

《中文核心期刊要目总览》收录  
Ei Compendex(核心版)收录  
百种中国杰出学术期刊  
RCCSE中国权威学术期刊



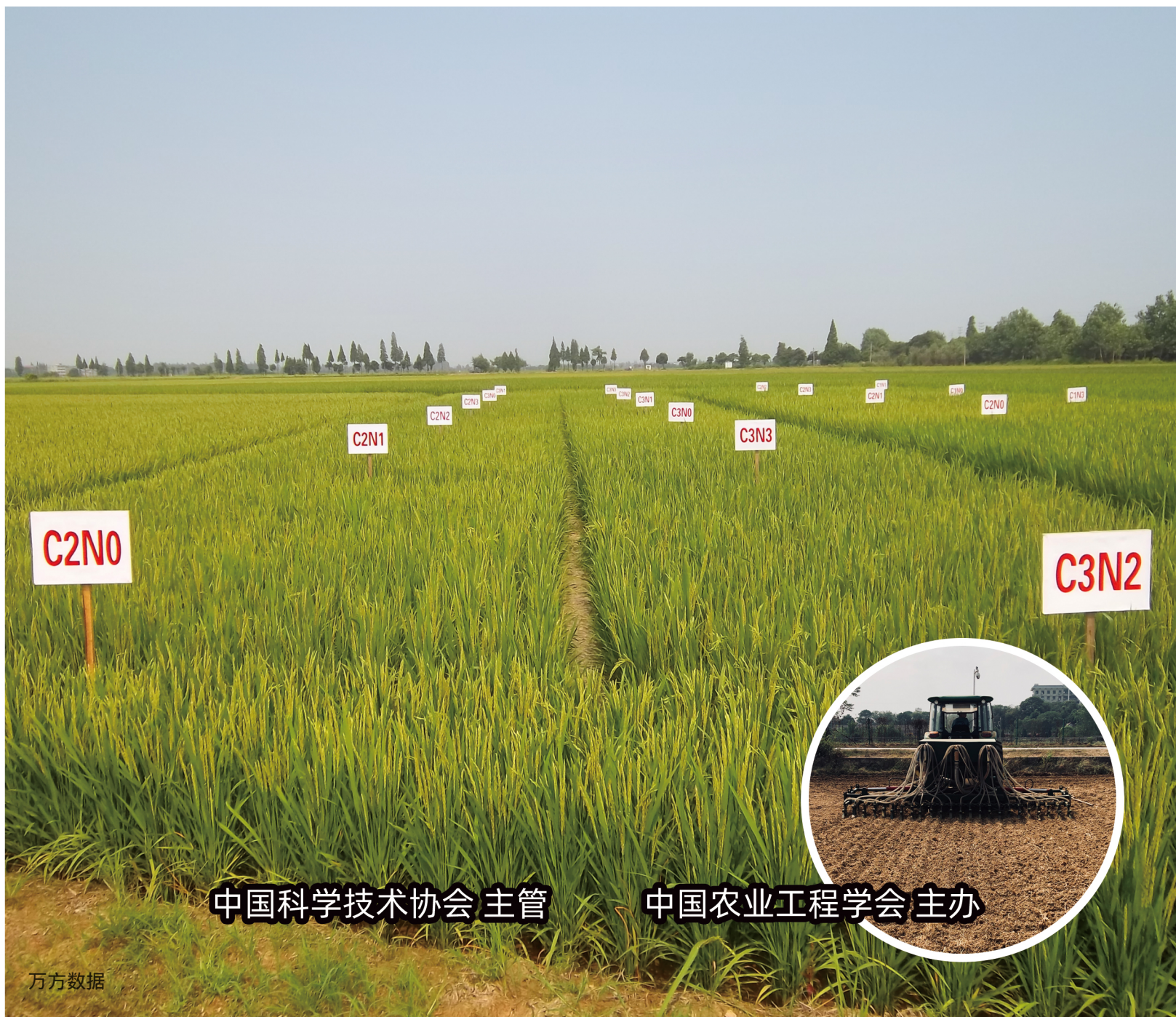
ISSN 1002-6819  
CN 11-2047/S  
CODEN NGOXEO  
www.tcsae.org

# 农业工程学报

NONGYE  
GONGCHENG  
XUEBAO

TRANSACTIONS OF THE CHINESE SOCIETY  
OF AGRICULTURAL ENGINEERING

2020年 10  
第36卷 VOL. 36



中国科学技术协会 主管

中国农业工程学会 主办

# 农业工程学报

2020 年 5 月第 10 期 总第 386 期 (第 36 卷)

## 目次

### • 农业装备工程与机械化 •

气吹集排式水稻旱直播机关键部件设计与试验

..... 戴亿政, 罗锡文, 张明华, 兰 峰, 周玉姣, 王在满 (1)

水稻精量穴直播机播量监测系统研制 ..... 王在满, 裴 娟, 何 杰, 张明华, 杨文武, 罗锡文 (9)

油菜精量直播机凸轮摇杆式播量调节机构设计与试验

..... 舒彩霞, 付云开, 王 磊, 廖宜涛, 席日晶, 廖庆喜 (17)

小麦联合收获机双出风口多风道清选作业试验

..... 金诚谦, 李庆伦, 倪有亮, 王廷恩, 印 祥 (26)

大豆联合收获机田间清选作业参数优化

..... 刘 鹏, 金诚谦, 刘 政, 张光跃, 蔡泽宇, 康 艳, 印 祥 (35)

番茄钵苗移栽机自动取苗装置作业参数优化与试验

..... 马晓晓, 李 华, 曹卫彬, 余思遥, 李树峰 (46)

摇枝式油茶果采摘装置作业过程分析与试验 ..... 伍德林, 李 超, 曹成茂, 范二波, 汪 奇 (56)

### • 农业航空工程 •

无人机多光谱遥感反演各生育期玉米根域土壤含水率

..... 谭丞轩, 张智韬, 许崇豪, 马 宇, 姚志华, 魏广飞, 李 宇 (63)

### • 农业水土工程 •

采用不同监测数据组合反演饱和均质石英砂水热运移参数

..... 潘梦绮, 黄权中, 冯 榕, 黄冠华 (75)

黄土高原生态工程区土壤容重及饱和导水率的分布特征 ..... 赵亚丽, 王云强, 张兴昌 (83)

PAM 喷施量与施用方式对风沙土风蚀的影响

..... 白岗栓, 罗 东, 苗庆丰, 周 楠, 杜社妮 (90)

基于 EPANET 的再生水滴灌系统余氯分布模型构建

..... 王 珍, 郝锋珍, 李久生, 栗岩峰 (99)

利用最小水分限制范围评价东北黑土区免耕和垄作的土壤水分稳定性

..... 刘淑珍, 高伟达, 任图生 (107)

河套灌区不同掺沙量对重度盐碱土壤水盐运移的影响

..... 周利颖, 李瑞平, 苗庆丰, 窦 旭, 田 峰, 于丹丹, 孙晨云 (116)

乌兰布和沙漠东北部不同下垫面的小气候变化特征

..... 罗凤敏, 高君亮, 辛智鸣, 郝玉光, 段瑞兵, 李新乐 (124)

多光谱遥感结合随机森林算法反演耕作土壤有机质含量

..... 刘焕军, 张美薇, 杨昊轩, 张新乐, 孟祥添, 李厚萱, 唐海涛 (134)

### • 农业信息与电气技术 •

基于作物生长监测诊断仪的双季稻叶面积指数监测模型

..... 李艳大, 孙滨峰, 曹中盛, 叶 春, 舒时富, 黄俊宝, 何 勇 (141)

农产品质量溯源 RFID 标签批量识别 ..... 王祖良, 郭建新, 张 婷, 李文臣, 曹闯乐, 于洪涛 (150)



面向渔业物联网的 GPS 相对定位策略 .....	曹守启, 禹 松, 张 铮 (158)
基于大数据的西藏荒漠化治理植物优选与验证 .....	柳平增, 王 雪, 宋成宝, 张 超, 奥宝平, 吕 涛, 张立欣 (166)
基于 U-Net 模型的含杂水稻籽粒图像分割 .....	陈 进, 韩梦娜, 练 毅, 张 帅 (174)
基于三维点云的甜菜根表型参数提取与根型判别 .....	柴宏红, 邵 科, 于 超, 邵金旺, 王瑞利, 随 洋, 白 凯, 刘云玲, 马韞韬 (181)
<b>• 农业生物环境与能源工程 •</b>	
基于温室环境和作物生长的番茄基质栽培灌溉模型 .....	徐立鸿, 肖康俊, 蔚瑞华 (189)
春秋季对近红外光谱模型预测奶牛场粪水氮磷含量结果的影响 .....	孙 迪, 杨仁杰, 李梦婷, 牟美睿, 李明堂, 张克强, 赵 润 (197)
舟山近海海域养殖水体悬浮物沉降特性试验研究 .....	桂福坤, 方 帅, 曲晓玉, 张清靖, 张学芬, 冯德军 (206)
<b>• 农业资源循环利用工程 •</b>	
基于微好氧同步预升温的序批式厌氧干发酵特性 .....	于佳动, 刘新鑫, 赵立欣, 冯 晶, 陈建坤, 郭占斌 (213)
在线旁路近红外实时监测粪污厌氧发酵挥发性脂肪酸含量 .....	梁 浩, 黄圆萍, 沈广辉, 韩鲁佳, 杨增玲 (220)
<b>• 土地保障与生态安全 •</b>	
基于地形改进 NPP 指数的县域耕地产能测算 .....	张金亭, 董艳超, 叶宗达 (227)
情景模拟下农民土地承包经营权退出决策及影响因素分析 .....	牛海鹏, 牛鹏程, 肖东洋 (235)
<b>• 农产品加工工程 •</b>	
含水率对小麦粮堆弹塑性力学特性的影响 .....	蒋敏敏, 陈桂香, 刘超赛, 刘文磊, 张志静 (245)
基于低场核磁共振的热风干燥猕猴桃切片含水率预测模型 .....	李 梁, 程秀峰, 杨尚雄, 罗 章, 刘振东 (252)
$\alpha$ 和 $\alpha'$ 亚基缺失对大豆分离蛋白乳化特性的影响 .....	孙 贺, 于寒松, 范宏亮, 付洪玲, 单单单, 吕 博, 宋 波, 刘珊珊 (261)
基于海藻酸钠与鸡蛋黄静电聚集作用的低脂蛋黄酱制备 .....	郭 绰, 郭玉蓉, 李安琪, 李晓飞, 李培源, 杨 曦 (269)
不同茶树品种 (系) 的绿茶滋味分析及评价模型构建 .....	马林龙, 刘艳丽, 曹 丹, 刘盼盼, 王胜鹏, 黄咏明, 金孝芳 (277)
足火工艺参数对工夫红茶热风干燥特性和品质的影响 .....	王近近, 袁海波, 滑金杰, 江用文, 董春旺, 邓余良, 杨艳芹 (287)
<b>• 专题论坛 •</b>	
中国粮食生产类家庭农场的适度经营规模研究 .....	辛良杰 (297)
中药材生产机械化的技术装备需求量化模型构建 .....	赵祖松颖, 郑志安, 黄璐琦 (307)
<b>• 研究速报 •</b>	
自动双环入渗仪设计与试验 .....	孙 权, 张建丰, 张 杰, 曾 辉, 胡克林, 刘 刚 (318)

**Transactions**  
**of the Chinese Society of Agricultural Engineering**  
**Vol.36 No.10 May 2020**  
**CONTENTS**

**• Agricultural Equipment Engineering and Mechanization •**

- Design and experiments of the key components for centralized pneumatic rice dry direct seeding machine  
..... *Dai Yizheng, Luo Xiwen, Zhang Minghua, Lan Feng, Zhou Yujiao, Wang Zaiman* (1)
- Development of the sowing rate monitoring system for precision rice hill-drop drilling machine  
..... *Wang Zaiman, Pei Juan, He Jie, Zhang Minghua, Yang Wenwu, Luo Xiwen* (9)
- Design and experiment of cam-rocker sowing rate adjusting mechanism for rapeseed precision direct seeding machine  
..... *Shu Caixia, Fu Yunkai, Wang Lei, Liao Yitao, Xi Rijing, Liao Qingxi* (17)
- Experimental study on double air outlet multi-ducts cleaning device of wheat combine harvester  
..... *Jin Chengqian, Li Qinglun, Ni Youliang, Wang Ting'en, Yin Xiang* (26)
- Optimization of field cleaning parameters of soybean combine harvester  
..... *Liu Peng, Jin Chengqian, Liu Zheng, Zhang Guangyue, Cai Zeyu, Kang Yan, Yin Xiang* (35)
- Optimization and experiment of working parameters of automatic seedling picking device for tomato seedlings transplanting  
..... *Ma Xiaoxiao, Li Hua, Cao Weibin, Yu Siyao, Li Shufeng* (46)
- Analysis and experiment of the operation process of branch-shaking type camellia oleifera fruit picking device  
..... *Wu Delin, Li Chao, Cao Chengmao, Fan Erbo, Wang Qi* (56)

**• Agricultural Aviation Engineering •**

- Soil water content inversion model in field maize root zone based on UAV multispectral remote sensing  
..... *Tan Chengxuan, Zhang Zhitao, Xu Chonghao, Ma Yu, Yao Zhihua, Wei Guangfei, Li Yu* (63)

**• Soil and Water Engineering •**

- Estimation of water and heat transfer parameters of saturated silica sand by using different types of data  
..... *Pan Mengqi, Huang Quanzhong, Feng Rong, Huang Guanhua* (75)
- Distribution characteristics of bulk density and saturated hydraulic conductivity in intensive land restoration project areas on the Loess Plateau ..... *Zhao Yali, Wang Yunqiang, Zhang Xingchang* (83)



Effects of spraying amounts and application methods of polyacrylamide (PAM) on aeolian sandy soil wind erosion	..... <i>Bai Gangshuan, Luo Dong, Miao Qingfeng, Zhou Nan, Du Shen</i> (90)
Modeling of the residual chlorine distribution in drip irrigation system applying reclaimed water based on EPANET	..... <i>Wang Zhen, Hao Fengzhen, Li Jiusheng, Li Yanfeng</i> (99)
Evaluating the stability of black soil water content in Northeast China under no tillage and ridge tillage using least limiting water range	..... <i>Liu Shuzhen, Gao Weida, Ren Tusheng</i> (107)
Effects of different sand ratios on infiltration and water-salt movement of heavy saline-alkali soil in Hetao irrigation area	..... <i>Zhou Liying, Li Ruiping, Miao Qingfeng, Dou Xu, Tian Feng, Yu Dandan, Sun Chenyun</i> (116)
Microclimate variations of different underlying surfaces in Northeastern Ulan Buh Desert in Inner Mongolia of China	..... <i>Luo Fengmin, Gao Junliang, Xin Zhiming, Hao Yuguang, Duan Ruibing, Li Xinle</i> (124)
Inversion of cultivated soil organic matter content combining multi-spectral remote sensing and random forest algorithm	..... <i>Liu Huanjun, Zhang Meiwei, Yang Haoxuan, Zhang Xinle, Meng Xiangtian, Li Houxuan, Tang Haitao</i> (134)

## • Agricultural Information and Electrical Technologies •

Model for monitoring leaf area index of double cropping rice based on crop growth monitoring and diagnosis apparatus	..... <i>Li Yanda, Sun Binfeng, Cao Zhongsheng, Ye Chun, Shu Shifu, Huang Junbao, He Yong</i> (141)
RFID batch-tag identification in quality traceability of agricultural products	..... <i>Wang Zuliang, Guo Jianxin, Zhang Ting, Li Wenchen, Cao Chuangle, Yu Hongtao</i> (150)
GPS relative positioning strategies for the fishery Internet of Things	..... <i>Cao Shouqi, Yu Song, Zhang Zheng</i> (158)
Optimal selection and verification of plant species for desertification control in Tibet based on big data	..... <i>Liu Pingzeng, Wang Xue, Song Chengbao, Zhang Chao, Ao Baoping, Lyu Tao, Zhang Lixin</i> (166)
Segmentation of impurity rice grain images based on U-Net model	..... <i>Chen Jin, Han Mengna, Lian Yi, Zhang Shuai</i> (174)
Extraction of phenotypic parameters and discrimination of beet root types based on 3D point cloud	..... <i>Chai Honghong, Shao Ke, Yu Chao, Shao Jinwang, Wang Ruili, Sui Yang, Bai Kai, Liu Yunling, Ma Yuntao</i> (181)

## • Agricultural Bioenvironmental and Energy Engineering •

Irrigation models for the tomatoes cultivated in organic substrate based on greenhouse environment and crop growth

.....*Xu Lihong, Xiao Kangjun, Wei Ruihua* (189)

Influences of spring and autumn on the nitrogen and phosphorus contents of the slurry predicted by near-infrared spectrum model on dairy farms

.....*Sun Di, Yang Renjie, Li Mengting, Mu Meirui, Li Mingtang, Zhang Keqiang, Zhao Run* (197)

Experimental study on settling characteristics of suspended solids in seawater of nearshore in Zhoushan of China

.....*Gui Fukun, Fang Shuai, Qu Xiaoyu, Zhang Qingjing, Zhang Xuefen, Feng Dejun* (206)

## • Agricultural Resource Recycling Engineering •

Characteristics of sequencing batch dry anaerobic fermentation with microaerobic preheating

.....*Yu Jiadong, Liu Xinxin, Zhao Lixin, Feng Jing, Chen Jiankun, Guo Zhanbin* (213)

Near-infrared real-time online bypass detection of volatile fatty acids in anaerobic fermentation of manure

.....*Liang Hao, Huang Yuanping, Shen Guanghui, Han Lujia, Yang Zengling* (220)

## • Land Security and Ecological Safety •

Calculation of county-level cultivated land productivity based on NPP index corrected by topography

.....*Zhang Jinting, Dong Yanchao, Ye Zongda* (227)

Decision-making of farmers to exit land contract management right and influencing factors under scenario simulation

.....*Niu Haipeng, Niu Pengcheng, Xiao Dongyang* (235)

## • Agricultural Produce Processing Engineering •

Effects of moisture content on elastic-plastic properties of bulk wheat

.....*Jiang Minmin, Chen Guixiang, Liu Chaosai, Liu Wenlei, Zhang Zhijing* (245)

Model for predicting the moisture content of kiwifruit slices during hot air drying based on low-field nuclear magnetic resonance

.....*Li Liang, Cheng Xiufeng, Yang Shangxiong, Luo Zhang, Liu Zhendong* (252)

Effects of the subunit-deficiency of  $\alpha$  and  $\alpha'$  on emulsifying properties of soy protein isolate

.....*Sun He, Yu Hansong, Fan Hongliang, Fu Hongling, Shan Dandan, Lyu Bo, Song Bo, Liu Shanshan* (261)

Preparation of low-fat mayonnaises based on electrostatic aggregation of alginate sodium and egg yolk

..... *Guo Chuo, Guo Yurong, Li Anqi, Li Xiaofei, Li Peiyuan, Yang Xi* (269)

Analysis and evaluation model for the taste quality of green tea made from various cultivars or strains

..... *Ma Linlong, Liu Yanli, Cao Dan, Liu Panpan, Wang Shengpeng, Huang Yongming, Jin Xiaofang* (277)

Effects of second-drying process parameters on the hot-air drying characteristics and quality of congou black tea

..... *Wang Jinjin, Yuan Haibo, Hua Jinjie, Jiang Yongwen, Dong Chunwang, Deng Yuliang, Yang Yanqin* (287)

### • Special Forum •

Moderate land scale of grain production family farms in China

..... *Xin Liangjie* (297)

Quantitative model for technology and equipment demanded for mechanization production of traditional Chinese medicine

..... *Zhao Zusongying, Zheng Zhian, Huang Luqi* (307)

### • Reseach Letters •

Design and experiment of automatic double-ring infiltrometer

..... *Sun Quan, Zhang Jianfeng, Zhang Jie, Zeng Hui, Hu Kelin, Liu Gang* (318)