
- Stability and effectiveness test of health food
- Second-party laboratories of food manufacturers

Industry Service and Technology Transfer

Tel: 886-3-5223191

Technology Promotion	ext 234	<ul style="list-style-type: none"> • Technology transfer for products or technologies • Open laboratories renting and cooperation on research and development
Quality Assurance and Certification	ext 330	<ul style="list-style-type: none"> • Promotion of the certification of CAS, TQF, HACCP, and Excellent Wine Certification System and providing technical supervision and inquiries • Food quality control • Assisting in the establishment of preventative mechanism against vectors • Contract researches, planning (product development, factory planning, design, technical troubleshooting) • Providing assistance and counseling to the food industry for competence of quality assurance • Providing the proficiency test for the domestic industries on their testing competence • Food safety management system (ISO 22000) certification services
Product Pilot Test	ext 257 258 259	<ul style="list-style-type: none"> • Contract services in microbial fermentation and cultivation • Contract services in scale up and downstream processing • Pilot scale processing of special products
Food Safety and Functional Assessment	ext 289	<ul style="list-style-type: none"> • Safety assessment of health foods • Functionality assessment and screening of health foods
Technical Consultancy	ext 330	<ul style="list-style-type: none"> • Technical consultancy and on-site diagnosis for whole plant and whole production line • Good Hygiene Practices (GHP) consultancy • Consultancy for tracing and tracking system of processed foods • Providing assistance and counseling to the food industry for optimization of food processing and inspection of microbial quality
Chemical Analysis and Microbial Detection	ext 257 258 259	<ul style="list-style-type: none"> • Chemical analysis of general and functional components • Detection of food microorganisms and food borne pathogens • Food nutritional labeling • Cause analysis of abnormal products
Bioresources Services	ext 512 513	<ul style="list-style-type: none"> • Preservation and distribution of microorganisms, cell lines, and gene resources • Off-site/safe depository services of biological materials • Depository for patent related biological materials • Import and export of biological materials for research and patent purposes • Identification of microorganisms and cell lines • Antimicrobial tests • Strain isolation and purification • Microscopy and electron microscopy services • Enzyme activity assay • Cell contamination detection and EBV transformation • GMO detection • Bioactivity assay for antimicrobial, antitumor and hormone modulation activities • Safety evaluation by Ames test and cell lines • Bioinformatics services • Identification of rice cultivars • Publication of newsletters and monographs
Canned Food Service	ext 270	<ul style="list-style-type: none"> • Sterilization data assay for canned food heat penetration • Calibration of retort sterilizer meters • Log inspection registry and functionality test of low acidity aseptic processed and packaged food items • Pilot production of functional drinks
FIRDI Academy	ext 269 231	<ul style="list-style-type: none"> • Professional training in food and bioresources • Cultivation of human resources for food and bio-related industries • Customized education and training services • Hosting license examinations and providing relevant training to obtain certification
Food Information	ext 297	<ul style="list-style-type: none"> • Food information knowledge club • Establishment of "Food Industry Databases Club" and "Food Industry Knowledge Base" • Food industry think tank • Market researches on food industries
Publications	ext 261	<ul style="list-style-type: none"> • Food Industries (monthly) • Food Marketing Information (monthly) • Operational manual on food and bio-related subjects • Research reports

FIRDI

Food Industry Research and Development Institute

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Southern Taiwan Service Center

(Chiayi Industry Innovation and Research Center, MOEA)

No. 569, Sec.2, Bo-Ai Road, Chiayi, 60060 Taiwan

Tel: 886-5-2918899 Fax: 886-5-2861590 <http://www.ciic.org.tw>

5F, R3 Bldg., No. 31 Gongye 2nd Rd., Annan District, Tainan 70955 Taiwan

Tel: 886-6-3847300 Fax: 886-6-3847329



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Stand for "Research, Development, Innovation, 1965" in Latin.

FIRDI was founded in 1965 with an office in Taipei. The main research building was formally established and inaugurated at Hsinchu in November 1, 1967.