A\* STAR Grant Proposal Outline:

Food Resilience

# 1. General Information

Project Title: Enhancing Urban Food Resilience through Climate-Smart Agriculture  
Principal Investigator: Dr. Jane Tan, A\*STAR Institute of Sustainability  
Collaborators: Singapore Institute of Technology (SIT), AVS, Wageningen University  
Duration: 3 years  
Funding Requested: SGD 2.5 million

# 2. Scientific Abstract of the Proposal

This project aims to develop scalable, climate-resilient urban farming systems that integrate AI-driven crop monitoring and precision irrigation. The goal is to improve yield and nutritional quality under climate stress, aligning with Singapore’s “30 by 30” food security goal.  
Source: https://www.sfa.gov.sg/food-for-thought/article/detail/levelling-up-singapore-s-food-supply-resilience

# 3. Objectives

• Design modular vertical farming systems adaptable to climate variability  
• Validate AI models for crop health and yield prediction  
• Assess nutritional outcomes of climate-resilient crops  
• Support national food resilience and innovation strategies  
Source: https://www.a-star.edu.sg/sifbi

# 4. Methodology

Study Design:

• Controlled environment trials in vertical farms  
• AI model training using multispectral imaging and IoT sensors  
• Nutritional profiling via metabolomics and proteomics

Workflow:

1. System prototyping and calibration  
2. Data collection from pilot farms  
3. AI model development and validation (specialized sensors by NUS and AI model development by A\*STAR)

4. Integration of renewable energy systems into the vertical farm design and evaluation of energy efficiency  
5. Nutritional analysis of harvested crops  
6. Economic feasibility assessment  
7. Consumer perception studies  
8. Life cycle assessment to evaluate environmental impacts

Data Plan:

• Sensor data streamed to cloud (AWS IoT)  
• Preprocessing and feature extraction using Python (NumPy, SciPy)  
• Predictive modeling using XGBoost and CNNs  
• Data visualization dashboard  
• Data management and sharing protocols following FAIR principles

# 5. Expected Scientific Results of the Joint Research

• Validated protocols for climate-smart urban farming  
• AI models for predictive crop management  
• Peer-reviewed publications and open-access datasets  
• Contributions to A\*STAR’s food innovation roadmap  
Source: https://www.a-star.edu.sg/sifbi

# 6. Expected Economic and Social Impact of the Joint Research

• Strengthened local food supply chains  
• Reduced reliance on imports (currently >90%)  
• Improved public health through nutrient-rich produce  
• Commercialization potential for smart farming systems  
Source: https://www.sg101.gov.sg/economy/case-studies/sg-food-challenge/

# 7. Keywords

Food resilience, Vertical farming, Climate-smart agriculture, AI in agriculture, Nutritional security

# 8. Research Topic and Work Plan

Year 1: System design, pilot deployment, baseline data collection  
Year 2: AI model development, mid-term evaluation  
Year 3: Nutritional analysis, scalability testing, final reporting  
(Optional Gantt chart to be included in appendices)

# 9. Detailed Description of Joint Project

• A\*STAR: System engineering, AI model development  
• SIT: Nutritional profiling and metabolomics  
• Wageningen University: Agronomic expertise and climate modeling  
• AVS: Regulatory guidance and deployment support

# 10. Problem Statement

Singapore imports over 90% of its food. Climate change and global disruptions threaten food supply chains. There is a need for resilient, local, and tech-enabled food production systems.  
Source: https://www.sfa.gov.sg

# 11. Future Prospect of Research

• Expansion to regional urban centers  
• Integration with national food strategy and “30 by 30” goal  
• Potential for commercialization and export of smart farming technology

# 12. Work Contribution

• Principal Investigator: Project coordination, system design  
• Co-Investigators: AI modeling (A\*STAR), nutritional analysis (SIT), agronomy (Wageningen University)  
• Collaborators: Regulatory and deployment support (AVS)