

Taiwan Agricultural Technology Foresight 2025

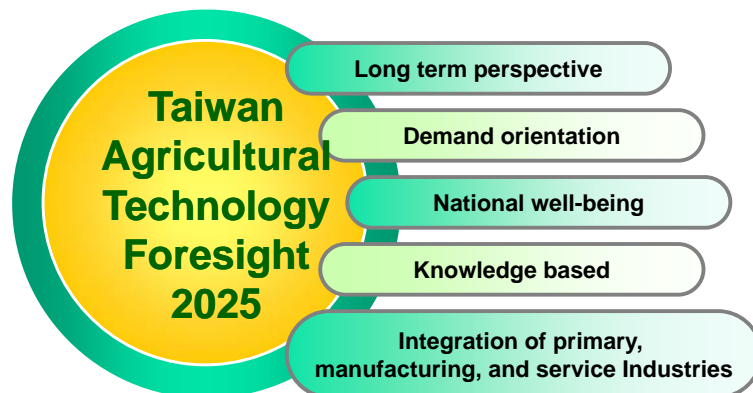
Dr. Julie C. L. SUN
Taiwan Institute of Economic Research
August, 2011



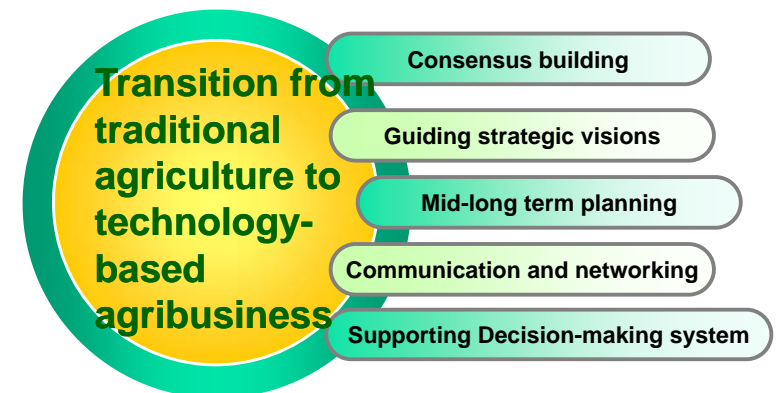
The Agriculture in Taiwan

- Taiwan, with nominal GDP \$427 billion dollars and GDP (PPP) per capita \$35 thousand dollars in 2010, is famous for its manufacturing capabilities. Agriculture seems to lose its importance in every aspect from job creation to domestic production, to international trade. But agriculture is still at the root of the economy and has multi-function beyond production. This is because it not only provides the food we eat, and conserves the environment we live in, it is also a force for social stability.
- Confronting the challenges of WTO, globalization, climate change and knowledge-based economy, Taiwan government attempts to revitalize agriculture. The Council of Agriculture (COA) commissioned the project, **Taiwan Agricultural Technology Foresight 2025**, to Taiwan Institute of Economic Research (TIER). The project is four-year from 2008 to 2011, with average budget \$350 thousand dollars annually, including foresight activities such as demand survey, trend and policy analysis, horizon scanning, scenario, bibliometrics, essays (competition), workshops, two-round Delphi, roadmapping, and policy suggestions (short-, mid-, and long-term development plan, and priority setting). This paper is aimed **to introduce the framework of the project and to analyse the major part of the project based on the expert opinion by large scale Delphi survey.**

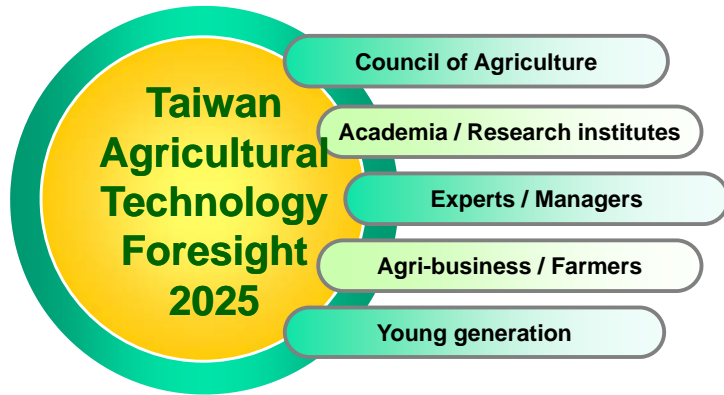
Basic Premises



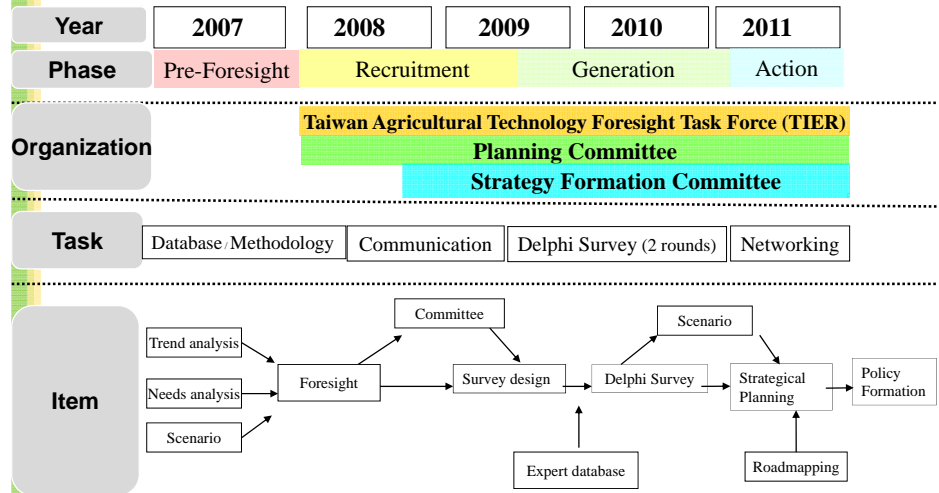
The Purposes



Participants / Stakeholders



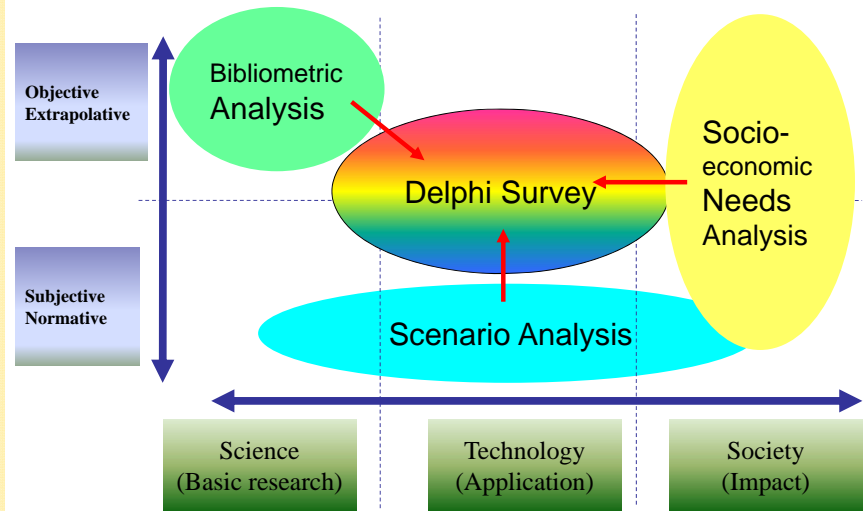
Framework of Taiwan Agricultural Technology Foresight 2025



Taiwan Agricultural Technology Foresight 2025

- TIER set up a task force of 6 research staffs and 2 assistants from 2008. The task force learned the foresight techniques mainly from Japan, and built up the data base including social needs, technological trends, research resources, critical issues and agricultural policies nationwide and worldwide. Under the support and approval of COA, the project set up the **Planning Committee** of 17 members, including government officers, agricultural experts, senior research fellows, social scientists and one economist.
- The **Planning Committee** decided that the **target year** of the project is **2025**, and that the function of the foresight is to meet the long term objectives for agriculture in three aspects: Firstly, economically, to increase the productivity of the work force, to improve the efficiency in the use of farmland, to transform the industrial structure into knowledge-based economy, to reach sustainable growth and to keep international competitiveness; secondly, socially, to guarantee quality and safety of the product for consumer, to improve welfare for farmers and their families, to improve the quality of life in rural areas, to narrow the gap in living standards between urban and countryside; and thirdly, ecologically, to harmonize agriculture and the environment, to ensure sustainable use of agricultural resources, to maintain the nation's "green assets" and biodiversity.

Design of Taiwan Agricultural Technology Foresight 2025



Taiwan Agricultural Technology Foresight 2025

- In order to link the foresight and policy, the project set up the **Strategy Formation Committee**, divided by **10 sub-committees**, corresponding to the 10 research areas of COA, each of which is comprised of 4 agricultural experts and senior scientists on average. The members of the Strategy Formation Committee are nominated by the Planning Committee and approved by COA. The duty of the Strategy Formation Committee is to depict 2025 scenario and to figure out the research topics to meet the long term objectives for agriculture in Taiwan.
- In 2009, the **Strategy Formation Committee** proposed more than 100 research topics for Taiwan Agricultural Technology Foresight 2025. TIER task force tried to adjust the research topics in a uniform format and to consolidate some of the research topics. Then the **Planning Committee** decided the final **74 research topics** and the **key questions** (the impacts on industrial development, life quality, and environment protection, government support and importance) as the main part of Delphi questionnaire.

The Content of Delphi Survey

Global Trend / Bibliometric Analysis

Socio-economic Needs Analysis

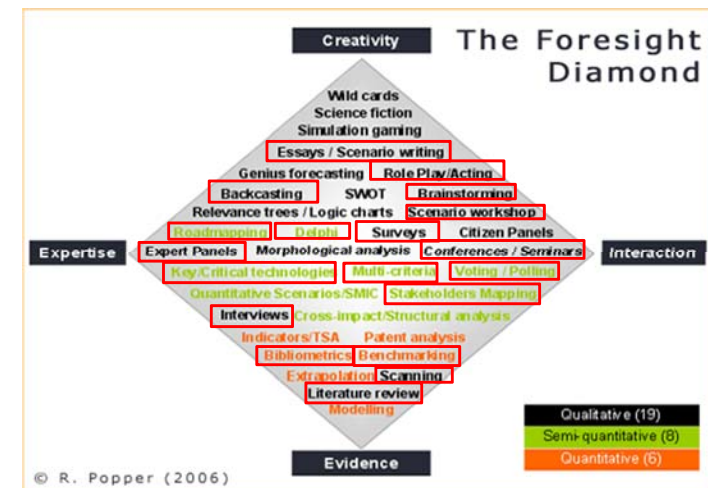
Scenario Writing

Agriculture Related Strategy Formation
(74 Research Topics for Questionnaire)

Taiwan Agricultural Technology Foresight 2025

- During this period of time between 2008 and 2010, TIER task force analysed social needs, technological trends, research resources, critical issues and agricultural policies nationwide and worldwide for both Committees as background information. TIER task force carried out the foresight activities such as demand survey, horizon scanning, scenario, bibliometrics, essays (competition), workshops, conferences, and forums. TIER task force also set up a platform, the website dedicated for Taiwan Agricultural Technology Foresight 2025, including on line Delphi Survey, and a database of more than three thousand experts and scientists in Taiwan.

Methodology of Taiwan Agricultural Technology Foresight 2025



Source: The Handbook of Technology Foresight—Concepts and Practice (2008)

農業科技前瞻資訊網
Taiwan Agricultural Technology Foresight Information Center

全文檢索 [SEARCH] 回首頁 加入我的最愛

計畫簡介 最新進度 國際前瞻資訊 意見交流 委員討論區 網網相連 線上問卷

背景/資料
創意前瞻徵文競賽
 「A.A. 徵文活動徵集區」

農業前瞻主題
 Asia-Pacific
 Bundesministerium für Bildung und Forschung
 FinnSight 2015

最新進度
 > 2010/03/15 「人人嚮往的未來農業」創意前瞻徵文競賽開始!
 > 2010/03/11 台大生農學院將於3/26舉辦台灣農業科技前瞻活動說明會
 > 2010/03/03 2025農業科技前瞻與德非調查主題說明會開始接受報名!
 > 2010/02/25 農業科技前瞻德非調查參與意願調查進行中
 > 2009/12/25 「台灣農業科技前瞻」全國宣導說明會圓滿達成!

國際前瞻資訊
 > 2010/06/02 神經肽研究可望開發無毒之生物性農藥
 > 2010/05/13 瑞士農業政策發展走向與未來展望
 > 2010/05/03 國際水資源管理中心發表東南亞農業的氣候變遷對策
 > 2010/04/19 日本宣布2009年十大農業生技研究成果(下)
 > 2010/03/29 日本宣布2009年十大農業生技研究成果(中)

活動/剪影


意見/交流
 ● 想瞭解「前瞻」究竟
 是.....cider
 ● 前瞻是一種對於未來的.....
 台經院前瞻小組

Website: <http://agritech-foresight.coa.gov.tw/>

Platform of Taiwan Agricultural Technology Foresight 2025

計畫簡介 最新進度 國際前瞻資訊 **意見交流** 委員討論區 網網相連 線上問卷

交流園地
 ● 一般訪客 (2)
 ● **德非問卷題目討論區 (75)**

德非問卷題目討論區
 發表新主題
 全文檢索 [SEARCH]

標題	回覆	點閱	發表人	最後發表
開發能減碳或預防代謝症候群的水稻育種技術及品種	1	38	農業科技前瞻研究小組	2010-04-12 13:21 2010-04-22 09:30 muasik
提升作物穩定產量之精密設施園藝技術	1	27	農業科技前瞻研究小組	2010-04-12 13:29 2010-04-22 09:17 muasik
問卷的有效性	1	34	吳孟瑋	2010-04-19 17:43 2010-04-20 10:32 台經院前瞻小組

Website: <http://agritech-foresight.coa.gov.tw/>

Survey on line Taiwan Agricultural Technology Foresight 2025

國際前瞻資訊 意見交流 委員討論區 網網相連 **線上問卷** 歡迎來到會員專區

會員登入
 本討論區提供參與「農業科技前瞻計畫」之規劃委員及全體會員，討論計畫工作相關事項之用。
 ● 請按序輸入您所收的帳號、密碼，以及頁面上的驗證碼，再點選「login」即可登入討論區
 ● 若您遺失您的帳號、密碼資訊，請來電 (02)2586-5000 # 209轉接我們
 ● 您必須輸入驗證碼後才可以登入，驗證碼已顯示於螢幕上方。

會員登入
 帳號: 00024
 密碼: []
 驗證碼: 378u

歡迎來到會員專區
 您無法使用本會員功能，您可以在這裡修改您的聯絡資料，若您對我們的服務有任何建議，歡迎隨時「與我們聯絡」，謝謝您。

進入委員討論區

 修改您的登入密碼或是聯絡方式

 請於離開本站前，記得登出會員，以避免會員帳號被盜用

系統提供每位專家一組帳號密碼(亦可自行修改)

Website: <http://agritech-foresight.coa.gov.tw/>

Survey on line Taiwan Agricultural Technology Foresight 2025

國際前瞻資訊 意見交流 委員討論區 網網相連 **線上問卷**

問卷
 請問下列那些是您較熟悉的領域:(可複選):
 (此選擇僅會影響問卷順序，並不會影響問卷內容)

農業技術 農政領域 漁業領域 畜牧領域 環境資源領域 森林保育領域 食品領域 防檢疫領域
 E化領域 生物技術領域

Website: <http://agritech-foresight.coa.gov.tw/>

Survey on line Taiwan Agricultural Technology Foresight 2025

12. 發展適合台灣海域之大型食用藻類繁殖技術

問項	1	2	3	4	5	請發表您對此題的建議與看法
(1)對提升民眾生活品質的影響力	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
(2)對提升環境品質的影響力	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
(3)對提升產業發展的影響力	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
(4)政府參與的必要程度	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
(5)本議題對於國家的重要度	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

13. 建構農村與城市共生交流的優質生活圈體系

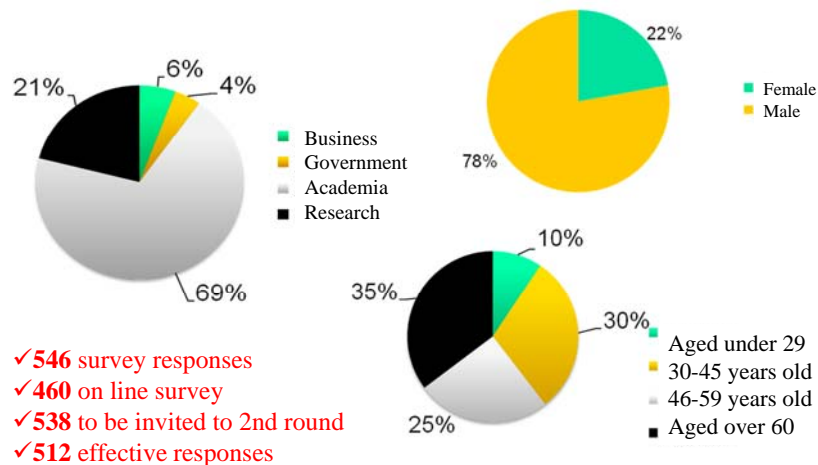
問項	1	2	3	4	5	請發表您對此題的建議與看法
(1)對提升民眾生活品質的影響力	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
(2)對提升環境品質的影響力	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
(3)對提升產業發展的影響力	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
(4)政府參與的必要程度	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
(5)本議題對於國家的重要度	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

Website: <http://agritech-foresight.coa.gov.tw/>

Two Rounds of Delphi Survey

- In 2010 TIER task force executed two rounds of Delphi survey of Taiwan Agricultural Technology Foresight 2025. The first round investigated 675 experts and scientists, 546 of which participated (response rate 80%), and 512 of which questionnaire were effective. The academia, research institutes, industry, and government account for 69%, 21%, 6%, and 4% respectively. The male and the female account for 78% and 22%. The groups of age, above 60, between 46 and 59, between 30 and 45, below 29 account for 35%, 25%, 30%, and 10% respectively.
- The second round investigated 546 experts and scientists, 413 of which participated (response rate 76%), and 407 of which questionnaire were effective. The academia, research institutes, industry, and government account for 66%, 25%, 5%, and 4% respectively. The male and the female account for 81% and 19%. The groups of age, above 60, between 50 and 59, between 40 and 49, between 30 and 39, below 29 account for 15%, 37%, 36%, 11%, and 1% respectively.

Survey Responses



Source: TIER(2010).The second round Delphi survey of Taiwan Agricultural Technology Foresight 2025

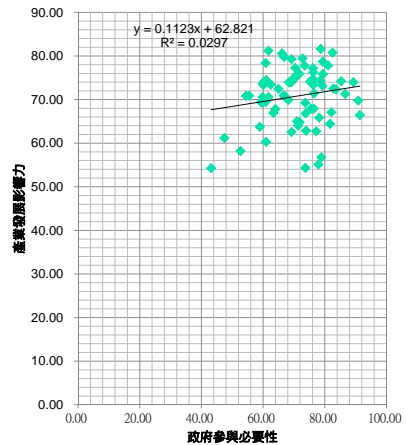
Two Rounds of Delphi Survey

- Based on the survey responses (Likert scale rating 1-5) to 74 research topics, the project compiled the indices of industrial development, life quality, environment protection, national priority and government support to measure the research topics in different aspects. Particularly, the papers define national priority as industrial development, life quality, and environment protection, with equal weights according to COA policy. The standard deviations of all indices at the second round become smaller than those at the first round, so it implies that the Delphi survey of Taiwan Agricultural Technology Foresight 2025 did converge.
- What follows is to study the relationships between industrial development, life quality, environment protection, national priority and government support to be need for the 74 research topics of Taiwan Agricultural Technology Foresight 2025. The survey shows that the government should support those research topics with higher ratings in environment protection and in life quality due to externality. It is, however, slightly correlated between industrial development and government support to be need for those research topics because some of them could be developed by the private sector.

Delphi Survey on Industrial Development

Top 10

Establishment of rapid diagnosis systems for infectious diseases of livestock, poultry and aquatic animals (2)
Establishment of mass quality fry production technologies for grouper, shrimp, and other important fishes (1)
Improvement of integrated safety test, certification, traceability system for agri-food products (3)
Improvement of high-quality seed and seedling production technology for the tropics and sub-tropics (4)
Development of agricultural and livestock production systems with IT and automation technologies (7)
Establishment of animal vaccine production systems that conform to international cGMP guidelines (6)
Development of efficient, labor-saving and safe facilities and technologies for agricultural production and processing operations (5)
Incentive development to foster a new generation of farmers and entrepreneurial management (10)
Construction of whole-plant orchid export system (8)
Development of crop production systems with low-energy consumption, low emission of greenhouse gases, and efficient use of water resources (12)



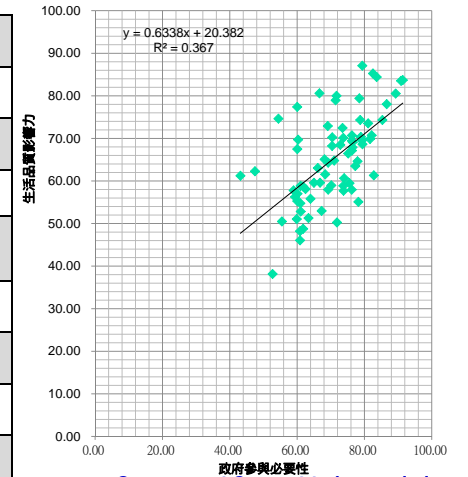
Government Support to be needed

Note: () The ranking of the first round.
Source: TIER(2010), The second round Delphi survey of Taiwan Agricultural Technology Foresight 2025

Delphi Survey on Life Quality

Top 10

Development of accurate, rapid and simple diagnostic kits for pesticide residues (1)
Improvement of integrated safety test, certification, traceability system for agri-food products (2)
Elucidation on the transmission mode and pathogenic mechanism of animal and human infectious diseases (3)
Improvement of forecasting and monitoring techniques for slope land debris slides (5)
Research on ecological restoration of polluted farmland, derelict rearing pond, overdrawn groundwater area, river bed and bank, and degraded forestland (4)
Promotion of recreational agriculture and rural development that integrate health, culture, leisure and nature conservation (7)
Elucidation of global climate change affecting Taiwan's agricultural ecosystem and development of countermeasures (9)
Development of food-safety monitoring system and inspection techniques (6)
Establishment of database and diagnostic techniques for toxic substances in agricultural materials and products (10)
Construction of rural and urban linkages for quality living system (8)



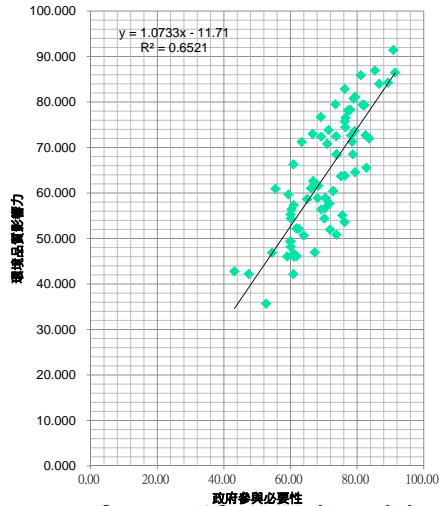
Government Support to be needed

Note: () The ranking of the first round.
Source: TIER(2010), The second round Delphi survey of Taiwan Agricultural Technology Foresight 2025

Delphi Survey on Environment Protection

Top 10

Research on ecological restoration of polluted farmland, derelict rearing pond, overdrawn groundwater area, river bed and bank, and degraded forestland (1)
Development of groundwater-saving aquaculture (3)
Improvement of forecasting and monitoring techniques for slope land debris slides (2)
Development of crop production systems with low-energy consumption, low emission of greenhouse gases, and efficient use of water resources (4)
Elucidation of global climate change affecting Taiwan's agricultural ecosystem and development of countermeasures (5)
Development of agricultural environmental-resources monitoring and disaster early-warning technology (6)
Integration of agricultural byproducts and refuses utilization systems and efficient energy conversion technologies (7)
Development of accurate, rapid and simple diagnostic kits for pesticide residues (8)
Research and development on ecoforestry and biodiversification (9)
Development of energy-saving and carbon-reducing preservation and shipping technologies of agricultural and processing products (12)



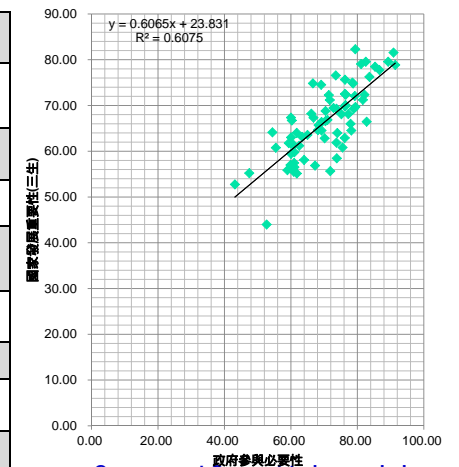
Government Support to be needed

Note: () The ranking of the first round.
Source: TIER(2010), The second round Delphi survey of Taiwan Agricultural Technology Foresight 2025

Delphi Survey on National Priority

Top 10

Development of accurate, rapid and simple diagnostic kits for pesticide residues (2)
Research on ecological restoration of polluted farmland, derelict rearing pond, overdrawn groundwater area, river bed and bank, and degraded forestland (1)
Elucidation of global climate change affecting Taiwan's agricultural ecosystem and development of countermeasures (4)
Improvement of integrated safety test, certification, traceability system for agri-food products (3)
Development of crop production systems with low-energy consumption, low emission of greenhouse gases, and efficient use of water resources (5)
Improvement of forecasting and monitoring techniques for slope land debris slides (6)
Development of groundwater-saving aquaculture (7)
Development of agricultural environmental-resources monitoring and disaster early-warning technology (8)
Development of energy-saving and carbon-reducing preservation and shipping technologies of agricultural and processing products (9)
Elucidation on the transmission mode and pathogenic mechanism of animal and human infectious diseases (10)



Government Support to be needed

Note: Derived from Industrial Development, Life Quality, Environment Protection; () The ranking of the first round.
Source: TIER(2010), The second round Delphi survey of Taiwan Agricultural Technology Foresight 2025

Government Support to be needed

Top 10

Improvement of forecasting and monitoring techniques for slopeland debris slides (1)
Research on ecological restoration of polluted farmland, derelict rearing pond, overdrawn groundwater area, river bed and bank, and degraded forestland (2)
Elucidation of global climate change affecting Taiwan's agricultural ecosystem and development of countermeasures (3)
Development of agricultural environmental-resources monitoring and disaster early-warning technology (4)
Development of groundwater-saving aquaculture (5)
Elucidation on the transmission mode and pathogenic mechanism of animal and human infectious diseases (6)
Collection and conservation of genetic resources in the face of climate change (7)
Improvement of integrated safety test, certification, traceability system for agri-food products (8)
Development of water system design and basin assessment techniques for irrigation and environment-regulation functions (10)
Establishment of transformation guidelines and impact assessment for sustainable farm land development (9)

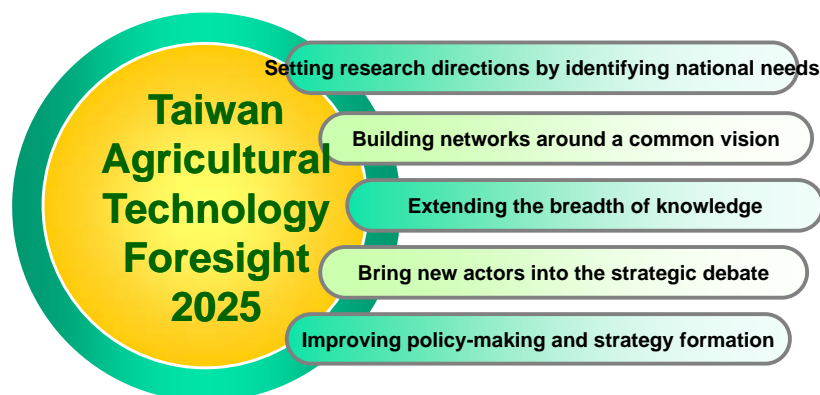
Note: () The ranking of the first round.

Source: TIER(2010),The second round Delphi survey of Taiwan Agricultural Technology Foresight 2025

Conclusions

- It is the first time for Taiwan to carry out the expert opinion survey on large scale by Delphi approach. The project of Taiwan Agricultural Technology Foresight 2025 will have to offer policy suggestions by roadmapping in the end of 2011. So far, it has had some kind of achievements as follows: Informing funding and investment priorities, including direct prioritization exercises; Reorienting the science and innovation system to match national needs; Building networks and strengthening communities around shared problems; Building trust between participants unused to working together; Aiding collaboration across administrative and epistemic boundaries; Increasing understanding and changing mindsets, especially about future opportunities and challenges; Providing anticipatory intelligence to system actors as to the main directions, agents, and rapidity of change; Building visions of the future that can help actors recognize more or less desirable paths of development and the choices that help determine these; Increasing the number and involvement of system actors in decision-making, both to access a wider pool of knowledge and to achieve more democratic legitimacy in the policy process; Extending the range of types of actor participating in decision-making relating to science, technology and innovation issues; Improving policy implementation by enabling informed "buy-in" to decision-making processes.

Evaluation / Impact



Taiwan Agricultural Technology Foresight 2025

<http://agritech-foresight.coa.gov.tw/>



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