

[1]秦鹏程,姚凤梅,曹秀霞,等.风险评估在气候变化对农业影响评价中的应用——研究进展[J].自然灾害学报,2012,01:39-46.

QIN Pengcheng, YAO Fengmei, CAO Xiuxia, et al. Application of risk assessment in evaluation of influence of climate change on agricultural production: review and prospect[J]., 2012, 01: 39-46.

点
击
复
制

风险评估在气候变化对农业影响评价中的应用——

《自然灾害学报》[ISSN:/CN:23-1324/X] 期数: 2012年01期 页码: 39-46 栏目: 出版日期: 1900-01-01

Title: Application of risk assessment in evaluation of influence of climate change on agricultural production: review and prospect

作者: 秦鹏程¹; 姚凤梅¹; 曹秀霞²; 张佳华³

1. 中国科学院研究生院 地球科学学院/中国科学院计算地球动力学重点实验室, 北京 100049;
2. 中国农业科学院棉花研究所, 河南 安阳 455004;
3. 中国气象科学研究院, 北京 100081

Author(s): QIN Pengcheng¹; YAO Fengmei¹; CAO Xiuxia²; ZHANG Jiahua³

1. College of Earth Science, Graduate University of Chinese Academy of Sciences/Key Laboratory of Computational Geodynamics, Chinese Academy of Sciences, Beijing 100049, China;
2. Institute of Cotton Research, Chinese Academy of Agricultural Sciences, Anyang 455004, China;
3. Chinese Academy of Meteorological Sciences, Beijing 100081, China

关键词: 气候变化; 农业影响; 风险评估

Keywords: climate change; impact on agriculture; risk assessment

分类号: P315.69

DOI: -

文献标识码: -

摘要: 基于风险理论,探讨了气候变化风险的内涵,介绍了可用于气候变化影响评价的风险评估概念框架,并着重总结了风险评估在气候变化对农业影响评价中的应用。随着目前概率型气候情景的广泛应用及利益相关者与公众对影响评估中的不确定性认识的需求,风险评估将在气候变化影响评价中得到更为广泛的应用,气候变化对农业的影响也有望基于风险形式实现终端至终端的评估。同时,当前气候变化农业影响的风险评估研究仍有诸多不足之处,真正实现综合全面的评估尚有诸多问题需要解决。

Abstract: Based on risk theory, this paper discusses the connotation of climate change risk, introduces the conceptual framework of risk assessment for climate change impacts, and specifically summarizes the application of risk assessment in climate change impacts on agricultural production. As ensemble modeling technology developed in climate modeling, climate projection community is now capable of producing probabilistic climate change information for impacts assessments, which can be directly fed into risk assessment. As a result, climate change impacts on agricultural production will realize an end-to-end impacts assessment

导航/NAVIGATE

[本期目录/Table of Contents](#)

[下一篇/Next Article](#)

[上一篇/Previous Article](#)

工具/TOOLS

[引用本文的文章/References](#)

[下载 PDF/Download PDF\(671KB\)](#)

[立即打印本文/Print Now](#)

[推荐给朋友/Recommend](#)

统计/STATISTICS

摘要浏览/Viewed 492

全文下载/Downloads 225

[评论/Comments](#)

XML

through a risk-based approach. There are, however, many challenges ahead in integrated assessment of climate change impacts on agricultural production.

参考文献/REFERENCES

- [1] Rosenzweig C, Phillips J, Goldberg R, et al. Potential impacts of climate change on citrus and potato production in the US[J]. *Agricultural Systems*, 1996,52(4): 455-479.
- [2] Lobell D B, Asner G P. Climate and management contributions to recent trends in US agricultural yields[J]. *Science*, 2003,299:1032-1032.
- [3] Kang Y, Khan S, Ma X. Climate change impacts on crop yield, crop water productivity and food security-a review[J]. *Progress in Natural Science*, 2009,19(12): 1665-1674.
- [4] 林而达, 许吟隆, 蒋金荷, 等. 气候变化国家评估报告(II):气候变化的影响与适应[J]. *气候变化研究进展*, 2006(2): 51-56. LIN Erda, XU Yinlong, JIANG Jinhe, et al. National assessment report of climate change (II): climate change impacts and adaptation [J]. *Advances in Climate Change Research*, 2006(2): 51-56.(in Chinese)
- [5] Yao F M, Xu Y L, Lin E D, et al. Assessing the impacts of climate change on rice yields in the main rice areas of China [J]. *Climatic Change*, 2007,80(3-4): 395-409.
- [6] Tao F, Zhang Z, Liu J, et al. Modelling the impacts of weather and climate variability on crop productivity over a large area: a new super-ensemble-based probabilistic projection[J]. *Agricultural and Forest Meteorology*, 2009,149(8): 1266-1278.
- [7] Xiong W, Matthews R, Holman I, et al. Modelling China' s potential maize production at regional scale under climate change[J]. *Climatic Change*, 2007,85(3/4): 433-451.
- [8] Alcamo J, Dronin N, Endejan M, et al. A new assessment of climate change impacts on food production shortfalls and water availability in Russia[J]. *Global Environmental Change-Human and Policy Dimensions*, 2007,17(3/4): 429-444.
- [9] New M, Hulme M. Representing uncertainty in climate change scenarios: a Monte-Carlo approach[J]. *Integrated Assessment*, 2000,1(3): 203-213.
- [10] Challinor A J, Wheeler T, Hemming D, et al. Ensemble yield simulations: crop and climate uncertainties, sensitivity to temperature and genotypic adaptation to climate change[J]. *Climate Research*, 2009,38(2): 117-127.
- [11] Lobell D B, Burke M B. Why are agricultural impacts of climate change so uncertain the importance of temperature relative to precipitation[J]. *Environmental Research Letters*, 2008,3(L034007).
- [12] Jones R N. Analysing the risk of climate change using an irrigation demand model[J]. *Climate Research*, 2000,14(2): 89-100.
- [13] Koubatis A, Schonberger J Y. Risk management of complex critical systems[J]. *International Journal of Critical Infrastructures*, 2005,1(2): 195-215.
- [14] IPCC. *Climate Change 2007: Impacts, Adaptation and Vulnerability—Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*[M]. Cambridge,UK: Cambridge University Press, 2007.
- [15] Stern N. *Stern Review:the Economics of Climate Change*[M]. Cambridge: Cambridge University Press, 2006.
- [16] Scholze M, Knorr W, Arnell N W, et al. A climate-change risk analysis for world ecosystems[J]. *Proceedings of the National Academy of Sciences of the United States of America*, 2006,103(35): 13116-13120.
- [17] Sharma D, Bharat A. Conceptualizing risk assessment framework for impacts of climate change on water resources [J]. *Current Science*, 2009,96(8): 1044-1052.
- [18] van Aalst M K, Cannon T, Burton I. Community level adaptation to climate change: the potential role of participatory community risk assessment[J]. *Global Environmental Change*, 2008,18(1): 165-179.
- [19] 王雪臣. 中国极端气候事件的风险分析及保险适应机制研究—以长江中游洪涝灾害为例[M]. 北京: 气象出版社, 2008. WANG Xuechen. *Risk Analysis of Extreme Climate Events in China and Research on Adaptive Insurance Mechanism*[M]. Beijing: China Meteorological Press, 2008.(in Chinese)
- [20] Pidgeon N, Butler C. Risk analysis and climate change[J]. *Environmental Politics*, 2009,18(5): 670-688.
- [21] Collins M. Ensembles and probabilities: a new era in the prediction of climate change[J]. *Philosophical Transactions of the Royal Society a-Mathematical Physical and Engineering Sciences*, 2007,365(1857): 1957-1970.
- [22] IPCC. *Climate Change 2001: Working Group II: Impacts, Adaptation and Vulnerability*[M]. Cambridge,UK: Cambridge University Press, 2001.
- [23] 张月鸿, 吴绍洪, 戴尔阜, 等. 气候变化风险的新型分类[J]. *地理研究*, 2008,27(4): 763-774. ZHANG Yuehong, WU Shaohong, DAI Erfu, et al. New classification method of climate change risks[J]. *Geographical Research*, 2008, 27(4): 763-774.(in Chinese)
- [24] 汪晶. 风险评价与风险管理的过去、现在与未来[J]. *卫生毒理学杂志*, 1999,13(1): 64-65. WANG Jing. Risk assessment and management: past, present, and future[J]. *Journal of Health Toxicology*, 1999,13(1): 64-65.(in Chinese)

- [25] 毛小琴, 刘阳生. 国内外环境风险评价研究进展[J]. 应用基础与工程科学学报, 2003,11(3): 266-273. (in Chinese)
- [26] 林玉锁. 国外环境风险评价的现状与趋势[J]. 环境科学动态, 1993(1): 8-10. LIN Yusuo. Environmental risk assessment: state and tendency of domestic and foreign researches[J]. Environmental Science Trends, 1993(1): 8-10. (in Chinese)
- [27] 杨梅英. 风险管理及保险原理[M]. 北京: 北京航空航天大学出版社, 1999. YANG Meiying. Introduction to Risk Management and Insurance[M]. Beijing: Beijing University of Aeronautics and Astronautics Press, 1999. (in Chinese)
- [28] 张继权, 李宁. 主要气象灾害风险评价与管理的数量化方法及其应用[M]. 北京: 北京师范大学出版社, 2007. ZHANG Jiquan, LI Ning. Quantitative Methods and Applications of Risk Assessment and Management on Main Meteorological[M]. Beijing: Beijing Normal University Press, 2007. (in Chinese)
- [29] 姜会飞, 霍治国, 潘学标, 等. 中国小麦生产的区域比较气候风险研究[J]. 自然灾害学报, 2006,15(3): 58-65. JIANG Huifei, HUO Zhiguo, PAN Xuebiao, et al. Regional comparison climate risk of wheat production in China[J]. Journal of Natural Disasters, 2006,15(3): 58-65. (in Chinese)
- [30] 薛昌颖, 霍治国, 李世奎, 等. 华北北部冬小麦干旱和产量灾损的风险评估[J]. 自然灾害学报, 2003,12(1): 131-139. XUE Changying, HUO Zhiguo, LI Shikui, et al. Risk assessment of drought and yield losses of winter wheat[J]. Journal of Natural Disasters, 2003,12(1): 131-139. (in Chinese)
- [31] 李世奎, 霍治国, 王素艳, 等. 农业气象灾害风险评估体系及模型研究[J]. 自然灾害学报, 2004,13(1): 77-87. LI Shikui, HUO Zhiguo, WANG Suyan, et al. Risk evaluation system and models of agrometeorological disasters[J]. Journal of Natural Disasters, 2004,13(1): 77-87. (in Chinese)
- [32] 方一平, 秦大河, 丁永建. 气候变化脆弱性及其国际研究进展[J]. 冰川冻土, 2009,31(3): 540-545. FANG Yiping, QIN dahe, DING Yongjian. Review of advance and orientation of vulnerability research[J]. Journal of Glaciology and Geocryology, 2009,31(3): 540-545. (in Chinese)
- [33] Shlyakhter A, James L, Valverde A, et al. Integrated risk analysis of global climate change[J]. Chemosphere, 1995,30(8): 1585-1618.
- [34] Bass B, Huang G H, Russo J. Incorporating climate change into risk assessment using grey mathematical programming[J]. Journal of Environmental Management, 1997,49(1): 107-123.
- [35] Svirezhev Y M, von Bloh W, Schellnhuber H J. Climate impact on social systems: the risk assessment approach [J]. Environmental Modeling and Assessment, 1999,4(4): 287-294.
- [36] Jones R N. An environmental risk assessment/management framework for climate change impact assessments[J]. Natural Hazards, 2001,23(2/3): 197-230.
- [37] Fenech A. Rapid Assessment of the Impacts of Climate Change (RAICC): An Integrated Approach to Understanding Climate Change in the Halton Region of Ontario, Canada. Toronto: University of Toronto, 2009.
- [38] 姚凤梅, 张佳华. 1981-2000年水稻生长季相对极端高温事件及其气候风险的变化[J]. 自然灾害学报, 2009,18(4): 37-42. YAO Fengmei, ZHANG Jiahua. Change of relative extreme high temperature events and climate risk in rice growing period in China from 1981 to 2000[J]. Journal of Natural Disasters, 2009,18(4): 37-42. (in Chinese)
- [39] 千怀遂, 任玉玉, 李明霞. 河南省棉花的气候风险研究[J]. 地理学报, 2006,61(3): 319-326. QIAN Huaisui, REN Yuyu, LI Mingxia. Changes of cotton climate risk degree in Henan Province[J]. Acta Geographica Sinica, 2006,61(3): 319-326. (in Chinese)
- [40] 孙宁, 冯利平. 利用冬小麦作物生长模型对产量气候风险的评估[J]. 农业工程学报, 2005,21(2): 106-110. SUN Ning, FENG Liping. Assessing the climatic risk to crop yield of winter wheat using crop growth models[J]. Transactions of the CSAE, 2005,21(2): 106-110. (in Chinese)
- [41] Andrés Ferreyra R, Podestá G P, Messina C D, et al. A linked-modeling framework to estimate maize production risk associated with ENSO-related climate variability in Argentina[J]. Agricultural and Forest Meteorology, 2001,107(3): 177-192.
- [42] IPCC. Climate change 2007: The Physical Science Basis—Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change[M]. Cambridge, UK: Cambridge University Press, 2007.
- [43] Jones R N, Mearns L. Assessing Future Climate Risk[M]// Lim B, Spanger-Siegfried E, Burton I, et al. Adaptation Policy Frameworks for Climate Change. Cambridge, UK: Cambridge University Press, 2005: 118-143.
- [44] Porter J R, Semenov M A. Crop responses to climatic variation[J]. Philosophical Transactions of the Royal Society B-Biological Sciences, 2005,360(1463): 2021-2035.
- [45] Tubiello F N, Soussana J F, Howden S M. Crop and pasture response to climate change[J]. Proceedings of the National Academy of Sciences of the United States of America, 2007,104(50): 19686-19690.
- [46] Li Y P, Ye W, Wang M, et al. Climate change and drought: a risk assessment of crop-yield impacts[J]. Climate Research, 2009,39(1): 31-46.
- [47] Hallegatte S. The use of synthetic hurricane tracks in risk analysis and climate change damage assessment[J].

Journal of Applied Meteorology and Climatology, 2007,46(11): 1956-1966.

[48] Tebaldi C, Hayhoe K, Arblaster J M, et al. Going to the extremes[J]. Climatic Change, 2006,79(3/4): 185-211.

[49] Hulme M, Brown O. Portraying climate scenario uncertainties in relation to tolerable regional climate change[J]. Climate Research, 1998,10(1): 1-14.

[50] Xiong W, Lin E D, Ju H, et al. Climate change and critical thresholds in China' s food security[J]. Climatic Change, 2007,81(2): 205-221.

[51] Naylor R L, Battisti D S, Vimont D J, et al. Assessing risks of climate variability and climate change for Indonesian rice agriculture[J]. Proceedings of the National Academy of Sciences of the United States of America, 2007,104(19): 7752-7757.

[52] Luo Q Y, Bellotti W, Williams M, et al. Potential impact of climate change on wheat yield in South Australia[J]. Agricultural and Forest Meteorology, 2005,132(3/4): 273-285.

[53] Luo Q Y, Bellotti W, Williams M, et al. Risk analysis of possible impacts of climate change on South Australian wheat production[J]. Climatic Change, 2007,85(1/2): 89-101.

[54] Luo Q Y, Jones R N, Williams M, et al. Probabilistic distributions of regional climate change and their application in risk analysis of wheat production[J]. Climate Research, 2005,29(1): 41-52.

[55] Parry M, Rosenzweig C, Livermore M. Climate change, global food supply and risk of hunger[J]. Philosophical Transactions of the Royal Society B-Biological Sciences, 2005,360(1463): 2125-2138.

[56] Palmer T N, Doblas-Reyes F J, Hagedorn R, et al. Probabilistic prediction of climate using multi-model ensembles: from basics to applications[J]. Philosophical Transactions of the Royal Society B-Biological Sciences, 2005,360(1463): 1991-1998.

[57] New M, Lopez A, Dessai S, et al. Challenges in using probabilistic climate change information for impact assessments: an example from the water sector[J]. Philosophical Transactions of the Royal Society a-Mathematical Physical and Engineering Sciences, 2007,365: 2117-2131.

[58] Masutomi Y, Takahashi K, Harasawa H, et al. Impact assessment of climate change on rice production in Asia in comprehensive consideration of process/parameter uncertainty in general circulation models[J]. Agriculture Ecosystems & Environment, 2009,131(3/4): 281-291.

[59] Yao F M, Qin P C, Zhang J H, et al. Uncertainties in assessing the effect of climate change on agriculture using model simulation and uncertainty processing methods[J]. Chinese Science Bulletin, 2011,56(8): 729-737.

[60] Katz R W. Techniques for estimating uncertainty in climate change scenarios and impact studies[J]. Climate Research, 2002,20(2): 167-185.

[61] 殷永元, 王桂新. 全球气候变化评估方法及其应用[M]. 北京: 高等教育出版社, 2004. YIN Yongyuan, WANG Guixin. Climate change impact assessment: methods and applications [M]. Beijing: Higher Education Press, 2004. (in Chinese)

备注/Memo: 收稿日期:2010-6-5;改回日期:2010-10-15。

基金项目:国家自然科学基金项目(40771147);全球变化研究国家重大科学研究计划项目(2010CB951302)

作者简介:秦鹏程(1986-),男,硕士研究生,主要从事气候变化及其影响研究. E-mail:qinpengcheng09@mails.gucas.ac.cn

通讯作者:姚凤梅(1968-),副教授. E-mail: yaofm@gucas.ac.cn
