

## 《智慧农业发展战略研究》专题快报

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中国工程科技知识中心农业分中心

中国农业科学院农业信息研究所

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### 【动态资讯】

#### 1. 数字引领 协同赋能

【农民日报】农担体系“一手托三家”，是政府、金融机构与农户之间的“桥梁”，这种分险合作机制，有效缓解了金融机构投入三农的后顾之忧。成立于2016年的浙江省农业融资担保有限公司（以下简称浙江农担），短短5年，在保余额超过了60亿元，2万多个在保项目分布全省各个地区和产业。尤其是其担保放大倍数4.7倍，高于全国体系平均水平，人均业务额更是接近2亿元，高居全国农担体系首位。相比很多农业大省，由于资源禀赋所限，浙江的农业产业大多体量小、散而杂。也因此，为了在有限土地上获得更高收益，这里的经营主体往往会在设施化、加工营销、农旅融合等方面加大投入，以提升产业附加值。浙江农担董事长李建斌告诉记者，近几年，浙江农担聚焦农业高质量发展过程中的资金需求、农村金融供需失衡问题，以数字化作为引领，多元协同进行担保赋能，为农服务能力得到了显著提升，成为“金融下乡”服务乡村振兴的“先头兵”。

链接:

<http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFucl-APLmRAEK8RSnGZEg834.pdf>

#### 2. 玉米“藏粮于技”助力稳粮增收

【中国农业科学院】近日，由中国农业科学院作物科学研究所主办的玉米“藏粮于技”现场观摩会暨玉米高质量发展论坛在内蒙古通辽市召开。“藏粮于技”重大科研任务自启动以来，各攻关团队紧紧围绕“深化基础研究、创新关键技术、研制重大产品、创建丰产模式”总体思路，以破解玉米生产问题为导向，以提升产量和质量为目标，聚焦全产业链科技创新链联合攻关。项目实施2年来，在优异基因挖掘、育种技术创新、新种质创制、重大产品研制、精准栽培与绿色防控技术研发、丰产绿色机械化模式创建等方面取得了明显进展，形成“新基因、新技术、新品种、新产品、新模式”技术储备。

链接:

<http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFucv-AYqAbAAec0JXCZ7o111.pdf>

### 3. 乘势聚能打造现代种业创新高地

【农民日报】在北京平谷和通州两区，共建有5万亩种业创新基地，近百家农作物、畜禽、水产、林果育种企业和科研院所在这里进行育种研发，为打赢种业翻身仗探路蓄力。寸土寸金的北京，拿出如此规模的土地搞科研育种，折射出北京着眼于国家战略、发力科技创新，带头振兴民族种业的决心和担当。习近平总书记高度重视种业问题，强调要下决心把民族种业搞上去。依托科技、品种、人才、要素的聚集优势，北京乘势作为，着力打造国家级现代种业创新高地。金秋时节，第二十九届中国北京种业大会如期而至。为期5天的大会不仅将集中展示北京种业发展成果和经验，而且也为全国种业交流交易搭建了平台，助推种业振兴。

链接:

<http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFucV6AUddLAD5EFIJ4gvU989.pdf>

### 4. 新疆吐鲁番：“智慧农业+智慧晾房”让村民省力又省心

【新华网】吐鲁番具有得天独厚的光热资源，当地村民约三分之一的收入来源于葡萄。时下正值葡萄干晾晒季节，家家户户忙着将葡萄挂上晾房支架。当下，农村里成片的传统砖式晾房内挂满晾晒的葡萄。为促进葡萄生产绿色发展，今年3月以来，国网吐鲁番供电公司便开始推广以电气化为基础的科学种植，试点开展“智慧农业+智慧晾房”项目，将配电台区大量融合终端数据分析应用到农业种植生产过程，精准控制种植过程和智慧“晾房”工作状态，实现台区多能互补零碳排。每年9月至10月，是晾制葡萄干的最佳时节，吕国民在智慧晾房里忙得不亦乐乎。往年传统晾晒葡萄干需要30至40天，而今使用智慧晾房，只需要提前设定好参数，3天就可以烘干出3到4吨葡萄干。热烘干的葡萄干色泽均匀、更加洁净，每吨价格从过去的0.8万至1.5万提升至1.2万至2万。通过前期试验，智慧晾房的投运，不仅节约大概60%的人工成本，而且产量提升约18%。

链接:

<http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFuc7aAJIFgAESF95tHWVA669.pdf>

### 5. 安顺大气候数字化智慧农业：助力农产品实现精准溯源

【新华网】在实施数字经济上抢新机，大力推进大数据战略的实施。作为又一家落户入驻011科创谷的安顺大气候数字化智慧农业公司，将依托安顺大数据发展优势，通过大数据助农、大数据销售等，提供大数据农业全产业链服务，助力农产品实现全程可溯化。

通过大屏幕，就能够看到农业生产基地现场情况，同时对生产时的气温、湿度、光照等信息进行实时记录、传输。在011科创谷，今年6月入驻的大气候农业企业，经过2个多月的紧张建设和前期准备，现在该公司共搭建起3个农业产业基地。据介绍，该公司是一家以“建立人与地的数据连接”为使命，以物联网+SaaS+数据智能+区块链为技术核心，通过用户定位与品牌属性一体化，农产品上行渠道及原产地品牌建设一体化，项目实施与后期运营一体化，订单式生产与标准化流通一体化、基地信息化改造与农事服务一体化五大核心业务，为农业产业植（殖）产销一体化赋能，缩短供应链路提高农产品的流通效率及流通价值。

链接:

<http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFudByAIP5EACHSmue73pE826.pdf>

## 6. 中国农科院积极推动农业科技“走出去”

【中国农业科学院】由中国农业科学院主办、江苏省农业科学院承办的“第26届全国农科院系统外事协作网会议暨全国农业科技‘走出去’联盟会议”于9月28-29日在南京举行。农业农村部国际合作司副司长韦正林、中国农科院副院长孙坦出席会议。韦正林充分肯定了全国农业科技“走出去”联盟工作，他指出，通过进一步整合资源，联盟在促成国际农业技术转移、整体推动我国农业科技“走出去”方面发挥了积极作用，农业农村部将继续支持联盟工作，进一步推动农业科技“走出去”。孙坦分析了当前我国农业科技面临的新形势、新挑战和新要求，回顾了联盟过去一年取得的成绩和不足，对下一步联盟具体工作作出了部署，对“科企融合”发展中的机制建设、信息共享和能力建设等方面提出了明确要求。南京大学、中国农科院海外农业研究中心等嘉宾分别做专题报告，江苏省农科院等6家单位做典型交流发言，与会代表围绕新形势下农业科技“走出去”面临的问题与挑战等内容进行了深入交流。全国各省（自治区、直辖市）农科院、部分重点农业大学和涉农企业等44家单位以线上线下形式参加了会议。

链接:

<http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFucj6ACmfDAAM49b9aVe0224.pdf>

### 【文献速递】

#### 1. 基于多传感器优化的农药残留快速检测新方法

文献源: 吉林大学学报(工学版),2021-10-19

摘要: 提出了一种基于CatBoost算法的传感器阵列优化策略。采用自行研制的基于仿生嗅觉的电子鼻测试系统,检测蒲公英上残留的农药敌百虫,提取蒲公英样本的响应特征信息,对传感器阵列进行多特征数据融合。使用CatBoost算法对数据矩阵进行特征选择,

优化后的传感器数量从12个减少到3个，准确率从91.69%提高到98.03%，减少了约88%的特征值，优于相关系数、递归消除和其他常用算法，解决了传感器繁多、数据冗余的问题，大大提高了检测精度。结果表明在蒲公英敌百虫残留检测上使用CatBoost算法可以提高电子鼻的鉴别能力。

链接:

<http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFud4WAcOJaABXYDwiXm3E998.pdf>

## **2. Long-term fertilization with high nitrogen rates decreased diversity and stability of diazotroph communities in soils of sweet potato**

文献源: ScienceDirect,2021-10-18

摘要: Sweet potato (*Ipomoea batatas* Lam) could produce acceptable root yield in low-nitrogen (N) soils, with substantial N uptake potentially attributed to supplies provided via biological N<sub>2</sub>-fixation by free-living diazotrophs. However, dynamics of diazotrophic communities as influenced by soil properties across the N fertilization gradients are still largely unclear. Long-term fertilization experiment under wheat-sweet potato rotation was established in an acid yellow brown soil since 2011. Soil samples were collected after sweet potato harvest (October 2018). The nitrogenase (*nifH*) gene real-time polymerase chain reaction (RT-PCR) and Hiseq highthroughput sequencing technologies were applied to soil samples from four N fertilizer treatments (0, 60, 120 and 180 kg ha<sup>-1</sup>). The results showed that long-term N fertilization significantly decreased abundance of the *nifH* gene, which was closely related to decreases in the content of available phosphorus (AP). The long-term high-N (120 and 180 kg ha<sup>-1</sup>) fertilization dramatically altered structure of soil diazotrophic community and lead to in decreased diversity of diazotrophs, whereas low-N (60 kg ha<sup>-1</sup>) fertilization maintained diazotrophic community diversity and stability. Compared with the low-N fertilizer inputs (0 and 60 kg ha<sup>-1</sup>), the high rates of N fertilization (180 kg ha<sup>-1</sup>) significantly decreased the relative abundance of *nifH*-harboring microorganisms, especially the phylum Cyanobacteria known as potential N<sub>2</sub>-fixers that could sustain fertility of sweet potato soils. There were negative correlations between N fertilization rates and the relative abundance of Proteobacteria, whereas the Bacteroidetes and Firmicutes showed a positive correlation. Moreover, the structural equation model (SEM) results suggested that the diazotrophic community diversity and structure were influenced mostly by soil pH rather than SOM and N forms (TN, NH<sub>4</sub><sup>+</sup>-N and NO<sub>3</sub><sup>-</sup>-N), and diazotrophs abundance mainly regulated by soil AP content. Our results implied that appropriate N fertilization is beneficial

to sustain the stability and diversity of the diazotrophic community.

链接:

[http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFueliAdeLVADjv\\_OyYePs120.pdf](http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFueliAdeLVADjv_OyYePs120.pdf)

### **3. Grassland ecology system: A critical reservoir and dissemination medium of antibiotic resistance in Xilingol Pasture, Inner Mongolia**

文献源: ScienceDirect,2021-10-15

摘要: Antibiotic resistance is a major threat to human health. It is necessary to explore all the potential sources and comprehend the pathways that antibiotic resistance genes (ARGs) are transmitted. In this study, by applying high-throughput quantitative PCR and high-throughput sequencing, ARGs and microbial community structure were determined, to understand the reservoirs and spread of ARGs in the Xilingol grassland system. A total of 151,140 and 138 different ARGs were observed in manure, soil, and water samples, respectively. Only 12 ARGs were shared in all environmental and animal manure samples. Multidrug defense system, such as efflux pump, was the most dominant factor in manure and soil samples, followed by antibiotic deactivation processes. These genes conferring resistance to major classes of antibiotics including  $\beta$ -Lactamase (blaSFO, fox5, blaCTX-M-04, blaOXY), vancomycin (vanC-03, vanXD), MLSB (vatE-01, mphA-01), aminoglycoside (aadA2-01), Multidrug (oprJ) and others (oprD, qacEdelta1-02), except sulfonamide and tetracycline. The 12 ARGs were significantly enriched in water samples compared to manure and soil samples ( $p < 0.01$ ) and demonstrated that the water environment was an important transmission source of ARGs in the grassland. The highest enrichment was up to 324.5-fold. Moreover, the 12 shared ARGs were positively correlated with the mobile genetic elements ( $p < 0.01$ ). The nonrandom co-occurrence network patterns between ARGs and microbial community suggested that a total of three bacterial phyla were viewed as the potential ARGs hosts. These findings indicate that ARGs were highly enriched in water samples, demonstrating that the water environment was a critical source and sink of ARGs in the grassland system. It may illuminate the mechanism stressing the effects of human activity on the occurrence and transmission of ARGs in the grassland system.

链接:

[http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFueU2AVI8dABXRN3I\\_B30040.pdf](http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFueU2AVI8dABXRN3I_B30040.pdf)

### **4. 基于控制论的农业低碳发展方略**

文献源：中国生态农业学报(中英文),2021-10-15

摘要：农业的对象是具备控制论系统特征的农业生态系统。农业低碳发展属于生态农业发展范畴。生态农业低碳发展的人为直接调控方法分别来源于传统和民间的农业实践探索、跨学科的现代农业科学研究以及生态友好的高新技术。为了达到低碳目标，不同来源的方法只要有利于系统在整体上顺应和强化自然调控过程就可以根据其在具体系统内的兼容性、协同性和有效性进行选择，并进一步优化组合。这有利于形成多样化的生态农业低碳模式与技术体系。政府自上而下的推进和民间自下而上的行动属于农业生态系统的人为间接调控过程，需要配合形成社会合力，有效推进生态农业低碳发展，助力我国碳中和目标的实现。

链接：

<http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFudWOAc1GUAAn4MzGh8g033.pdf>

## 5. 基于人工智能算法的CYGNSS数据土壤水分反演

文献源：南京信息工程大学学报(自然科学版),2021-10-12

摘要：利用CYGNSS数据估计地表土壤水分（SM）近年来获得了极大的关注，但效率和精度有待进一步提升。本文提出了一种预分类策略，结合人工智能算法(AI)，利用CYGNSS数据预测土壤水分。此策略能够在人工智能算法的基础上进一步的提高土壤水分预测的精确度，具有较好的普适性和易用性。本文使用了2018全年中国地区的实地土壤水分数据作为地面真实参考数据进行建模以及预测。结果证实预测土壤水分与参考真实数据具有良好的一致性。基于CYGNSS数据预测的土壤水分与实地土壤水参考数据比对，其相关系数高达0.8，平均均方根误差（RMSE）和平均无偏均方根误差（ubRMSE）分别为0.059 cm<sup>3</sup>/cm<sup>3</sup>和0.050 cm<sup>3</sup>/cm<sup>3</sup>。研究结果表明，预分类策略的人工智能算法可明显提高CYGNSS预测土壤水分的精确度，其简单易操作性也使其可广泛应用于其他回归和预测研究领域，具有较好的泛化性和拓展性。

链接：

[http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFudvaAOy4GAA7bllGI\\_vA308.pdf](http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFudvaAOy4GAA7bllGI_vA308.pdf)

## 6. 农业科技投入对农业生态效率的空间效应分析

文献源：中国生态农业学报(中英文),2021-10-10

摘要：农业污染日益严重背景下，探究农业科技投入对农业生态效率的作用机制，对缓解农村生态压力、农村健康发展具有重要现实意义。鉴于此，本文在采用超效率SBM（Slack-based measure）模型测度2000—2018年我国东中西部省际农业生态效率基础上，根据莫兰指数对农业生态效率及农业科技投入进行空间自相关检验，采用空间计量模

型剖析农业科技投入对农业生态效率影响的空间溢出效应与门槛特征。结论表明，2010—2018年东中西部的农业生态效率呈现东西部高、中部低的态势；2000—2018年东中西部的农业生态效率波动明显，2000—2003年有小幅波动，2004—2008年农业生态效率略有下降，2008—2010年稍有上升，2010年农业生态效率为0.731；之后2011—2014年稍有下降，2015—2017年全国农业生态效率分别下降到0.5894、0.5839、0.5159；2018年农业生态效率提升到0.5453。农村科技投入对农业生态效率影响呈现为“倒U”型，农业科技投入规模对农业生态效率有着显著的溢出效应。东中西部分组面板门槛回归显示：东中西部的农业科技投入门槛效应差别较大，东部表现为正向促进作用，中部农业科技投入对农业生态效率积极作用没有东部稳定，西部农业科技投入对农业生态效率表现为负向抑制作用，中西部地区农业发展中的科技投入要兼顾经济与生态效率。为此，我国要大力推广绿色高效技术模式，积极采取有机肥替代化肥行动，加快实施科学施肥用药技术，抓好示范带动减量增效，提高农业生态效率。

链接:

<http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFudjqAYHEzAAnumcBnRIY494.pdf>

## **7. Agricultural data sharing and sustainable development of ecosystem based on block chain**

文献源: ScienceDirect,2021-09-15

摘要: The development of modern science and information technology has promoted social progress and created better conditions for the realization of smart agriculture. The core of smart agriculture is big data, but the current big data management model still has certain hidden problems. The application of block chain technology can better realize the sharing of agricultural data. This article is based on block chain technology to study agricultural data sharing and sustainable development of ecological environment. This article conducts an in-depth analysis of the advantages of block chain-based big data sharing, and establishes a block chain-based big data sharing model. In order to improve the problems of significant regional and independent information of major agricultural information websites, this article also analyzes the agricultural data sharing technology, develops an agricultural information sharing system combined with the cloud computing platform, and links the characteristics of agricultural data to common data integration and the sharing method has been improved. According to the experimental data in the agricultural information exchange platform, users' attention to agricultural product production data is as high as 26.2%, and their attention to agricultural consumption accounts for 25.6%. It can be seen

that many users are willing to complete the exchange of agricultural data on the platform. A cross-regional agricultural information exchange platform can improve the scattered distribution of agricultural data in the past, and provide agricultural production decisions for users in need through data analysis, and promote the sustainable development of agricultural economy. The innovation of this article is to make full use of blockchain technology to realize agricultural data sharing and sustainable development of the ecosystem. Through the combination of quantitative analysis and qualitative analysis, theoretical research and empirical research, it highlights decentralization from multiple angles. The mechanism can actually solve agricultural problems and achieve ecological sustainable development.

链接:

<http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFuexaAYBo-ABVPKbxXdo8891.pdf>

## 8. 我国智能农机的研究进展与无人农场的实践

文献源: 华南农业大学学报,2021-09-09

摘要: 智慧农业是现代农业的高级形式,无人农场是实现智慧农业的重要途径,智能农机是无人农场的物质支撑。本文以植物生产为例,介绍了智能农机的智能感知、自动导航、精准作业和智慧管理4项功能在智慧农业中的地位和关键技术的研究进展。介绍了华南农业大学集成相关智能农机创建水稻无人农场的实践和无人农场的5个特点,包括耕种管收生产环节全覆盖、机库田间转移作业全自动、自动避障异况停车保安全、作物生产过程实时全监控和智能决策精准作业全无人。在2020年的中稻和2021年的早稻生产中,水稻无人农场的稻谷产量均高于当地的平均产量,表明了其巨大的发展潜力。无人农场建设为解决“谁来种田”和“如何种田”的问题提供了重要途径。

链接:

[http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFudKaAd-AAAAnkAO6h\\_fo336.pdf](http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFudKaAd-AAAAnkAO6h_fo336.pdf)

## 9. Block Chain Based Agricultural Supply Chain-A Review

文献源: ScienceDirect,2021-08-12

摘要: The passage of a yield from the producer to the buyer is traced by a farming supply chain. A clear stage that permits organization members to farm together is a blockchain-based farming supply chain. This method eliminates the requirement for a centralized trusted authority, mediators, and business histories, growing production and security whereas sustaining extreme integrity, liability, and safety. According to the planned



resolution, smart contracts are used to switch and handle all communications and dealings amongst all shareholders in the supply chain network. AgriBlockIoT is a block chain-based traceability key that comprises facts since IoT devices in the supply chain. It comprises an example of watching harvest from farmhouse to branch, as well as assessments of Ethereum and Hyperledger implementations.

链接:

[http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFuem-AVJ1SAAiDWX\\_E8NI578.pdf](http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFuem-AVJ1SAAiDWX_E8NI578.pdf)

## 【会议论文】

### 1. Fog-based WSAN for Agriculture in Developing Countries

发布源: IEEE

发布时间: 2021-10-12

摘要: The prevalence of food insecurity has been a catalyst for the integration of Information Technology (IT) into existing agricultural practices, resulting in the concept of precision agriculture. Current research is primarily conducted in agricultural scenarios with strong IT infrastructure such as controlled greenhouse farming, making it unfeasible to replicate these systems for open-field farming in rural areas due to limited electrical and IT infrastructure. We propose a Wireless Sensor-Actuator Network (WSAN) system architecture with smart Internet of Things (IoT) base stations based on the Fog Computing paradigm. The system is designed for deployment based on the conditions of rural farms in Southeast Asia. The proposed system design has potential contributions toward remote monitoring of isolated farming locations with minimal existing IT infrastructure.

链接:

<http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFubHGAGBKjAAgfd0H61R0058.pdf>

### 2. A heterogeneous access meta-model for efficient IoT remote sensing observation management: Taking precision agriculture as an example

发布源: IEEE

发布时间: 2021-10-06

摘要: Standard remote sensing observation (RSO) access and formulization is essential to Internet of Things (IoT) data management, such as in precision agriculture. Because of the heterogeneous characteristics and the petabyte data size of RSO, massive remote sensing processing in RSO management has been hampered. Here, we present a heterogeneous

access meta-model for efficient RSO management (HAMERM) and verify it in precision agriculture. The structure of basic metadata components is defined. A five-tuple metadata structure based on the Meta Object Facility is designed. HAMERM consists of identification, platform, observation, product, and access, which represent the five aspects of RSO metadata information. In addition, the flatMap/reduceByKey algorithms and the table structure have been proposed under Sensor Web and Geographic Information Science (GIS) techniques. Intensive experiments in Guangdong Province, China are conducted to test the proposed method. Two RSO metadata formulization instances were conducted to examine the ability of sheltering the differences of multisource and heterogeneous RSO. Experiments containing data storage and data soil moisture mapping were performed. The results suggest that the HAMERM method achieved a performance 30.1 times higher than that of Hadoop and 3 times higher than that of Spark (stand-alone). Consequently, the proposed HAMERM can be applied to achieve efficient soil moisture mapping within precision agriculture, which is helpful for efficient RSO management for the IoT.

链接:

<http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFubTWAFWLQAMgEblxAm2g179.pdf>

### **3. SGADA: Smart Geomapping Assistant for District-wide Agriculture**

发布源: IEEE

发布时间: 2021-10-04

摘要: Crop identification and mapping suitable area to grow the crops is the major concern in the today's world. Data of yield are made by open and worldwide rustic associations, and regional provincial sheets to establish up a standard of what was filled in explicit zones and structure will really need to perceive the suitable region for the cultivation of crops. The fundamental activities consolidate in perceiving the gathered types crop data that is being depicted along with their degree. The efficiency and precision of data are improved when the distant identifying data things and GIS are used. In this paper, we have endeavored to examine use of GIS (Geography Information System) in agribusiness. We also will organize subject to the limit like soil, precipitation, climate and so on. Furthermore, this digitized picture will be used to show the areas which are sensible for expecting a higher yield rate around here.

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#### **4. Development of Virescens Fresh Fruit Bunch Ripeness Prediction using LiDAR for Smart Agriculture**

发布源: IEEE

发布时间: 2021-10-04

摘要: Smart Agriculture is a part of Humanitarian Technology. Oil palm fruit is one of the leading agricultural product exports by Malaysia. At present, the general methods used to determine the ripeness of oil palm fresh fruit bunch are using human vision, computer vision and laser-based imaging techniques. This research aims to design and build a scanning system based on a LiDAR sensor and servo motors and obtain point cloud data from oil palm fresh fruit bunch (FFB). The proposed project consists of LiDAR Lite V3, Arduino UNO and two servo motors as its main component. LiDAR sensor is used to collect the intensity value that reflects from the Virescens oil palm FFB, and the data collected are saved in a CSV file for further analysis. The methodology used in this research is the Iterative Waterfall model. This model supports redesign if there are any improvements needed in this project, and the phase can be looped back to the previous iteration if the process faces any errors. The system proposed works successfully to produce point clouds from oil palm fresh fruit bunch, and it is found that ripe oil palm fruit has a lower mean intensity value than unripe oil palm fresh fruit bunch.

链接:

<http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFubbmAYue2AEnL0uHwACw297.pdf>

#### **5. An Analysis on Application of Deep Learning Techniques for Precision Agriculture**

发布源: IEEE

发布时间: 2021-10-01

摘要: Technological support to agriculture will enhance its productivity. Deep learning is known for its high accuracy level in whichever domain it is implemented and sometimes even it surpasses human performance. Deep learning is making a huge difference in the current agricultural landscape. It is being widely used for improving irrigation facilities, pest - disease detection at the earlier stage and crop yield estimation. Deep learning-based image processing shows better improved results than the traditional image processing techniques. This research paper gives an overview of the applications of deep learning methods used in precision agriculture particularly in irrigation, pest and diseases control,

and yield estimation.

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<http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFubyCACe6CAAZAIZG2MkM027.pdf>

## **6. Smart agriculture and role of IOT**

发布源: IEEE

发布时间: 2021-10-01

摘要: Internet of things (IOT) is a technology trend in modern innovation which provides answers for issues in our standard of living. IOT is being applied in modernization of many spaces of life. IOT can also be utilized to solve issues in traditional agriculture methods and agribusiness area to naturally keep up and screen rural homesteads with insignificant human association. The paper highlights numerous parts of innovations associated with the space of IOT in farming and role of IOT in agribusiness. The impact of inclusion of IOT in organization advancements in IOT based agribusiness has been introduced, that includes sensors, actuators, network engineering, wireless technologies and architectural layers, network geographies utilized, and conventions.

链接:

[http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFubriARtglAAe\\_e0AlpMg764.pdf](http://agri.ckcest.cn/file1/M00/0F/CF/Csgk0GFubriARtglAAe_e0AlpMg764.pdf)

## **7. Combining Multiangular, Polarimetric, and Hyperspectral Measurements to Estimate Leaf Nitrogen Concentration From Different Plant Species**

发布源: IEEE

发布时间: 2021-09-01

摘要: Optical remote sensing is one of the most popular methods for estimating leaf nitrogen concentration (LNC). This nondestructive approach based on reflected intensity measurements has been applied to estimate the variation and distribution of nitrogen concentration in leaf and canopy levels in numerous studies. However, both intensity and polarization are necessary to describe the optical properties of light reflected from leaves and to estimate LNC estimation. In this study, based on the Stokes parameters, the total reflectance, the polarized reflectance, and the nonpolarized reflectance factors (NpRFs) were simultaneously obtained through polarimetric hyperspectral measurements under varied source-viewing geometries in both laboratory and field conditions. Several published hyperspectral indices based on the NpRF showed much better LNC estimation accuracy than

those using the total reflectance factor. A clear improvement was found in the viewing directions dominated by specular reflection. Thus, using multi-angular polarimetric hyperspectral measurements not only improves the accuracy of hyperspectral indices on LNC estimation using the NpRF, but also enables the hyperspectral indices to be effective for a wide range of viewing angles. Moreover, polarimetric measurements deepen the understanding of the optical properties of light reflected from leaves. These results indicate that the combination of multiangular, polarimetric, and hyperspectral measurements may play a key role in the estimation of LNC.

链接:

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主编: 赵瑞雪  
地址: 北京市海淀区中关村南大街12号  
电话: 010-82106649

本期编辑: 陈亚东  
邮编: 100081  
邮件地址: [agri@ckcest.cn](mailto:agri@ckcest.cn)