Getting Young People to Farm: How Effective Is Thailand's Young Smart Farmer Programme?

 Para Jansuwan, Kerstin K Zander

Abstract:

In 2014, the Thai government initiated the Young Smart Farmer (YSF) programme to counter the decline in the number of young people involved in farming. The YSF programme has three desired outcomes: first, to increase participants' financial independence; second, to enhance the adoption of innovative farming methods; and third, to retain participants in the long-run by satisfying them. This study aimed to evaluate if these outcomes have been achieved. A Propensity Score Matching (PSM) method was applied to analyse the data collected from programme participants (61 responses) and non-participants (115 responses) through a survey in the Prachin Buri province in Thailand. Participation was determined by education, farmland size, farming experience, and challenges to farming. Most participants (~79%) stated that they were satisfied with the programme; however, the programme did not increase financial independence and the adoption of innovative farming methods. As such, the programme might not be very effective in motivating young people to continue, return to, or enter farming. We recommend that the programme can be improved by adjusting training and field trips to meet the needs of participants in different production systems. The programme should also be expanded beyond providing knowledge and information, and it could offer additional monetary and non-monetary support to participants, such as loans for technology investments needed for farm expansion and competitive advantages.

Social media for smart farmer-shared farming equipment model

Wuttipong Pongsuwan, Hongladda Pongsuwan

This research offers a roadmap for creating a concept for building a collaborative and connected mobility model to share the agricultural machine. The study aims to adopt those models to create a collaborative and connected mobility model as a Shared Agricultural Machine Network for Smart Farmer. The fact that Thai farmers are facing the aging crisis, like all other industries and farming machinery has become a need for manpower replacement to keep their earning for livings. Unfortunately, these machines are often expensive, so they can own only a few, and when it comes to reaping the harvest season, and they often require different tools for specific purposes. Our survey has shown that farmers have different ways of cultivating different crops at the same time this implies that in harvesting season there are unused agricultural pieces of equipment available to share among them. The model of shared farm equipment could lead to new farmers' way of life and it's time to become smart-farmers. This paper will discuss important considerations, including the need for challenges, trends, and opportunities for farmers to have machinery when needed and to share what idle with others via a peer-to-peer network using mobile application platform.

Smart farmer application in monitoring and learning of android-based rice cultivation

Andysah Putera Utama Siahaan, Rian Farta Wijaya

Farmers are jobs that are done by planting crops and then harvesting crops for sale or consumption. Farmers must know the plants to be planted to get good harvests. Smart Farmer application is made to be a medium of help for young Farmers who do not have sufficient knowledge in conducting farming activities. The Smart Farmer application is created by presenting relevant information such as cultivation techniques, diseases, pests, and benefits related to rice plants. Rice plants were chosen as the subject matter because rice is the primary food choice needed by humans in Indonesia, and at this time farmers have also decreased in number.

Aquarium fish smart farming on internet of things (IoT) and mobile application technology

Kittikhun Meethongjan, Suwit Kongsong

Caring for fish raised in mini-aquarium fish farming is very important in keeping fish beautiful and reduce the mortality of fish. This paper aims to present a mobile application system with IoT and android application to control the aquarium water system. Android studio, Java, C, Arduino IDE, SQL and Firebase software ware used to develop in this study. Node esp28266 MCU V. 2 board, Wemos-D1 boards and module ultrasonic hardware were used to create the control system. This system has been tested with real home mini-aquarium and performance data collection. Black Box testing is used to evaluate the performance of the system with users and experts. The result shows the mean and standard division by after users and experts explain on 4.21, 4.15 and 0.74, 0.72 respectively. Thus, this system can be used a main information tool for helpful users and prototype in others smart farmer

Semantic web enabled smart farming

Raj Gaire, Laurent Lefort, Michael Compton, Gregory Falzon, David Lamb, Kerry Taylor

Sensors have been used in agriculture to quantitatively monitor and control farming activities. Middleware like GSN have been developed to manage sensor stream data, while Semantic Sensor Network (SSN) ontology and Linked Data have been developed to describe sensor networks and enable sharing of data over the web respectively. Creating a semantic web enabled sensor network in a farm that can integrate not only data but also things in the farm, the farmers and other users is a challenge. In this paper, we present our Kirby Smart Farm as a prototypical livestock smartfarm system with an architecture for rapid development. We have used RabbitMQ and Virtuoso together with our GSN extended for RDF data generation, geo-spatial analysis and complex event processing to achieve a connected smart farm.

Mobile-based Smart Farmer Application as a Forum and Learning Center for Horticultural Crop Cultivation

Yulian Findawati, Muhammad Alfan Rosid, Aldo Reghan Ramadhan, Ari Setiawan

The driving wheel of the state's economy Alignment to small farmers must also be demonstrated by optimizing the role of extension workers. Agricultural extension workers can take advantage of digital information technology so that assistance can be done anytime and anywhere. Therefore, an application for an Android-

based online forum and learning forum is needed to make it easier for farmers to get learning information about PEST management, nurseries and planting. With technology that supports learning, counseling, online forums, it is hoped that it will facilitate communication during the Covid-19 pandemic. is an online learning media application for farmers. Where farmers can see learning videos, bibliography, agricultural material, extension videos, discussions with farming communities and questions and answers with agricultural experts from both the government and universities. Due to the Covid pandemic, counseling communication was somewhat hampered. This application is built using the PHP, Java and MySQL programming languages. With this application, it is hoped that it will facilitate the process of learning, counseling and consulting by farmers

Smart Farmer System

Athrva Dalvi, Shefali Kulkarni, Utsavi Kulkarni, Shweta Todkar

India is a country largely dominated by the agricultural sector, and hence it is our duty to utilize our knowledge of easy and accurate analysis in time efficient manner to boost the agriculture to newer heights. Also, lately there have been innumerable changes in our environmental conditions and hence, the rate of crop failure has increased over time. This is resulting into the increased number of suicides of farmers. Thus, the focus of this paper is to implement a system that would help the farmers of our country to maximize their yields along with maximized profits. The system proposes to predict the accurate crop prediction based on the past and live data that is analyzed using supervised machine learning algorithm, SVM. Both the live data as well as the big data is stored and retrieved from cloud. Also, the system proposes to make use of soil moisture sensors along with the weather conditions to automate the process of irrigation, which is one of the most time-consuming activities in farming. All the notifications from the system and the queries of the farmer are interacted using an android application.

Simulations of crop responses to climate change: effects with present technology and currently available adjustments (the 'smart farmer'scenario)

William E Easterling, Norman J Rosenberg, Kathleen M Lemon, Mary S McKenney

If climate changes, farmers will have to adapt to a new set of climate constraints. In this paper we examine the efficacy of strategies for dealing with climate change that are currently available to farmers and that are inexpensive to use; we refer to this group of strategies as 'adjustments'. Adjustment schemes of various kinds were identified for us by agricultural experts in the Missouri-Iowa-Nebraska-Kansas (MINK) states. These can involve changes in land use, changes in variety and crop selection, changes in planting and harvesting practices, and changes in fertility and pest management. Using the erosion productivity impact calculator (EPIC) model on a small set of representative farms, we tested adjustments of these kinds. The simulations show that earlier planting, longer-season cultivars and the use of furrow diking for moisture conservation would offset some of the yield losses induced by climate change in warm-season crops. Longer-season varieties of wheat (a cool-season crop) and shorter-season varieties of the perennials wheatgrass and alfalfa were also effective.

The adjustments to climate change diminished yield losses in all crops but irrigated wheat. Despite the positive effects of adjustments, however, yields of all dryland warm-season crops remained lower than control levels. The adjustments also increased demand for irrigation water. Carbon dioxide enrichment had the same incremental effect on crop yields with or without adjustments (see the fourth paper in this issue), except in the case of alfalfa and sorghum, where a CO2-adjustment interaction was found. We conclude that currently available techniques would partially offset the yield reductions caused by a 1930s-like

climate, but that in most crops the yield reductions would still be substantial

IoT-based strawberry disease prediction system for smart farming

Sehan Kim, Meonghun Lee, Changsun Shin

Crop diseases cannot be accurately predicted by merely analyzing individual disease causes. Only through construction of a comprehensive analysis system can users be provided with predictions of highly probable diseases. In this study, cloud-based technology capable of handling the collection, analysis, and prediction of agricultural environment information in one common platform was developed. The proposed Farm as a Service (FaaS) integrated system supports high-level application services by operating and monitoring farms as well as managing associated devices, data, and models. This system registers, connects, and manages Internet of Things (IoT) devices and analyzes environmental and growth information. In addition, the IoT-Hub network model was constructed in this study. This model supports efficient data transfer for each IoT device as well as communication for non-standard products, and exhibits high communication reliability even in poor communication environments. Thus, IoT-Hub ensures the stability of technology specialized for agricultural environments. The integrated agriculture-specialized FaaS system implements specific systems at different levels. The proposed system was verified through design and analysis of a strawberry infection prediction system, which was compared with other infection models

The comparison of soil sensors for integrated creation of IOT-based Wetting front detector (WFD) with an efficient irrigation system to support precision farming

Pradorn Sureephong, Patcharapong Wiangnak, Santichai Wicha

This study investigates a prototyping of integrated system of Internet of Things based Wetting front detector (IOT-WFD) which focuses on how to enhance the IOT based Wetting front detector design for smart irrigation system. The empirical study was conducted with 2 sensors type to detect the wetting fronts which are the Frequency Domain Reflectrometry sensor (FDR) and Resistor-based sensor (RB) integrated and design with low-cost WFD. The results of this study point toward the IOT-WFD as an appropriated technology providing real time wetting front information in soil positively for application in terms of agricultural water management, with precision agriculture and efficient irrigation domain with a related decision knowledge that matches with the technology trend and smart farmer requirements. Evidence of positive results of this prototyping summary has been provided.

"If they don't tell us what they do with it, why would we trust them?" Trust, transparency and benefit-sharing in Smart Farming

Emma Jakku, Bruce Taylor, Aysha Fleming, Claire Mason, Simon Fielke, Chris Sounness, Peter Thorburn

Advances in Smart Farming and Big Data applications have the potential to help agricultural industries meet productivity and sustainability challenges. However, these benefits are unlikely to be realised if the social implications of these

technological innovations are not adequately considered by those who promote them. Big Data applications are intrinsically socio-technical; their development and deployment are a product of social interactions between people, institutional and regulatory settings, as well as the technology itself. This paper explores the socio-technical factors and conditions that influence the development of Smart Farming and Big Data applications, using a multi-level perspective on transitions combined with social practice theory. We conducted semi-structured interviews with 26 Australian grain farmers and industry stakeholders to elicit their perspectives on benefits and risks of these changes. The analysis shows that issues related to trust are central concerns for many participants. These include procedural concerns about transparency and distributional concerns about who will benefit from access to and use of "farmers' data". These concerns create scepticism about the value of 'smart' technologies amongst some industry stakeholders, especially farmers. It also points to a divergence of expectations and norms between actors and institutions at the regime and niche levels in the emerging transition towards Smart Farming. Bridging this divide will require niche level interventions to enhance the agency of farmers and their local networks in these transactions, and, the cooperative design of new institutions at regime level to facilitate the fair and transparent allocation of risk and benefit in farming data information chains

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State-of-the-art convolutional neural networks for smart farms: A review

Patrick Kinyua Gikunda, Nicolas Jouandeau

Farming has seen a number of technological transformations in the last decade, becoming more industrialized and technology-driven. This means use of Internet of Things (IoT), Cloud Computing (CC), Big Data (BD) and automation to gain better control over the process of farming. As the use of these technologies in farms has grown exponentially with massive data production, there is need to develop and use state-of-the-art tools in order to gain more insight from the data within reasonable time. In this paper, we present an initial understanding of

Convolutional Neural Network (CNN), the recent architectures of state-of-the-art CNN and their underlying complexities. Then we propose a classification taxonomy tailored for agricultural application of CNN. Finally, we present a comprehensive review of research dedicated to applications of state-of-the-art CNNs in agricultural production systems. Our contribution is in two-fold. First, for end users of agricultural deep learning tools, our benchmarking finding can serve as a guide to selecting appropriate architecture to use. Second, for agricultural software developers of deep learning tools, our in-depth analysis explains the state-of-the-art CNN complexities and points out possible future directions to further optimize the running performance.

Technology to turn you into a truly smart farmer

Lloyd Phillips

Farmer's Weekly 2017 (17045), 52-54, 2017

Production data is invaluable for enhancing farm management and improving profitability. However, collecting and analysing this information efficiently can be daunting. Western Cape farmer Wolfgang von Loeper explains why this need not be the case. Lloyd Phillips reports.

A Study on Smart Farmer Service Using Community Mapping

Jee Hee Koo, Seung Woo Lee, Mu Wook Pyeon

Journal of the Korean Society of Surveying, Geodesy, Photogrammetry and Cartography 39 (6), 419-427, 2021

Due to the effects of climate change and the reduction of the labor force due to COVID-19, the crop yield, harvest time, and cultivated area are rapidly changing every year. In order to respond flexibly to this situation, attempts to apply smart

farm technology based on ICT (Information and Communication Technology) to individual farms are increasing. On the other hand, various stakeholders are trying to predict the yield of crops using artificial intelligence and IoT technology, but accurate prediction is difficult due to the lack of learning data. In this study, in order to overcome the data collection problem limited to a specific institution, a smart farmer service technology based on community mapping was developed in which farmers directly participate, input and share accurate data to predict production. In the process, analysis was performed on napa cabbage, which is a vegetable with a large price change compared to production.

SmartFarm: Improving agriculture sustainability using modern information technology

Chandra Krintz, R Wolski, N Golubovic, B Lampel, V Kulkarni, B Sethuramasamyraja, B Roberts, B Liu

In this paper, we overview our work on an open source, hybrid cloud approach to agriculture analytics for enabling sustainable farming practices. SmartFarm integrates disparate environmental sensor technologies into an on-farm, private cloud software infrastructure that provides farmers with a secure, easy to use, low-cost data analysis system. SmartFarm couples data from external cloud sources (weather predictions, satellite imagery, state and national datasets, etc) with farm-local statistics, provides an interface into which custom analytics apps can be plugged, and ensures that all private data remain under grower control.

A smart-farming ontology for attribute based access control

Sai Sree Laya Chukkapalli, Aritran Piplai, Sudip Mittal, Maanak Gupta, Anupam Joshi

With the advent of smart farming, individual farmers have started adopting the concepts of agriculture 4.0. Modern smart farms leverage technologies like big data, Cyber Physical Systems (CPS), Artificial Intelligence (AI), blockchain, etc. The use of these technologies has left these smart farms susceptible to cyber-attacks. In order to help secure the smart farm ecosystem in this paper, we develop a smart farming ontology. Our ontology helps represent various physical entities like sensors, workers on the farm, and their interactions with each other. Using the expressive ontology we implement an Attribute Based Access Control (ABAC) system to dynamically evaluate access control requests. Furthermore, we discuss various use cases to showcase our access control model in various scenarios on a smart farm.

IoT and data interoperability in agriculture: A case study on the gaiasenseTM smart farming solution

Nikos Kalatzis, Nikolaos Marianos, Fotis Chatzipapadopoulos

Among the most important challenges towards the digitisation of agriculture is the high cost of technical equipment and the lack of smart farming systems' capability to interoperate. This paper presents the gaiasense TM solution which follows an innovative approach in offering smart-farming services as an inexpensive service with zero technological related investment for farmers. In addition, the concept of the "Data Interoperability Zone" is introduced along with

the "Information Management Adapter" aiming to facilitate data interoperability for smart-farming system.

A Study on the Implementation of an Android-based Educational IoT Smartfarm

Se-Jun Park

Recently, the need to introduce smart farms is increasing in order to solve the problems of intensifying competition such as a decrease in rural population due to aging, a decrease in production, and the inflow of foreign agricultural products, and accordingly, the need for education is increasing. This paper is a study on the implementation of an Android-based IoT smart farm for education so that it can be used in a real environment by reducing the farm's smart farm system. To confirm that Android-based education can be applied in a real environment using the IoT smart farm for education, experiments were performed in automatic mode and manual mode using Bluetooth, Wi-Fi, and server/client communication methods. In the automatic mode, the current status can be checked in real time by receiving all data, and in the manual mode, commands are transmitted in real time using the received sensor data and remote control is performed. As a result of the experiment, it was possible to understand the characteristics of each communication method, and it was confirmed that remote monitoring and remote control of the smart farm using the Android App was possible.

IoT and data interoperability in agriculture: A case study on the gaiasenseTM smart farming solution

Among the most important challenges towards the digitisation of agriculture is the high cost of technical equipment and the lack of smart farming systems' capability to interoperate. This paper presents the gaiasense TM solution which follows an innovative approach in offering smart-farming services as an inexpensive service with zero technological related investment for farmers. In addition, the concept of the "Data Interoperability Zone" is introduced along with

the "Information Management Adapter" aiming to facilitate data interoperability for smart-farming systems.

MOBILE USER INTERFACE DESIGN FOR SMALLHOLDER AGRICULTURE TO BE A SMART FARMER: A SCOPING

Mohamad Jahidi Osman, Nurul Hawani Idris, Zulkepli Majid, Mohd Radhie Mohd Salleh

Mobile user interface (UI) design plays a very important role in determining an application that can be adopted by all types of users, especially those residing in rural areas. This review aims to provide a mapping of previously published studies on mobile UI design application for smallholder agriculture to be a smart farmer. The focus of this scoping review is on the design elements of the proposed UI, strategies of inquiry used and to find out if there is a UI design that involves geospatial context by published articles. The results show that interview and observation are the most common field study methods used to obtain information in designing mobile UI, and the most widely applied UI elements are audio and Interactive Voice Response (IVR). There are many user interface elements that can be used by farmers who have different skills level in dealing with mobile technology. Icon interface is an important element in designing mobile UI for rural farmers based on previous results. Other than that, the use of location function in mobile UI design shows an upward trend where three recent articles used location function to report crop pest and disease and determine the nearest market location. In addition, there is a need to design geospatial elements such as map for mobile UI that match the skills of rural farmers to support the fourth Industrial Revolution in agriculture to be a smart farmer.

Smart farm monitoring using Raspberry Pi and Arduino

[Siwakorn Jindarat](#); [Pongpisitt Wuttidittachotti](#)

Abstract:

This study aimed to investigate an establishment using an Intelligent System which employed an Embedded System and Smart Phone for chicken farming management and problem solving using Raspberry Pi and Arduino Uno. An experiment and comparative analysis of the intelligent system was applied in a sample chicken farm in this study. The findings of this study found that the system could monitor surrounding weather conditions including humidity, temperature, climate quality, and also the filter fan switch control in the chicken farm. The system was found to be comfortable for farmers to use as they could effectively control the farm anywhere at anytime, resulting in cost reduction, asset saving, and productive management in chicken farming.

Internet-of-Things-Enabled SmartVillages: An Overview

Publisher: IEEE

[Prasenjit Chanak](#); [Indrajit Banerjee](#)

Abstract:

Internet of Things (IoT) plays a vital role in smart village applications where IoT devices and automation would find its applications in agriculture, healthcare, education, and livestock management. IoT technologies are transforming villages by better infrastructure, better transportation systems, providing precision farming facilities, increasing farmer income, and improving the quality of human life. In the smart village paradigm, several communication technologies and consumer electronics (CE) have used to develop several IoT-enabled applications. Hence, this article provides state-of-the-art communication technologies and the CE aspect for IoT-based smart village realization. Furthermore, a taxonomy is devised by classifying the literature based on modern communication technologies, network types, supporting technologies, offering services, mode of operation, and requirements. Finally, we discuss important issues and opportunities regarding the smart village realization.

L & M Farm: A Smart Farm based on LoRa & MQTT

Publisher: IEEE

Hye Won Yoon; Dong Jun Kim; Miran Lee; Chaehee Weon; Anthony Smith

Abstract:

Smart farms are the future of Agriculture, which are expected to increase productivity with low-cost and high convenience. Nevertheless, farmers are skeptical of running smart farms, due to their expensiveness, inefficient energy consumption, difficult management, and potential data leakage. Many studies suggest using LoRa (Long Range), a type of LPWAN (long power wide area network) technology, which is capable of long-range with economical price and small battery consumption. However, studies overlook on how to transmit data proficiently, safely and assuredly. Therefore, this study proposes L & M Farm, a LoRa and MQTT (Message Queue Telemetry Transport) based smart farm. MQTT is a lightweight messaging protocol that guarantees the reliability and security of data while minimizing the wastage of packet space. The prototype uses two Arduino Boards with Dragino LoRa Hat, in which one is connected to the VH400 soil moisture sensor and DHT11 temperature and humidity sensor, the other connected to a solenoid valve irrigation actuator. Also, there is a Raspberry Pi irrigation node, which uses Open Weather API to get 5 days of weather data. In addition, a web-based application for farmers to conveniently manage the smart farm.

Digital Technology Adoption in Agriculture: Success Factors, Obstacles and Impact on Corporate Social

Responsibility Performance in Thailand's Smart Farming Projects

- **Sorawadee Srivetbodee**Thammasat Business School, Thammasat University, Thailand

- **Barbara Igel**Moscow School of Management SKOLKOVO, Russia

 Abstract

Technological growth is fueling the global economy in every sector, including agriculture. This study's objectives are (1) to examine how the Internet of Things (IoT), Artificial Intelligence (AI) and big data technology can improve agricultural productivity for small-scale farmers in Thailand, (2) to investigate the success factors and impediments to this technology adoption in Corporate Social Responsibility (CSR) projects, and (3) to explore the link between technology adoption in two CSR projects in Thailand with the CSR performance. This study adopts an inductive qualitative approach with in-depth face-to-face interviews with two leading Thai IT companies that successfully helped local small-scale farmers to implement smart farming solutions. Both firms employed smart technology, such as IoT, using sensors, AI-enabled mobile device applications, and big data to help farmers plan, operate, and monitor their crops and paddy fields. The study's findings add new knowledge to both academic theory and business practice by showing how corporations not only can help small producers to successfully adopt smart technology to scale their social impact but also promote implementing more proactive CSR strategies in their industry.

Marketing Mix Factors Relating the Selective Decision making on Technology Smart Farmer in Agriculture of Thailand

Parita Chaipattarawong

Suan Sunandha Rajabhat University

Abstract

The research objectives represented 1) to study the marketing mix and the selective decision making. 2) to examine the relationship between the marketing mix and the selective decision making on Smart Farmer. The population was the service recipients of Smart Farmer, the 384 sample size of service recipients were determined by W.G. Cochran formula with the 95 percent of confidence and the 5 percent of error. The research instrument represented the questionnaire and collecting data form the sample that was the service recipients of Smart Farmer on the weekend day only. The data analysis represented descriptive statistical approach by percentage, mean and standard deviation, the statistical correlation analysis represented the correlation coefficient. The finding found that marketing mix factors related with the selective decision making on Smart Farmer in addition the marketing mix factors focused on the six factors of marketing mix as following 1) product 2) place 3) promotion 4) price 5) people 6) process 7) physical environment.

Cloud Platform for Smartfarm

스마트팜을 위한 클라우드 플랫폼

- **Lee, Meong-hun** (Sunchon National University) **;Yi, Se-yong** (Korea Greenhouse Horticulture ICT Industry Cooperative) **;Kim, Joon-yong** (Seoul National University) **;Yoe, Hyun** (Sunchon National University)**이명훈** (순천대학교) **이세용** (한국시설원예ICT융복합협동조합) **;김준용** (서울대학교)

;여현 (순천대학

Abstract

The smartfarm is a leader in the Field of environmental monitoring in agriculture. By the use of wireless remote systems, monitoring applications of the smartfarm are able to provide vital information to the farmer wherever he may be. Absentee farmers are finding the ease of viewing the application graphs on their mobile phone is providing them with peace of mind. We design system and technical requirements of service for managing and operating smart-farm based on cloud technology. It describes requirements of cloud technology for monitoring, controlling, managing, and operating cloud-based smart farm. Smart farm system and service with cloud platform contains 3 interfaces and 3 services. In addition, smart-farm using cloud platform could have several cases so it should be established and managed in varying way depending on cultivars, its size and type. This paper will focus the industry's attention on the importance of Open/Standard Cloud platform thereby stimulating the smartfarm in agriculture.

Smart farming: towards a sustainable agri-food system

Musa, Siti Fatimahwati Pehin DatoBasir Khairul Hidayatullah

Abstract

Purpose
The objectives of this paper are firstly to investigate the relationship between smart farming and sustainable development goal (SDG) 2 i.e. zero hunger. Secondly, the paper applies SWOT analysis to better understand the strengths, weaknesses, opportunities and threats of implementing smart farming in Southeast Asia (SEA). Finally, the paper provides research and practical implications for smart farming in SEA.

Design/methodology/approach
This study applies SWOT analysis to evaluate the strengths, weaknesses, opportunities and threats of smart farming in SEA in its goal to achieve zero hunger. The SWOT analysis is performed by conducting a comprehensive

review of past and relevant literature on smart farming and its relationship with SDG 2. The use of SWOT analysis provides a foundation to identify the desired future position, identifies existing issues and better informs leaders and policymakers on how to resolve the weaknesses and take advantage of the opportunities available.

Findings

Smart farming has shown great promise in increasing food production sustainably whilst maintaining a high standard of food safety and quality. Smart farming offers a path towards achieving SDG 2 by providing innovative ways into a more profitable, resilient and green agri-food system. It is also found that a regional approach towards ensuring food security should be taken in SEA due to the dependency of the states on one another for the supply of food and agricultural products. For smart farming to take off in the region, a stronger government initiative is needed to encourage Science Technology Engineering and Mathematics (STEM) learning to equip the local workforce.

Originality/value

This study contributes to the literature by highlighting the role of smart farming in achieving zero hunger. This may assist policymakers to understand the implications of adopting smart farming in the region when compared to other competing trade locations. In addition, this study uses SWOT analysis to evaluate internal and external factors which may assist in formulating strategies by allowing researchers to gain insights and to think of possible solutions for existing or potential problems.

AgroLens: A low-cost and green-friendly Smart Farm Architecture to support real-time leaf disease diagnostics☆

RodrigoMoreiraaLarissa FerreiraRodrigues MoreirabPablo Luiz AraújoMunhozaEveraldo AntônioLopescRenato Adriane AlvesRuasc

Abstract

Agriculture is one of the most significant global economic activities responsible for feeding the world population of 7.75 billion. However, weather conditions and diseases impact production efficiency, reducing economic activity and the food sovereignty of economies worldwide. Thus, computational methods can support disease <u>classification</u> based on an image. This <u>classification</u> requires training Artificial Intelligence (AI) models on high-performance computing resources, usually far from the user domain. State of the art has proposed the concept of Edge Computing (EC), which aims to bring computational resources closer to the domain problem to decrease application latency and improve computational power closer to the client. In addition, EC has become an enabling technology for Smart Farms, and the literature has appropriated EC to support these applications. However, predominantly state-of-the-art architectures are dependent on Internet connectivity and do not allow diverse real-time classification of diseases based on crop leaf on <u>mobile devices</u>. This paper sheds light on a new architecture, AgroLens, built with low-cost and green-friendly devices to support a mobile Smart Farm application, operational even in areas lacking Internet connectivity. Among our main contributions, we highlight the functional evaluation of AgroLens for AI-based real-time classification of diseases based on leaf images, achieving high classification performance using a <u>smartphone</u>. Our results indicate that AgroLens supports the connectivity of thousands of sensors from a smart farm without imposing computational overhead on edge-compute. The AgroLens architecture opens up opportunities and research avenues for deployment and evaluation for large-scale Smart Farm applications with low-cost devices.

A Game Theoretic Analysis for Cooperative Smart Farming

Publisher: IEEE

 Abstract:

The application of Internet of Things (IoT) and Machine Learning (ML) to the agricultural industry has enabled the development and creation of smart farms and precision agriculture. The growth in the number of smart farms and potential cooperation between these farms has given rise to the

Cooperative Smart Farming (CSF) where different connected farms collaborate with each other and share data for their mutual benefit. This data sharing through CSF has various advantages where individual data from separate farms can be aggregated by ML models and be used to produce actionable outputs which then can be utilized by all the farms in CSFs. This enables farms to gain better insights for enhancing desired outputs, such as crop yield, managing water resources and irrigation schedules, as well as better seed applications. However, complications may arise in CSF when some of the farms do not transfer high-quality data and rather rely on other farms to feed ML models. Another possibility is the presence of rogue farms in CSFs that want to snoop on other farms without actually contributing any data. In this paper, we analyze the behavior of farms participating in CSFs using game theory approach, where each farm is motivated to maximize its profit. We first present the problem of defective farms in CSFs due to lack of better data, and then propose a ML framework that segregates farms and automatically assign them to an appropriate CSF cluster based on the quality of data they provide. Our proposed model rewards the farms supplying better data and penalize the ones that do not provide required data or are malicious in nature, thus, ensuring the model integrity and better performance all over while solving the defective farms problem.

Smart Hydroponic Lettuce Farm using Internet of Things
Publisher: IEEE

Tanabut Changmai; Sethavidh Gertphol; Pariyanuj Chulak

Abstract:

Smart agriculture or smart farming is the application of Internet of Things to growing crops with the potential of saving labor and resources, more fine-grained control in watering and fertilization, and more accurate gathering of information about planting environment. In this research, we developed a Smart Hydroponic farm using Internet of Things technology to investigate its benefits comparing with regular hydroponics farm. Lettuce was chosen as the testing crop. Our smart farm can monitor the growing environment and adjusts nutrient solution, air temperature, and air humidity according to the situation automatically. The results show that lettuces from smart farm has on the average around 36.59% higher weight, 17.2% more leaf, and 13.9% larger stem diameter than ones from a regular farm. The nitrate content of Smart farm lettuces is also 8.24% better.

Capturing agricultural data using AgriRover for smart farming

Xiu-TianYan1CongNiu1YouhuaLi1WillieThomson2DaveRoss2IanCox3

Abstract

Secure and sustainable food production for a growing world population has become a challenge for governments around the world to tackle. Recent technological developments in sensing, big data and associated analytics present a great opportunity to enhance food production. As a result, the agricultural industry is going through a rapid and revolutionary change empowered by the use of abundant data generated by a new suite of sensory devices. These data capture systems range from mobile and small devices such as hand-held soil quality measurement instruments to large satellites which are positioned to generate large amounts of imagery data as well as spectral and spatial data for targeted farming at field level. This chapter describes a new approach to smart farming based on a UK–China Flagship Challenge programme project funded by the UK's innovation agency Innovate UK and the Chinese government as part of the UK China Science, Technology and Innovation Strategy. A generic approach to data gathering is described and a specific system architecture for data collection is introduced. AgriRover was used as a key technology to collect soil fertility data in farm fields in both the United Kingdom and China. The design methodology of such a system, designed from sustainable energy consumption perspective, is detailed to show the considerations of critical design parameters of such a data collection system. An energy-efficient path planning approach is then described based on a review of a number of path planning algorithms available. Based on the above, an energy efficient and optimised path planning example is shown

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