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▶ 前沿资讯

1 . Responsible innovation key to smart farming (负责任的创新是智能农业的关键)

简介: 东安格利亚大学 (UEA) 的学者认为, 负责任的创新应该考虑到对社会的更广泛影响, 这是智能农业 (smart farming) 的关键。农业正在经历一场由世界各地政策制定者支持的技术革命。尽管智能技术将在提高生产率和提高生态效率方面发挥重要作用, 但批评人士指出, 对社会影响的考虑正在被边缘化。

在一篇新的期刊文章中, 来自东安大学环境科学学院的David Rose博士和Jason Chilvers博士认为, 负责任的创新概念应该支持所谓的第四次农业革命, 确保创新能提供社会效益, 并解决潜在的负面作用。之前的每一次革命在当时都是激进的——第一次农业革命是从狩猎和采集过渡到定居农业, 第二次革命涉及18世纪的英国农业革命, 第三次是战后生产力的提升与机械化和发展中国家的绿色革命。目前的“农业技术”发展中, 英国政府提供9000万英镑的公共资金来改造粮食生产, 以便走在全球先进可持续农业的前沿; 许多其他国家也优先考虑智能农业技术; 再加上IBM、巴克莱 (Barclays) 和微软 (Microsoft) 等机构的私人投资, 这意味着“农业4.0”正在进行中, 人工智能 (AI) 和机器人等技术正日益被用于农业。Rose博士和Chilvers博士在《可持续食品系统前沿》一书中警告说, 农业技术也可能产生副作用, 带来潜在的环境、伦理和社会成本。“鉴于有争议的农业技术先例, 智能农业无疑将引发类似的争议。机器人和人工智能可能会导致失业, 或以某些农民不喜欢的方式改变农业的性质。其他人可能会被技术进步抛在后面, 而更广泛的社会群体可能不喜欢这种食品生产方式,” Rose博士说。

“因此, 我们鼓励政策制定者、资助者、技术公司和研究人员考虑农业社区和更广泛社会群体的观点。我们主张, 这场新的农业科技革命应该负责地既考虑到赢家, 更应该考虑到变革的潜在输家, 特别是由公共资金资助的领域。Rose博士补充说: “这意味着采用更好的方式, 无论是正式的还是非正式的, 让农民和公众参与决策, 与顾问和其他主要利益相关者分享他们的观点。他们应该能够质疑和争论生产率的好处是否可以取代社会、伦理或环境问题, 并且能够说服创新者改变设计过程。负责任的创新框架应该在实践中得到检验, 看看它们能否让科技变得更负责任。更负责任的技术可以避免争议, 确保农民和公众支持它, 并有助于实现政策目标。”

来源: EurekAlert

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全文链接:

http://agri.ckcest.cn/file1/M00/06/5A/Csgk0Fwkp_OAFG0XAAG1WsOXFhc937.pdf

2 . A method to monitor indoor crop health no matter what planet you're on (一种监测室内作物健康的方法, 无论你在哪个星球)

简介: As the world urbanizes and technologies such as LED grow lights bring down costs, indoor farming is becoming an increasingly important part of the food supply. Eventually, indoor farming techniques could help humans maintain a healthy diet in space. However, because of the completely closed systems in which indoor crops are grown, imbalances in soil nutrients, salinity, temperature, and other factors must be caught quickly to avoid losing a whole crop. In work published in a recent issue of Applications in Plant Sciences, Dr.

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Robert Ferl and colleagues at the University of Florida Space Plants Lab developed a light-based tool to assess plant health quickly, accurately, and inexpensively. Not surprisingly for work coming from the Space Plants Lab, this study was conducted with an eye toward extraterrestrial farming. "Imagine a greenhouse being robotically maintained on Mars," said Dr. Ferl, corresponding author on the study. "The only data we can get back from that greenhouse is electronic. No sample return. Under those conditions it becomes really beneficial to derive as much data as possible from the photons that are coming off the leaves of plants." These photons make distinctive light signatures that can tell quite a bit about how a plant is doing, when analyzed using the normalized difference vegetation index (NDVI). The NDVI is a widely used metric of plant health and photosynthetic rate that was originally developed for satellite-based monitoring of plant growth. This metric compares the plants' absorption of different spectra of light; healthy plants give off an identifiable light signature, absorbing light in the photosynthetically active region of light spectra, and reflecting near-infrared light. "[NDVI] proved to be an interesting starting point for the project simply because there is a large dataset and collective understanding that underpins the idea of using different spectral components to understand plant health," said Dr. Ferl. They adapted single-image NDVI (SI-NDVI), a low-cost version of this analysis, to see if it would be practical for monitoring crop health in indoor farming conditions. Dr. Ferl and colleagues assessed the efficacy of this monitoring technique by exposing two different plants (arugula and the model plant *Arabidopsis thaliana*) to two different stressors (salinity and a high-concentration ammonium nitrate treatment) that create distinctive and well-understood stress responses. "Using these well-controlled stresses that have a well-defined biochemical basis for their responses is allowing us to probe the root causes of NDVI difference detections of stress or health responses," said Dr. Ferl. They were able to detect stress signatures from both treatments well before stress was visible to the naked eye, proving the utility of these techniques as early monitoring systems that can be deployed remotely and relatively inexpensively. While these authors were primarily motivated by an interest in growing plants in space, the monitoring technique they developed could prove useful here on earth for indoor farmers looking to catch problems in the grow room quickly. "Single-image NDVI offers the opportunity to derive spectral character from a single RGB image. This keeps costs down," said Dr. Ferl. "It also opens the door to a large community of citizen scientists and applications developers that are interested in using SI-NDVI concepts commercially." This means that this method could be adapted to monitor a variety of crops grown under indoor conditions, which could mean less expensive, healthier salad greens on your table, whether that table be here or on Mars.

来源: EurekaAlert

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<http://agri.ckcest.cn/file1/M00/06/5A/Csgk0FwkqJuAKbkuAAKmBKlfVtE438.pdf>

学术文献

1 . A review on smart application of supplemental lighting in greenhouse fruiting vegetable production (补充照明在温室果蔬生产中的智能应用综述)

简介: Different spectra of light trigger different plant growth processes. Therefore, the optimum light spectrum for various plant physiological and growth processes may be different. For greenhouse fruiting vegetables, such as tomatoes, it is important to optimize light spectrum to promote canopy growth to increase light interception during the early stage of plant growth. Once the plants reach full canopy, the focus should be moved to optimizing vertical light distribution because most greenhouse fruiting vegetables are tall crops and the growth processes along the vertical profile are different; most of the canopy growth occurs in the top and middle canopy while fruit growth occurs in the middle and bottom canopy. Because the fruit, not the leaf, is the economic product, the optimized light spectral composition should enhance leaf carbon export and translocation to fruit to improve fruit yield and quality. Therefore, a research project was initiated in 2013 to identify proper light spectral composition and vertical distribution regimes for greenhouse fruiting vegetable production. Different overhead light sources (high-pressure sodium light with or without far-red light-emitting diode (LED) light, plasma light and different spectral compositions of LEDs) and several intra-canopy spectral compositions provided by LEDs were evaluated over four winters on tomatoes, mini-cucumbers and sweet peppers. The effects of light spectrum on whole-plant net carbon exchange and leaf carbon export using ^{14}C -isotope tracing were also investigated. The vertical light regimes resulted in significant differences in leaf photosynthetic rate, leaf size, fruit yield and fruit quality in greenhouse tomatoes, mini-cucumbers and sweet peppers. Proper vertical light regimes were identified for hybrid light systems (overhead high intensity discharge light + intra-canopy LEDs) and for pure LED light systems (overhead + intra-canopy LEDs). This review clearly demonstrates that optimized vertical light regimes can be developed for improving both plant growth and fruit yield and quality in year-round greenhouse fruiting vegetable production.

来源: ISHS Acta Horticulturae 1227: International Symposium on New Technologies for Environment Control, Energy-Saving and Crop Production in Greenhouse and Plant Factory - GreenSys 2017

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http://agri.ckcest.cn/file1/M00/06/5A/Csgk0FwkpZCAYPRhAARJUmp_kLo521.pdf

2 . LED-integrated vertical aeroponic farming system for vegetable production in Singapore (新加坡蔬菜生产采用led集成垂直空气种植系统)

简介: To compensate for the lack of available land and its increasing population, Singapore needs to develop its own effective farming systems that will not be influenced by climate

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change. Using aeroponic systems, our previous studies showed that cooling the root-zone could help produce all types of vegetables all year-round. Recently, we have developed an integrated vertical aeroponic farming (VAF) system for both indoor and greenhouse vegetable production. The key factor that determines the success of VAF system is the provision of sufficient uniform and effective light to the plants. We utilized low-energy input engineering solutions such as light-emitting diodes (LEDs) to enhance photosynthesis and thus maximize crop productivity. Our own designed LED-integrated VAF systems have been used to test the growth of various vegetable crops including green- and red-leaved lettuce (*Lactuca sativa* L.), Chinese broccoli, kai lan (*Brassica alboglabra*), nai bai (*Brassica chinensis* L.) and mizuna (*Brassica juncea* var. *japonica*). Various experiments have been carried out to identify the optimal combinations of LED lighting for maximal vegetable production and their impacts on photosynthesis. Our results showed that there was no close relationship between productivity and photosynthesis under different spectra of LED lighting. However, the optimal combinations of LED spectrum could enhance plant growth and photosynthesis and they are species-dependent. In conclusion, extensive development of LED-integrated VAF systems would diminish Singapore's reliance on vegetable imports, thus enhancing national food security and sustainability.

来源: ISHS Acta Horticulturae 1227: International Symposium on New Technologies for Environment Control, Energy-Saving and Crop Production in Greenhouse and Plant Factory - GreenSys 2017

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➤ 相关专利

1 . ION-SELECTIVE ELECTRODE SYSTEMS AND METHODS UTILIZING SAME (离子选择电极系统及其应用方法)

简介: ISEs comprising a substrate layer; a carbon nanotube layer disposed on the substrate layer; a conductive metal layer on a portion of the carbon nanotube layer; a conductive polymer disposed on the portion; and an ion-selective membrane disposed on the conductive polymer and methods of making them are provided. A system is also provided for detecting a plurality of analyte ions in a sample comprising a housing; a plurality of ISEs associated with the housing, each electrode comprising an ion-selective membrane to a different analyte ion; a reference electrode associated with the housing; a fluid sample receptacle associated with the housing and in fluid communication with the plurality of ion-selective electrodes and reference electrode.

来源: 美国专利商标局

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全文链接:

<http://agri.ckcest.cn/file1/M00/06/5A/Csgk0FwkpsqAZYLSABJSKd-5qVg765.pdf>

2 . Ion-selective electrodes and reference electrodes with a solid contact having mesoporous carbon (具有介孔碳的固体接触的离子选择电极和参考电极)

简介: The present description discloses solid-contact (SC) electrodes that use mesoporous carbon such as colloid-imprinted mesoporous (CIM) carbon as the interlayer. The electrodes can be ion-selective electrodes (ISEs) or reference electrodes. The CIM carbon with the interconnected mesopores is used as the intermediate layer between the solid electron conductor, such as gold, and a membrane such as an ionophore-doped ion-selective membrane or a reference membrane. The disclosure includes methods of constructing solid contact electrodes such as SC-ISE or reference electrodes with a CIM carbon interlayer, and methods of using the electrodes to determine the quantity of an analyte in a sample. The description also includes disposable paper-based devices for measuring analytes in a sample.

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