中国工程科技知识中心
China Knowledge Centre for Engineering Sciences and Technology

《农业水土资源监控研究》专题快报

2020年第9期（总第22期）

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　　　　　　　　　　　2020年5月5日

【动态资讯】

1．农业农村部：今年夏粮丰收有较好基础

【中国产业经济信息网】 4月28日，国务院联防联控机制举行新闻发布会。农业农村部发展规划司司长魏百刚在发布会上介绍，目前，我国小麦从南到北大多处于抽穗扬花灌浆期，整体长势好于去年，也好于常年，再有一个多月就收获了。小麦产量占夏粮的90%以上，今年夏粮丰收有较好基础。

链接：

http://agri.ckcest.cn/file1/M00/00/EE/Csgk0V6yRt6AI1ifAApS9qewp_k596.pdf

2．2020年中国遥感行业市场现状与发展趋势分析：大数据处理走向智能化

【前瞻经济学人】 遥感行业产业链。遥感产业链上游为卫星制造及发射产业、航空飞机、无人机制造业及地面基础设备，包括接收设备、网络设备、IT基础设施(服务器、云存储和人工智能平台等软硬件基础设施)等。卫星制造主要企业包括：中国航天、中国卫星、世纪空间、长光卫星、欧比特等;卫星发射企业主要包括：中国航天、零壹空间、蓝箭空间。遥感产业链中游主要为遥感数据接收处理企业，遥感应用服务企业。遥感数据接收处理企业主要单位包括：航天宏图(PIE)、世纪空间(PCI代理)、易智瑞(ENVI代理)、中科九度等;遥感应用服务企业主要包括航天宏图、中科星图、世纪空间、欧比特等。

链接：

http://agri.ckcest.cn/file1/M00/00/EE/Csgk0V6yRnSADGQ5ABf_P8y3QPc823.pdf

3．我国早稻播插接近尾声 智能装备、投入资金等多措施力保国家粮食安全

【环球网】 农业农村部最新农情调度显示，目前全国春播进度已近3成，进展总体顺利，夏粮长势较好，丰收有基础。今年以来，农业农村部采取多措施力保国家粮食安全。早

稻面积恢复增长 后期需加强田管。目前全国早稻大部分地区已经完成播栽，进入返青期和分蘖期。预计播栽面积7000多万亩，实现了恢复性增长。 农业农村部相关负责人表示，目前各地正在加快播栽，早稻适期移栽比例高，加上近期天气较好，全国早稻苗情长势良好。

链接:

http://agri.ckcest.cn/file1/M00/00/EE/Csgk0V6yRQCAB_fKABE5tGmMf_A869.pdf

4．5G加持 巨头争抢入局智慧农业

【通信信息报】《中国数字乡村发展报告（2019）》预测，今年我国智慧农业市场规模将达2000亿元人民币，市场前景广阔。5G时代，智慧农业不但得到了三大运营商的助力，互联网巨头近年也纷纷加强智慧农业发展布局，与各地合作打通产销对接。近日，拼多多宣布，未来5年内将投入不低于500亿支持农业农村"新基建"。在政策加持的大背景下，中国智慧农业正逐步成熟，但未来还需在商业和产业领域不断创新与验证。

链接:

http://agri.ckcest.cn/file1/M00/00/EE/Csgk0V6ySs-AGENsABtk7nQgNvo360.pdf

5．发展智慧农业 建设数字乡村

【农业农村部发展规划司】现代信息科技在当代表现出两大突出特征。一是信息科技的生产力特征。现代信息科技是直接的生产力，通过与农业各生产力要素渗透，起到倍增器的作用,大大提高了农业劳动生产率。现代农业信息科技是未来最活跃的农业生产力，互联网、农业人工智能、农业大数据、区块链等技术，将提升农业生产者决策和管理行为的智能化；农业传感器、农业机器人、农业智能装备等技术将实现传统农业生产工具的转型升级;数字化技术将使管理者更清晰地认识和把握农业生产对象及其与各生产要素、环境要素、技术措施等相互作用关系。二是信息科技的经济特征。数字经济是指以使用数字化的知识和信息作为关键生产要素，以现代信息网络为重要载体，以信息通信技术的有效使用作为效率提升和经济结构优化重要推动力的一系列经济活动。

链接:

http://agri.ckcest.cn/file1/M00/00/EE/Csgk0V6ySbSAFMeaAAlqMLoAns8742.pdf

6．疫情对我国农业发展的冲击、影响及对策

【农民日报】新冠肺炎疫情对我国农业造成全面而深刻的影响。中央和各地及时采取一系列行之有效的应对措施，有力平复了疫情对农业生产的短期冲击，春耕春管和重要农产品生产流通有序推进。但从长期看，疫情对农业后期的潜在影响正在缓慢释放，应从

全局和战略高度给予足够重视，全力保障全年粮食生产和重要农产品供给。

链接:

http://agri.ckcest.cn/file1/M00/00/EE/Csgk0V6yR0SALJsLAA4Xus_kwYM773.pdf

7．农业大国变成数字农业大国

【中国农网】在未来十年，数字农业将会给中国农业带来巨大的机会。中国农业正迎来数字经济的变革时代。此前，国家也陆续出台数字农业相关政策和法规，推动数字农业服务传统农业发展。从长远看，农村的数字化又是一个新的引擎，将农业产业和消费全链路全面互联化。为乡村经济发展、政府行政监管赋能；为乡村基层治理、农民参与赋权；从乡村公共服务方面为广大农民群众赋利。而中国的未来，也必将从农业大国走向数字农业大国。

链接:

http://agri.ckcest.cn/file1/M00/00/EE/Csgk0V6yRZmAVRsHAAlQo3SWye8216.pdf

8．土地何以抛荒，又如何治理？

【中国农网】近期，一些地方政府出台相关文件，强调不得弃耕抛荒。这是在新冠疫情背景下，各地积极加强粮食安全保障的重要举措。一些地方政府在改善基础设施、推进土地流转等常规治理方式之外，还做出了惩罚性规定，采取收回耕地地力补贴、罚款、收回土地等做法。农村土地抛荒问题何以成为顽疾，地方政府何以采取如此严厉的整治措施，要想弄清这些问题，需要深入分析土地抛荒的内在逻辑。土地抛荒分为季节性抛荒和全年抛荒，地方政府侧重解决的是后一种类型的土地抛荒问题。主要有两种地区容易产生全年土地抛荒问题，一是土地生产率很低的高山山区。这类地区自然条件差、土地贫瘠、地块细碎、难以实现机械化耕作，土地效益较差。这些地区往往被纳入到国家生态保护和退耕还林的范围中，只有小部分地区国家相关政策还没有覆盖到，农民种地积极性又不高，土地就抛荒了。

链接:

http://agri.ckcest.cn/file1/M00/00/EE/Csgk0V6ySBGAT0YTAAu-DKvqOnM805.pdf

9．大兴安岭农垦"硬核"农机引领智慧农业

【呼伦贝尔日报】农垦作为保障国家粮食安全和重要农产品有效供给的国家队，肩负着引领中国特色新型农业现代化的光荣使命。大兴安岭垦区充分发挥现代化、机械化、规模化、组织化的优势，今年已累计投入资金3208万元，购置了世界先进的轮式拖拉机、精量播种机及配套农具，同时组建了一支专业植保无人机航化队伍。按照增产增效并重、

良种良法配套、农机农艺结合、生产生态协调的基本要求，大垦区始终坚持走以生态优先、绿色发展为导向的高质量发展之路，大力发展资源节约型、环境友好型和生态保育型的"三型"农业，以生态优先的理念引领垦区"大健康"产业发展。

链接:

10．今年中央财政资金重点支持这些农业生产发展项目

【农业科技报】近日，农业农村部、财政部联合印发《关于做好2020年农业生产发展等项目实施工作的通知》（以下简称《通知》）。通知就做好项目实施工作作出明确要求，并以附件形式下发了农业生产发展资金项目实施方案、农业资源及生态保护补助资金项目实施方案、动物防疫等补助经费项目实施方案三个实施方案，全面部署2020年中央财政农业生产发展、农业资源及生态保护、动物防疫等项目实施工作。其中，《农业生产发展资金项目实施方案》明确，中央财政农业生产发展资金主要用于对农民直接补贴，以及支持农业绿色发展与技术服务、农业产业发展、农业经营方式创新等方面工作。

链接:

【文献速递】

1．Integrating multiple land cover maps through a multi-criteria analysis to improve agricultural monitoring in Africa

文献源：International Journal of Applied Earth Observation and Geoinformation,2020

摘要：Monitoring agricultural land cover is highly relevant for global early warning systems such as ASAP (Anomaly hot Spots of Agricultural Production), because it represents the basis for detecting production deficits in food security assessment. Given the significant inconsistencies among existing land cover datasets, there is a need to obtain a more accurate representation of the spatial distribution and extent of agricultural area in Africa. In this research, we explore a fusion approach that combines the strength of individual datasets and minimises their limitations. Specifically, a semi-automatic method is developed, relying on multi-criteria analysis (MCA) complemented with manual fine-tuning using the best-rated datasets, to generate two hybrid and static agricultural masks   one for cropland and another for grassland. Following a comprehensive selection of land cover maps, each dataset is evaluated at country level according to five criteria: timeliness, spatial resolution, comparison with FAO statistics, accuracy assessment and expert evaluation. A sensitivity

analysis is performed, based on an evaluation of the impact of weight settings on the resulting land cover. The proposed methodology is capable of improving agricultural characterisation in Africa. As a result, two static masks at 250 m spatial resolution for the nominal year 2016 are provided.

链接:

http://agri.ckcest.cn/file1/M00/00/EE/Csgk0V6yWWmAS1eHAJmKA1AnaN0368.pdf

2．Towards smart farming: Systems, frameworks and exploitation of multiple sources

文献源：Computer Networks,2020

摘要：Agriculture is by its nature a complicated scientific field, related to a wide range of expertise, skills, methods and processes which can be effectively supported by computerized systems. There have been many efforts towards the establishment of an automated agriculture framework, capable to control both the incoming data and the corresponding processes. The recent advances in the Information and Communication Technologies (ICT) domain have the capability to collect, process and analyze data from different sources while materializing the concept of agriculture intelligence. The thriving environment for the implementation of different agriculture systems is justified by a series of technologies that offer the prospect of improving agricultural productivity through the intensive use of data. The concept of big data in agriculture is not exclusively related to big volume, but also on the variety and velocity of the collected data. Big data is a key concept for the future development of agriculture as it offers unprecedented capabilities and it enables various tools and services capable to change its current status.This survey paper covers the state-of-the-art agriculture systems and big data architectures both in research and commercial status in an effort to bridge the knowledge gap between agriculture systems and exploitation of big data. The first part of the paper is devoted to the exploration of the existing agriculture systems, providing the necessary background information for their evolution until they have reached the current status, able to support different platforms and handle multiple sources of information. The second part of the survey is focused on the exploitation of multiple sources of information, providing information for both the nature of the data and the combination of different sources of data in order to explore the full potential of ICT systems in agriculture.

链接:

http://agri.ckcest.cn/file1/M00/00/EE/Csgk0V6yWNmATE4rABlaEdD2Ky4413.pdf

3．Rainfall anomalies are a significant driver of cropland expansion

文献源：PNAS,2020

摘要：Rainfall anomalies have long occupied center stage in policy discussions, and understanding their impacts on agricultural production has become more important as climate change intensifies. However, the global scale of rainfall-induced productivity shocks on changes in cropland is yet to be quantified. Here we identify how rainfall anomalies impact observed patterns of cropped areas at a global scale by leveraging locally determined unexpected variations in rainfall. Employing disaggregated panel data at the grid level, we find that repeated dry anomalies lead to an increase in cropland expansion in developing countries. No discernible effects are detected from repeated wet events. That these effects are confined to developing countries, which are often dominated by small-holder farmers, implies that they may be in response to reduced yields. The estimates suggest that overall, in developing countries, dry anomalies account for ~9% of the rate of cropland expansion over the past two decades. We perform several tests to check for consistency and robustness of this relationship. First, using forest cover as an alternative measure, we find comparable reductions in forest cover in the same regions where cropland expands due to repeated dry anomalies. Second, we test the relationship in regions where yields are buffered from rainfall anomalies by irrigation infrastructure and find that the impact on cropland expansion is mitigated, providing further support for our results. Since cropland expansion is a significant driver of deforestation, these results have important implications for forest loss and environmental services.

链接:

http://agri.ckcest.cn/file1/M00/00/EE/Csgk0V6yVWyAMTIdAAcT1n7yzqo198.pdf

4．气候与人类活动对丹江口水源区植被覆盖变化的影响

文献源：农业工程学报,2020

摘要：植被覆盖状况直接影响到区域生态环境质量，动态监测区域植被覆盖变化，分析其影响因素，对有效开展生态工程建设、实现生态环境的可持续发展具有重要意义。丹江口水库作为南水北调中线工程核心水源区，其生态环境状况直接影响到水源区的水质和水量，目前此区域植被覆盖动态变化研究存在研究时间较短，人类活动定量评估不足等问题。 该研究以丹江口水源地为研究区，以GIMMS NDVI和MODIS NDVI为数据源，运用经验正交遥相关EOT （empirical orthogonal teleconnections）算法对1982—2018年归

一化植被指数NDVI （normalized difference vegetation index）数据进行重构，分析此区域植被覆盖时空变化特征。在此基础上，分析气候和人类活动因素对区域植被覆盖变化的综合贡献情况。结果表明：1982—2018年间NDVI呈现波动上升趋势。空间上，89.93%的像元年均NDVI呈现增加趋势，10.06%的像元年均NDVI呈现减小趋势。气温与NDVI呈现显著正相关，相关系数为0.79（P<0.05），降水量与NDVI呈现显著负相关，相关系数为－0.43（P<0.05），气温对植被的影响大于降水。气候因素对植被的影响呈现明显的空间异质性，在海拔较高的山地区域，植被生长受降水和气温的综合作用影响；而在地势较为低平的盆地和河谷区，NDVI与气温呈现显著的正相关关系，与降水则呈现显著负相关关系。人类活动对区域植被覆盖影响具有双重作用，研究区67.74%区域人类活动对植被覆盖产生正面影响，正向作用表现在为恢复生态环境实施的一系列生态保护与建设工程措施；32.26%区域人类活动对植被覆盖产生负面影响，负向作用表现在为发展社会经济进行的一系列不合理的生产活动。采用残差法分离气候因素和人为因素对区域植被覆盖影响，气候因素对区域植被覆盖变化的综合贡献度为92.14%，人类活动因素的综合贡献度为7.86%，气候因素是影响区域植被覆盖整体变化的主导因素。空间上，在生态措施实施以及中心城市周围等人类活动程度较高的区域，人类活动逐渐成为NDVI变化的关键因素。

链接:

http://agri.ckcest.cn/file1/M00/00/EE/Csgk0V6yVsmAIe5iADx_aC_MELM064.pdf

5 .Using HJ-ccD image and pLS algorithm to estimate the yield of field-grown winter wheat
文献源：Scientific Reports,2020

摘要：Remote sensing has been used as an important means of estimating crop production, especially for the estimation of crop yield in the middle and late growth period. In order to further improve the accuracy of estimating winter wheat yield through remote sensing, this study analyzed the quantitative relationship between satellite remote sensing variables obtained from HJ-CCD images and the winter wheat yield, and used the partial least square (PLS) algorithm to construct and validate the multivariate remote sensing models of estimating the yield. The research showed a close relationship between yield and most remote sensing variables. Significant multiple correlations were also recorded between most remote sensing variables. The optimal principal components numbers of PLS models used to estimate yield were 4. Green normalized difference vegetation index (GNDVI), optimized soil-adjusted vegetation index (OSAVI), normalized difference vegetation index (NDVI) and plant senescence reflectance index (PSRI) were sensitive variables for yield

remote sensing estimation. Through model development and model validation evaluation, the yield estimation model's coefficients of determination (R2) were 0.81 and 0.74 respectively. The root mean square error (RMSE) were 693.9 kg ha^{-1} and 786.5 kg ha^{-1}. It showed that the PLS algorithm model estimates the yield better than the linear regression (LR) and principal components analysis (PCA) algorithms. The estimation accuracy was improved by more than 20% than the LR algorithm, and was 13% higher than the PCA algorithm. The results could provide an effective way to improve the estimation accuracy of winter wheat yield by remote sensing, and was conducive to large-area application and promotion.

链接:

http://agri.ckcest.cn/file1/M00/00/EE/Csgk0V6yUMmAB3DRABopuQmc88g501.pdf

6．Agriculture in Hilly and Mountainous Landscapes: Threats, Monitoring and Sustainable Management

文献源：Geography and Sustainability,2020

摘要：Agricultural landscapes cultivated in hilly and mountainous areas, often with terracing practice, could represent for some regions historical heritages and cultural ecosystem services. For this reason, they deserve to be protected. The complex morphology that characterises them, however, makes these areas intrinsically susceptible to hydrogeological instability, such as soil loss due to surface erosion or more severe mass movements. We can identify three major critical factors for such landscapes. The first is related to the socio-economic evolution of contemporary civilization, that increased the land abandonment of several rural regions, leading therefore to a lack of maintenance. A second element is the unsustainable agricultural practices, such as excessive heavy-mechanization that cause soil compaction thus accelerating degradation. Finally, the climate change forcing, with the increasing of the extreme rainfall. In this complex framework, it is necessary to find innovative solutions for the mitigation of hydrogeological risk and to respond in a well-prepared way to the possible future critical scenarios. Therefore, the use of sustainable agricultural practices, which allow the production of quality agricultural products in perfect harmony with the surrounding environment, becomes crucial. Suitable solutions must respond to the criterion of multidisciplinary, where the various stakeholders collaborate by offering their specific knowledge in a shared intention of problem-solving. The discipline of geography may become a valuable asset in this framework. In particular, thanks to the

recent technological advances in the topographic survey (e.g. innovative remote sensing techniques such as drones and airborne laser scanning), it is possible to exploit digital terrain analysis to synthesize key information for decision-makers, in order to plan sustainable interventions. Moreover, thanks to the high-resolution and accuracy offered by digital topography and the advanced morphometric algorithms, it is possible to tackle the problem of hydrogeological risk from a unique and privileged perspective: that of prevention.

链接:

http://agri.ckcest.cn/file1/M00/00/EE/Csgk0V6yWhqARKx9ACmkCv7xuT8900.pdf

7．利用光谱混合分解模型分析GF-6新增波段对土地利用/覆被的响应

文献源：农业工程学报,2020

摘要：当前面对紧迫的自然资源管理压力和生态环境监测需求，针对国产遥感卫星大数据应用能力的挖掘将面临很大的挑战。GF-6卫星具有大角度、高频次和新谱段的特点，该文基于GF-6卫星数据，测试新增的红边、黄光和紫光波段响应能力。利用具有物理意义的全约束线性光谱混合分解模型，根据研究区物候特征确定四端元包括植被（GV），裸地和建设用地等基质（SU），山体植被阴影（DA）以及水（WA），通过对比保留红边、黄光波段、紫光波段和去除红边、黄光、紫光波段后的分解结果，对各新增波段和GV端元、SU端元、差均方根（RMSE）进行相关性分析；最后对比光谱混合分解结果和基于专家知识决策树分类结果。通过对比丰度值估计参数和决策树分类结果发现红边波段对植被较为敏感，对光谱混合分解模型的适用性、稳健性以及丰度值估计精度有着很大贡献，黄光波段和紫光波段经过数据降维后对植被和裸地、建设用地有少量贡献。通过相关性分析发现红边2波段、近红外波段与GV端元丰度图有最大的相关性，紫光波段、黄光波段和红边1波段与GV端元反向相关；红边1波段、紫光波段和黄光波段与SU端元丰度图显著相关；红边1波段和黄光波段对丰度值计算误差有主要贡献，是主要的噪音来源，紫光波段次之。通过对比GF-6数据和OLI、Sentinel-2数据丰度值估计结果发现GF-6丰度值估计的均方根误差以及除了WA端元的各端元丰度值估计变异系数均小于OLI和Sentinel-2载荷，体现出CF-6卫星在地表信息识别上较高的精度和稳健性。

链接:

http://agri.ckcest.cn/DOI:10.11975/j.issn.1002-6819.2020.03.030

8．基于土地利用格局重建的区域生境质量时空变化分析

文献源：地理学报,2020

摘要：区域生境质量决定了区域内生物多样性状况,是生态系统服务功能和生态系统健康程度的重要体现,生境质量变化研究对区域生态安全具有重要的意义,重建区域生境质量空间格局可以还原历史时期的生态环境本底,为揭示区域生态环境质量演变规律提供科学支撑。选取高程、坡度、坡向、GDP、人口、温度、降雨量、河流距离、城市距离和海岸线距离10个土地利用变化驱动因子,构建CA-Markov模型参数,模拟得到历史土地利用空间数据。在此基础上,运用InVEST模型重建泛长三角地区生境质量空间格局,并对计算得到的生境退化度指数和生境质量指数进行等级划分与统计分析。结果表明：① 土地利用模拟精度验证结果显示Kappa系数为0.88,土地利用空间格局重建方法可行,可以在此基础上开展生境质量模拟研究。② 泛长三角地区1975—2010年生境退化度逐期上升,生境退化等级在空间分布上呈圈层递变分布规律。生境质量则表现为逐期下降,高值区主要分布于山区,低值区大部分位于建成区;1975—2010年期间,低值区逐渐向周边高值区域演变,生境高值区域趋于破碎化。③ 1975—2010年生境质量时空变化特征表明：生境质量差等级区域,其生境难以修复,维持原状居多;生境质量较差等级区域易继续恶化,且易发生在建成区周边区域,占比为研究区总面积的6.40%;生境等级为良好和优等的区域,其生境等级易转换为差等和较差等级,使得该区域的生境破碎化,该类型的面积占比为研究区总面积的5.68%。④ 1975—2010年期间,研究区土地利用变化显著,对生境质量造成了巨大的影响;研究区生境质量逐期变差,其生境质量等级位于较差及以下区域面积占比均达到了60%以上,建设用地为生境质量最大的威胁因子。

链接:

http://agri.ckcest.cn/file1/M00/00/EE/Csgk0V6yV5GAU51MALi9TmvB5jk052.pdf

9．Paradigm change in Indian agricultural practices using Big Data: Challenges and opportunities from field to plate

文献源：Information Processing in Agriculture,2020

摘要：Agriculture is the backbone of the Indian Economy. However, statistics show that the rural population and arable land per person is declining. This is an ominous development for a country with a population of more than one billion, with over sixty-six percent living in rural areas. This paper aims to review current studies and research in agriculture, employing the recent practice of Big Data analysis, to address various problems in this sector. To execute this review, this article outline a framework for Big Data analytics in agriculture and present ways in which they can be applied to solve problems in the present agricultural domain. Another goal of this review is to gain insight into state-of-the-art Big Data applications in agriculture and to use a structural approach to identify challenges to be

addressed in this area. This review of Big Data applications in the agricultural sector has also revealed several collection and analytics tools that may have implications for the power relationships between farmers and large corporations.

链接:

http://agri.ckcest.cn/file1/M00/00/EE/Csgk0V6yWCGAFVfyABZK-oJBHc8636.pdf

【研究报告】

1．Global agricultural economic water scarcity

发布源：Science Advances

发布时间：2020-04-29

摘要：Water scarcity raises major concerns on the sustainable future of humanity and the conservation of important ecosystem functions. To meet the increasing food demand without expanding cultivated areas, agriculture will likely need to introduce irrigation in croplands that are currently rain-fed but where enough water would be available for irrigation. "Agricultural economic water scarcity" is, here, defined as lack of irrigation due to limited institutional and economic capacity instead of hydrologic constraints. To date, the location and productivity potential of economically water scarce croplands remain unknown. We develop a monthly agrohydrological analysis to map agricultural regions affected by agricultural economic water scarcity. We find these regions account for up to 25% of the global croplands, mostly across Sub-Saharan Africa, Eastern Europe, and Central Asia. Sustainable irrigation of economically water scarce croplands could feed an additional 840 million people while preventing further aggravation of blue water scarcity.

链接:

http://agri.ckcest.cn/file1/M00/00/EE/Csgk0V6yTsmAQK22ADIcdzxQrkY661.pdf

【行业报告】

1．2020全国县域数字农业农村电子商务发展报告

发布源：农业农村部信息中心

发布时间：2020-04-30

摘要：《2020全国县域数字农业农村电子商务发展报告》对全国农业农村生产现状、县域电商发展现状、发展特点、面临挑战进行深入分析，预测未来县域电商市场的发展趋势，旨在加强政策引导，加快以创新驱动推动县域电商高质量发展，加快建设数字农业农村，缩小城乡间数字鸿沟，推进数字技术与农业农村深度融合。

链接: