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

《现代智慧生态农业发展战略研究》专题快报

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中国农业科学院农业信息研究所　　　　　　　　　　2021年5月4日

【动态资讯】

1．农业农村部启动现代农业全产业链标准化试点工作

【农业农村部】近日，农业农村部印发通知，正式启动现代农业全产业链标准化试点工作。通知提出，"十四五"期间全国将试点构建30个农产品全产业链标准体系及相关标准综合体，制修订相关标准200项，遴选命名现代农业全产业链标准化基地300个，按标生产培训5万人次，培育一批全国知名的绿色、有机和地理标志农产品，全产业链标准化协同推进机制基本形成。试点工作以高质量发展为主题，以提升农业质量效益和竞争力为主攻方向，突出品种培优、品质提升、品牌打造和标准化生产。试点期间将着重构建以产品为主线、全程质量控制为核心的现代农业全产业链标准体系，试点打造一批全产业链标准化基地，培育一批高标准引领的绿色优质农产品精品，选树一批标准化带动特色农产品产业发展和质量提升的示范典型，为保障农产品质量安全、增加绿色优质农产品供给和推动农业高质量发展提供有力支撑。

链接:

http://agri.ckcest.cn/file1/M00/02/CF/Csgk0WCKH5WAXj0GAANL4Wguhqc080.pdf

2．农业农村部启动2021年全国农产品产地冷藏保鲜设施建设工作

【农业农村部】4月27日，农业农村部组织召开2021年全国农产品产地冷藏保鲜设施建设工作视频启动会暨培训会。农业农村部副部长于康震出席会议并讲话。会议指出，2020年各地农业农村部门、财政部门齐心协力、扎实推进农产品产地冷藏保鲜设施建设，广大农业经营主体踊跃申请、积极参与，取得显著成效。全年支持1.1万个家庭农场和农民合作社建设了近500万吨产地冷藏保鲜设施，形成了一套科学规范、行之有效的制度机制和工作方法。会议强调，全面推进农产品产地冷藏保鲜设施建设，要在准确把握当前面临形势和存在问题的基础上，正确处理好建设过程中政府引导与市场主导、主体利

益与企业利益、突出重点与兼顾一般、标准规范与因地制宜、严格管理与为农服务的关系，做到建设规范、质量可靠、效益显著。会议要求，各地要本着高度负责的态度，以更严的要求、更高的标准和更具前瞻性的措施，从明确管理责任、加快建设进度、落实扶持政策、加强宣传示范、严格监督管理等方面，着力抓好各项建设工作，确保政策措施落实落地，高质量完成全年建设任务。各省（区、市）及新疆生产建设兵团农业农村厅（局、委）、北大荒农垦集团、广东省农垦总局有关负责人，2000多个市县农业农村部门负责人和业务干部参加会议。

链接:

http://agri.ckcest.cn/file1/M00/02/CF/Csgk0WCKHveAWnP9AAO3rnW6C7s558.pdf

3．Agriculture sets sights on space technologies

【**Future Farming**】According to a new report by AgriFutures Australia, agriculture is the next frontier for space tech, with billion-dollar opportunities to super-charge technology adoption for farmers, fishers and foresters over the next five to ten years.

链接:

http://agri.ckcest.cn/file1/M00/02/CF/Csgk0WCKW96ACI94AAJyFLzJtA8573.pdf

4．农业农村部农产品冷链物流标准化技术委员会2021年工作会议在京召开

【**农业农村部**】4月26日，农业农村部农产品冷链物流标准化技术委员会2021年工作会议暨换届大会在北京召开。会议强调，要以"完善一个体系、突出两个重点"为目标，加快构建农产品冷链物流基础标准体系，加强与法律法规和现有标准衔接融合，做好标准宣传贯彻工作，为加快补齐农产品冷链物流短板奠定坚实基础。会议选举了新一届标委会主任委员、副主任委员，补充调整了标委会委员，审议通过了农业农村部农产品冷链物流标准化技术委员会章程，部署了标委会2021年工作。据悉，2016年，农业农村部成立了农产品冷链物流标准化技术委员会。4年来，标委会提出了基于农产品种类的全链条标准体系，成功立项了8项农业行业标准。

链接:

http://agri.ckcest.cn/file1/M00/02/CF/Csgk0WCKICyAHfxyAAMvX2Y2158571.pdf

5．2021中国农业展望大会在京召开

【**农业农村部**】会议强调，当前国内外农产品市场运行的不确定性增大，展望大会通过粮食等重要农产品供需形势会商和发布，来引导市场预期、服务生产经营，契合形势需要和各方诉求。要进一步完善农产品市场监测分析和预警体系，加快新技术应用，切实

发挥好信息在稳预期、固安全方面的重要作用。会上发布的《中国农业展望报告（2021-2030）》预测，2021年中国粮食和重要农产品供给保障能力将进一步增强，口粮绝对安全有保障，玉米种植面积将增长4%以上，猪肉产量增长约20%，农产品价格有望保持总体稳定。未来10年，中国农业结构将不断优化，发展质量效益持续提升，玉米、猪肉、奶类等产量年均增速在2%以上，玉米、大豆单产将明显提高，农产品国际贸易更加活跃、贸易伙伴更趋多元。

链接:

http://agri.ckcest.cn/file1/M00/02/CF/Csgk0WCKIKCAClQ9AAOXcxxEOe0052.pdf

【文献速递】

1．Circulation traceability system of Chinese herbal medicine supply chain based on internet of things agricultural sensor

文献源：ScienceDirect,2021-06-03

摘要：In the past years, the supply of Chinese herbal medicine has become more and more significant. In order to promote the standardized production of Chinese herbal medicine, we should take effective quality control on its production, processing and purchase. It is difficult to control the production quality and production standards of various Chinese herbal medicines planted separately. It is imperative to create a safe and effective Chinese herbal medicine supply chain circulation traceability system. Therefore, this paper puts forward the research of Chinese herbal medicine supply chain circulation traceability system based on Internet of things agricultural sensor. According to the characteristics of the Chinese herbal medicine supply chain, this paper uses the agricultural sensors in the Internet of things technology platform to plan the implementation of the detailed information inspection and traceability system of the Chinese herbal medicine supply chain, and then numbers the planting, processing, purchasing and selling parts of Chinese herbal medicine. It mainly improves the information implementation of the whole process and realizes the high supervision mode of Chinese herbal medicine from planting to selling drugs. Through testing the feasibility of the system, it is found that the Chinese herbal medicine supply chain circulation traceability system based on the Internet of things agricultural sensor can significantly improve the circulation efficiency of Chinese herbal medicine. It not only reduces the circulation cost of Chinese herbal medicine, but also enables Chinese herbal medicine suppliers, manufacturers and sellers to enjoy accurate and convenient Chinese herbal medicine supply services. It is concluded that the first mode of Chinese herbal medicine supply chain is pre supervision mode, and the second is circulation

traceability monitoring mode. The 100 % safety inspection makes citizens feel more confident about the use of Chinese herbal medicine, and the popularization of Chinese herbal medicine will be more extensive.

链接:

http://agri.ckcest.cn/file1/M00/02/CF/Csgk0WCKaAeAeZdOABqzdQ_VqB8365.pdf

2．A systematic literature review on applications of information and communication technologies and blockchain technologies for precision agriculture development

文献源：ScienceDirect,2021-05-20

摘 要 ： This review examines literature from 2011 to 2020 on information and communications technologies (ICTs) and blockchain technologies (BTs) in agriculture. To describe the status of the subjects and identify issues for future research, we utilized bibliometric and content analyses of leading journals. The main findings are: (1) ICT technique adoption is affected by application design and socio-demographic factors, while research in BTs in this area only focuses on application design factors; (2) ICTs and BTs have similar applications in agricultural production (information provision for efficient decisions and production improvement), logistics (tracing), and supply chain (trust-building); (3) ICT techniques are applied more to production improvement, while BTs focus more on using visibility, traceability, and automation to improve transparency and transaction efficiency in whole sectors; (4) in relation to consumption, ICTs focus on balancing supply and demand to achieve market stability, while BTs investigate effects on consumer purchasing decisions. Insights are also proposed for future research based on common challenges in the application of ICT and blockchain in agriculture in the following areas: (i) security and privacy protection; (ii) solutions for scalability and interoperability; (iii) solutions for high cost and high consumption, and demands for high knowledge in technology application; (iv) formulation of policies and regulations related to standard criteria for market stability. This review provides a basis for studying the combination of ICTs and BTs in agriculture and furthers the understanding of their usage by comparison; this has significant implications for technological development and agricultural sustainability.

链接:

http://agri.ckcest.cn/file1/M00/02/CF/Csgk0WCKYr6AP9-kADUfu_JIORc278.pdf

3．改进的CLAHE无芒隐子草叶切片图像增强

摘要：无芒隐子草叶切片图像在获取过程中不可避免产生低对比度图像,对后续处理产生影响。为此,针对传统的限制对比度自适应直方图均衡化方法（contrast-limited adaptive histogram equalization, CLAHE）对较暗图像处理效果不佳的问题,提出了基于自适应亮度调整的CLAHE图像增强算法。该算法首先将图像RGB空间转换到HSV空间,提取图像的亮度分量,再根据图像的亮度值,自适应调整RGB通道图像整体亮度,最后应用CLAHE算法实现图像增强。采用50张无芒隐子草叶切片图像为样本进行试验,结果表明:该算法相比于传统的CLAHE算法,图像信息熵、图像对比度、图像平均梯度和图像的峰值信噪比均显著提高,有效克服了传统CLAHE算法对过暗图像增强效果不佳问题,能使图像局部细节信息和清晰程度得到明显提高,不仅适合无芒隐子草叶切片低对比度图像增强,也可为其他植物叶切片图像增强提供参考。

链接:

http://agri.ckcest.cn/file1/M00/02/CE/Csgk0WCJC_KAIry6ABShqf-JsaI026.pdf

4．果园避障旋耕机的设计与试验分析

摘要：目前,新疆林果业要进一步实现机械化,需要不断提高果园的"宜机化"标准,开展新疆果园的"宜机化"改造势在必行。为此,针对普通旋耕机作业造成少耕、漏耕的情况,设计了一种适合新疆果园避障旋耕作业的机具,可通过液压控制系统提供动力输出,控制避障执行系统在中耕除草时对果树或障碍物进行有效避让,以免对果树造成伤害。经过对国内外避障旋耕机的理论研究和一系列有效计算,设计了适合新疆林果业的果园避障旋耕机液压系统和旋耕机的关键部件,并通过采用正交试验分析,对果园避障旋耕机的性能进行测试,得出果园避障旋耕机最佳的作业理论参数。

链接:

http://agri.ckcest.cn/file1/M00/02/CE/Csgk0WCJA8uAMcOnABcQ7SWkCs0682.pdf

5．基于机器视觉的马铃薯自动分级与缺陷检测系统设计

摘要：针对现有的马铃薯分级和检测需要大量的人力物力、检测效率不高,设计了基于机器视觉的马铃薯自动分级与缺陷检测系统。工作时,自动分级系统对大量马铃薯进行快速表皮去泥和分级工作,得到3种规格的马铃薯并逐个运输到缺陷检测系统进行马铃薯缺陷的识别检测;通过多种图像处理算法对比分析,以平均值法灰度化、中值滤波处理、大津法分割等方法得到最佳的马铃薯图像,且目标图像能与背景图像很好分割,提高了缺

陷检测的准确度和效率;采用RGB彩色模型对马铃薯图像进行分析,以马铃薯图像设定的阈值与标准差值相比较,得到图像中所有缺陷点,并对马铃薯图像缺陷部分的连通区域进行标记。选择1000个试验样本进行系统和人工分级与检测的试验,结果表明:自动分级系统对不同类别大小的马铃薯分级有较高的准确度,缺陷检测系统对多种缺陷的检测准确精度很高,并验证了马铃薯缺陷检测系统的可行性。

链接:

http://agri.ckcest.cn/file1/M00/02/CE/Csgk0WCJA0KAV7rHADJf_DpC1d4701.pdf

6．基于机器视觉的高地隙喷雾机自动导航系统设计

文献源：农机化研究,2021-04-28

摘要：针对高地隙喷雾机在玉米中后期喷药植保作业对行难的问题,设计了一种基于机器视觉的高地隙喷雾机自动导航系统,并进行了可行性分析和仿真试验。系统整体由前置的CCD摄像头、车载计算机、STM32微控制器、蓄电池组、步进电机及控制器,以及传感器模块组成,通过Labview编程软件实现程序的开发及数据的储存工作,车载计算器进行图像数据的处理,并由单片机执行控制。试验结果表明:系统鲁棒性强,能够成功提取导航线并达到自动导航目的,综合成功率为89.3%,满足实际工作要求,为实现玉米高地隙喷雾机自动导航作业提供了一种可行方案。

链接:

http://agri.ckcest.cn/file1/M00/02/CE/Csgk0WCJAOqAb_24AC4ZWpHVE8U167.pdf

7．基于创业孵化区块链模型的农机数字化设计系统研究

文献源：农机化研究,2021-04-28

摘要：近年来,为了提高农机产品的研发速度,提高产品的设计质量,农机产品的数字化设计被应用到了产品的研发过程中,并出现了农机数字化工厂。在农机数字化设计过程中,协同区块化分工不仅可提高设计效率,还可以降低设计成本,对提升农机新产品的设计能力具有重要的意义。为此,在农机数字化设计平台上引入了创业孵化区块链模型,并以播种机的区块化分工为例,初步探究了模型在数字化设计过程中的作用,对于提升农机产品的设计和研发效率具有重要意义。

链接:

http://agri.ckcest.cn/file1/M00/02/CE/Csgk0WCI_-6AVjW0ABvM_4Egmlo302.pdf

8．基于机器学习的奶牛颈环ID自动定位与识别方法

文献源：南京农业大学学报,2021-04-27

摘要：[目的]奶牛个体信息的实时感知和行为分析是现代化奶牛精细养殖的必然要求，奶牛个体身份的有效识别是上述目标的前提和基础。基于奶牛生物特征（牛脸、体斑等）图像的无接触识别方法易受外界干扰、算法复杂度高，可识别的样本规模受到限制。因此，本文提出了一种基于机器学习的奶牛颈环ID自动定位与识别方法。[方法]针对奶牛运动造成的颈环ID偏转问题，采用基于HOG特征的级联检测器结合多角度检测方法实现奶牛标牌的定位；对标牌图像进行图像增强和二值化分割等处理，得到单个字符图像；设计卷积神经网络的结构和参数，训练字符识别模型，从而完成标牌字符的识别。试验数据包括80头奶牛的1 414幅侧视图像，随机选取其中58头奶牛的图像作为训练集，其余22头奶牛的图像作为测试集。[结果]标牌定位的准确率为96.89%，召回率为80.23%，字符识别模型的准确率为93.55%，连续图像序列中奶牛个体的识别率为95.45%。[结论]识别模型对光线变化、污渍沾染、旋转角度等具有良好的鲁棒性，具有代替传统动物个体身份识别方法的潜力。

链接:

http://agri.ckcest.cn/file1/M00/02/CE/Csgk0WCJAGqAQrX2ABBbvMkrZVM848.pdf

9．基于虚拟雷达模型的履带拖拉机导航路径跟踪控制算法

文献源：农业机械学报,2021-04-26

摘要：为提高传统果园广泛使用的小型履带式拖拉机导航路径跟踪控制精度和行驶稳定性，提出了一种基于虚拟雷达模型的导航路径跟踪控制算法。该算法借鉴人类的车辆驾驶经验，参考雷达扫描原理和图像识别技术原理，构建了虚拟雷达模型以生成虚拟雷达图，使用该图描述车辆与路径的位置关系；经深度神经网络分类生成对应的履带拖拉机行驶操作指令；以果园作业典型的"U"形路径为例进行了仿真和实车试验。仿真结果表明：本研究提出的算法能够精准地实现导航路径跟踪控制；果园实车试验表明：车速在0.36 m/s和0.75 m/s时，该算法的路径跟踪最大横向偏差分别为0.150 m和0.191 m，平均横向偏差分别为0.031 m和0.051 m，标准差分别为0.025 m和0.036 m；与模糊控制算法相比，最大横向偏差分别减小了15.73%和36.33%，平均横向偏差分别减小了27.91%和19.05%，标准差分别减少了40.48%和28.00%。结果表明：基于虚拟雷达模型的导航路径跟踪控制算法有更高的路径跟踪精度和行驶稳定性，能满足果园实际作业需求。

链接:

http://agri.ckcest.cn/file1/M00/02/CE/Csgk0WCJKROAItGAABdKT8z67yU394.pdf

10. The Impact of GIS/GPS Network Information Systems on the Logistics Distribution Cost of Tobacco Enterprises

摘 要： The improvement of logistics operation management for many tobacco companies highly depends on the reduction of distribution costs. In order to optimize routes, cigarettes are delivered through online real-time distribution system equipped with GIS/GPS. These network information technologies are crucial to creating and maintaining an efficient distribution system. Considering the applicability and flexibility of GIS/GPS network information system, this paper assesses the impact of its implementation on the logistics distribution cost from both overall and household levels. Specifically, DID and pseudo-DID models were adopted and monthly panel data of 14 prefecture-level branches of Hunan Tobacco Company during 2016-2019 were used for regression.We find that the implementation of GIS/GPS network information systems increased the total distribution cost. However, the average distribution cost was significantly reduced at per household level as the customer base expanded. A series of robustness and sensitivity tests supported above results. Furthermore, the implementation of GIS/GPS network information system is beneficial to service quality and employee performance. In addition, more time and logistics costs were saved when drivers chose "dynamic + fixed optimization" route model.

链接:

http://agri.ckcest.cn/file1/M00/02/CF/Csgk0WCKanOAPSFjAE_2b2MAK8s908.pdf

11．Blockchain and agricultural supply chains traceability: research trends and future challenges

摘 要： Blockchain is today one of the most interesting and debated research topics. Blockchain technology was implemented for the first time in the financial sector a few years ago. However, it is currently used in many other areas, such as: healthcare, smart cities, smart contracts, energy markets, government sector. The success of this technology mainly lies in the following properties: reliability, transparency, immutability. In this study, we collect and analyze the main contributions in the literature about the application of blockchain in the agricultural sector, focusing on food traceability issues. Considering the quick growth of this technology and the high number of published documents in recent months, there is a need to catalog the different methodologies, proposed by the various scholars. Our aim is to detect the current research trends and possible future challenges. In the agricultural context, the need for an adequate traceability system is motivated by

several bad habits and problems, such as the wide use of pesticides and fertilizers in fruits and vegetables, which are extremely harmful for human health. Moreover, in the last few years, the consumers' attention about the quality of agricultural products has considerably increased. The present study shows that the blockchain technology is still in its early stage. Although there are several proposals in the literature, still a limited number of applications have been put into use in the real context. From the point of view of scientific research, only some countries are investing in this technology: China and United States are among the most active, but Italy is also very involved in this phenomenon. Overall, the blockchain technology appears very promising, but still many efforts are needed to reach the maturation stage.

链接:

http://agri.ckcest.cn/file1/M00/02/CF/Csgk0WCKacWAT5pEAA8BnhLKPxE651.pdf

12．A new mobile application of agricultural pests recognition using deep learning in cloud computing system

文献源：ScienceDirect,2021-03-31

摘要：Agricultural pests cause between 20 and 40 percent loss of global crop production every year as reported by the Food and Agriculture Organization (FAO). Therefore, smart agriculture presents the best option for farmers to apply artificial intelligence techniques integrated with modern information and communication technology to eliminate these harmful insect pests. Consequently, the productivity of their crops can be increased. Hence, this article introduces a new mobile application to automatically classify pests using a deep-learning solution for supporting specialists and farmers. The developed application utilizes faster region-based convolutional neural network (Faster R-CNN) to accomplish the recognition task of insect pests based on cloud computing. Furthermore, a database of recommended pesticides is linked with the detected crop pests to guide the farmers. This study has been successfully validated on five groups of pests; called Aphids, Cicadellidae, Flax Budworm, Flea Beetles, and Red Spider. The proposed Faster R-CNN showed highest accurate recognition results of 99.0% for all tested pest images. Moreover, our deep learning method outperforms other previous recognition methods, i.e., Single Shot Multi-Box Detector (SSD) MobileNet and traditional back propagation (BP) neural networks. The main prospect of this study is to realize our developed application for on-line recognition of agricultural pests in both the open field such as large farms and greenhouses

for specific crops.

链接:

13．A decision algorithm for selecting the design scheme for blockchain-based agricultural product traceability system in q-rung orthopairfuzzy environment

文献源：ScienceDirect,2021-03-25

摘要：The safety of agricultural products has always been a matter of great concern to people. To address thisconcern, many blockchain-based agricultural product traceability systems (BAPTSs) have been con-structed. The implementation of such systems necessitates the selection of an appropriate designscheme. However, due to the diversity of agricultural products and the uncertainty of the environment,selecting an adequate design scheme for BAPTS is a difficult task for decision-makers. Because the q-rungorthopair fuzzy (q-ROF) set can dynamically delineate the space of uncertain information, this paperproposes a decision algorithm for selecting a design scheme for BAPTS using the q-ROF set. Herein, wefirst combine the Muirhead mean operator and power operator to develop the q-ROF power MuirheadMean (q-ROFPMM) operator and the q-ROF weighted power Muirhead Mean (q-ROFWPMM) operator.Then, we investigate several properties of the proposed operators. Further, we construct a novel multi-criteria decision-making framework for evaluating and selecting the design scheme for BAPTS based onthe q-ROFWPMM operator. Next, a case study on BAPTS selection is presented to validate our method.Finally, the results of sensitivity and comparative analyses are provided to verify the efficiency and ac-curacy of our method. The results show that our method can effectively address the issues of BAPTSevaluation and selection, capture the relationships between any number of criteria, and eliminate thenegative effects of abnormal expert evaluation values on decision-ma

链接:

【会议论文】

1．Automation and integration of growth monitoring in plants (with disease prediction) and crop prediction

发布源：ScienceDirect

发布时间：2021-03-12

摘要：In the age of climate change, even the farmers who possess indigenous knowledge face difficulties in making judicious decisions on crop health monitoring that leads to the failure of the crop which in turn results in the decline of crop production. Another reason for the decline in crop production can be the selection of unsuitable crops for cultivation and the inability of identifying the visible effect of the disease in a plant. The research paper deals with how the IoT technology helps in collecting information about conditions like temperature, humidity, pH, and rainfall by applying various machine learning algorithms to obtain the output. The research work deals with Decision Tree to predict the crop condition and suggests a suitable solution, it also suggests which crop can be grown. Using a public dataset of 87,000 RGB images of diseased and healthy plant leaves, we train a convolutional neural network to identify diseases that are categorized into 38 different classes. This paper consists of a proposed model that takes real-time data for predicting the kind of crop which is the most suitable and will monitor the crop conditions in the field through weather analysis and crop disease diagnosis on a massive scale for better production.

链接:

http://agri.ckcest.cn/file1/M00/02/CF/Csgk0WCKZBeARnqCACXodNrjisE043.pdf

【相关专利】

1.　一种基于机器视觉技术的温室鱼苗智能投饲装置及方法

发布源：国家知识产权局

发布时间：2021-02-26

摘要：本发明提供了一种基于机器视觉技术的温室鱼苗智能投饲装置及方法，属于温室鱼苗养殖投喂技术领域。养殖池内壁、投饲区域正上方均安装有摄像头采集鱼群视频信息，并传递至数字信号处理器进行预处理，获得鱼群清晰图像，并发送至服务器处理获得鱼群光流运动轨迹，将鱼群光流运动轨迹输入至判别模型中后判断鱼群当前进食状态，据此下发指令至PLC，控制料仓绞龙、运输绞龙、风机的工作状态，实现精准变量投喂。整个投饲过程更加智能化，无需人工参与，节省了人力物力，具体有较好的经济效益；能够确定科学合理的饲料投喂量和投饲时间，节省饲料成本，实现鱼苗养殖生产智能化精准变量投饲，促进渔业生产高效养殖、经济养殖、生态养殖的进程。

链接:

http://agri.ckcest.cn/file1/M00/02/D0/Csgk0WCLdjqAH_oZAA102xQq3bo918.pdf

【科研项目】

1．我专家应用稳定同位素技术精准溯源牛奶产地

发布源：中国农业科学院

发布时间：2021-04-28

摘要：近日，中国农业科学院农业质量标准与检测技术研究所畜产品质量安全创新团队采用基于稳定同位素技术的多维溯源手段实现了我国不同产区的牛奶产地精准溯源，为应用稳定同位素技术进行农产品产地溯源提供了重要依据。相关研究成果发表在《食品化学（Food Chemistry）》等刊物上。据赵燕副研究员介绍，该团队通过测定牛奶中碳氮氢氧稳定同位素比值，溯源的养殖场最小距离可以缩短至0.7公里；团队还对我国牛奶主产区内蒙古自治区的5个城市的11个区的牛奶进行了产地溯源研究，发现将稳定同位素、矿物元素及氨基酸分析结合进行多维溯源是鉴别牛奶产地小区域范围的最佳选择，该技术方法为今后小规模区域食品的产地溯源提供了依据。该团队积极开展产地稳定同位素信息数据库构建及软件应用开发研究，完成了涵盖我国4大奶源带的牛奶稳定同位素数据测定，构建了我国首个最完整的牛奶稳定同位素数据库以及对应地区的饲料、饮水等稳定同位素数据库；从喂养方式、季节、泌乳期等角度研究了稳定同位素分馏机制。该研究体现了我国在畜产品稳定同位素溯源方面的领先地位，将极大推动我国农业领域稳定同位素溯源的研究进展，更好地服务农产品产地溯源的需求。该研究得到中国农业科学院科技创新工程、国家国际科技合作专项项目等资助。

链接:

http://agri.ckcest.cn/file1/M00/02/CF/Csgk0WCKXLmAby2LAAP2UpxB-6Q020.pdf