Integrated evaluation of payments for ecosystem services programs in China: a systematic review

Wu Yang and Qiaoling Lu

College of Environmental and Resource Sciences, Zhejiang University, Hangzhou, China

ABSTRACT

Introduction: During the past two decades, payments for ecosystem services (PES) program has become a popular conservation paradigm for realigning socioeconomic costs and benefits among different stakeholders. As billions of investment flows into the natural capital pool, there is growing interest to understand the ecological, economic, and social outcomes of PES programs. China is one of the countries that extensively implements PES programs. Although there is a growing interest to perform impact evaluation of China’s massive PES programs, it is unclear that what existing literature has done, has not done, and should do in the future. Therefore, to guide further research and practices, we conduct a systematic review of studies on China’s PES programs.

Results: Our review shows that there are growing impact evaluation studies of PES programs in China. However, the spatial and ecosystem distributions of existing studies are quite uneven. Most case studies were poorly designed, rarely quantified, and evaluated without sophisticated methods. Among the three dimensions of ecological effectiveness, economic efficiency, and social equity, economic efficiency is the least studied.

Discussion and Conclusion: We further discuss the challenges and opportunities and provide insights for future research. To improve the understanding and management of natural capital, we call for mainstreaming impact evaluation of ecosystem service policies in China and beyond following the state-of-art procedures.

Introduction

During the past two decades, payments for ecosystem services (PES) program has become a popular conservation paradigm for realigning socioeconomic costs and benefits among different stakeholders. Globally, hundreds of PES programs have been designed and implemented from local, regional, to national scales (Farley and Costanza 2010; Yang et al. 2013a). As billions of investment flows into the natural capital pool, there is growing interest to understand the ecological, economic, and social outcomes of PES programs (Ferraro and Pattanayak 2006; Baylis et al. 2016; Ouyang et al. 2016).

In existing literature, there are scattered PES case studies that evaluate the ecological, economic, and social outcomes at various scales. For instance, early in 2006 in Costa Rica, Sierra and Russman (2006) found that PES program had limited immediate effects on forest ecosystem services. Sierra and Russman (2006) speculated that there might be a time lag before PES programs took effects. Later in 2014, in a rigorous national impact evaluation using long-term geographic and socioeconomic data, Ferraro and Hanauer (2014) confirmed that tourism explained two-thirds of the poverty reduction associated with the establishment of Costa Rican protected areas. While protected areas indeed reduced deforestation and promoted recovery, the associated land-cover change did not have a statistically significant effect on poverty. Wunsch, Engel, and Wunder (2008) criticized the lack of spatial differentiation in PES targeting and proposed an inverse auction approach for site selection to improve the economic efficiency of PES programs. According to their empirical analyses in Costa Rica, the best scenario of PES targeting can double the economic efficiency. In addition, Gross-Camp et al. (2012) focused on the legitimacy, fairness, and equity issues of PES programs. Their case study in the Nyungwe National Park in Rwanda suggested that the ecological effectiveness of studied PES program depended on the equitable distribution of payments, the legitimacy and fairness of institutions, participants’ belief and acceptance of the paid ecosystem services, as well as the complementary nature of PES to conventional enforcement methods.

China is one of the countries that extensively implements PES programs. In response to the severe drought in 1997 and devastating Yangtze River flood...
in 1998, China initiated two of the world’s largest PES programs – the Grain-to-Green Program (GTGP, also known as the Sloping Land Conversion Program) and the National Forest Conservation Program (NFCP). The GTGP and NFCP provide payments to local households and county governments or state-owned enterprises to motivate conservation behaviors, respectively. The main goal of GTGP was to reduce soil erosion through the conversion of sloping croplands to forests and grasslands. By 2014, 28.6 million ha of croplands involving more than 120 million farmers were enrolled in GTGP (SFA 2014). The main aim of NFCP was to protect and restore natural forests through logging bans and afforestation. By 2014, NFCP afforested 15.5 million ha of forests through aerial seeding, artificial planting, and mountain closure (SFA 2014). Besides the GTGP and NFCP, there are also many other different PES programs implemented in China across scales. These programs include the National Ecological Transfer Program (Liu 2015), Grassland Eco-compensation Program (Rong, Yuan, and Ma 2014; Zhang 2016), Wetland Restoration Program (Fu and Lin 2009; Lu and He 2014), Beijing–Tianjin Sandstorm Control Program (Yan et al. 2014), Beijing–Hebei Paddy Land to Dry Land Program (Zheng et al. 2013), Xin’anjiang Watershed Eco-compensation Program (Ma and Du 2015), and so on.

China’s massive implementation of PES programs also attracts more and more attention to their ecological, economic, and social performance. For example, Uchida, Xu, and Rozelle (2005) conducted a cost-effectiveness analysis in Ningxia and Guizhou Provinces. Their results suggested that the cost-effectiveness of GTGP could be moderately improved by replacing the uniform payment rate to a flexible rate based on actual opportunity costs and ecological benefits of each plot. Zheng et al. (2013) quantified the costs and benefits of both service providers and beneficiaries in the Paddy Land to Dry Land program. Their results showed that the PES program achieved unusual win-win outcomes with 5% short-term increase in water provision to the downstream and 50% of increase in household income in the upstream. Li et al. (2011) found that GTGP in Zhouzhi County, Shaanxi Province significantly contributed to the increase of household income and reduction in income inequity for households who participated in GTGP than those who did not. Viña et al. (2013) suggested that the economic efficiency of GTGP in Baoxing County, Sichuan Province could have doubled if the targeting approach was used for cropland selection. Yang et al. (2013a) conducted an integrated assessment of NFCP at Wolong Nature Reserve, Sichuan Province. Their analyses showed that NFCP had an overall positive effect on forest recovery but mixed effects on economic and social activities. Ouyang et al. (2016) reported the results of China’s first National Ecosystem Assessment between 2000 and 2010. Their results showed an overall trend of ecosystem service recovery from natural capital investment via a series of conservation policies including NFCP, GTGP, and so forth.

Although there is a growing interest to perform impact evaluation of China’s massive PES programs, it is unclear that what existing literature has done, has not done, and should do in the future. In particular, there has long been a concern whether PES programs are sustainable in the long run. Some scholars speculated that massive implementation of PES programs might not achieve their claimed ecological outcomes (Cao 2008; Zhai et al. 2014); another group of scholars suggested that there is a large room to improve the economic efficiency of implemented PES programs (Viña et al. 2013, Chen et al. 2010; Uchida, Xu, and Rozelle 2005); others argued that the benefits of PES programs are not distributed equally across different stakeholders (Liu et al. 2012, Gross-Camp et al. 2012, Li et al. 2011). From our point of view, if a PES program were to be sustainable in the long run, it needs to satisfy all the three criteria: ecologically effective, economically efficient, and socially equal. In addition, a group of mainstream scholars on impact evaluation recently have stated that many existing impact evaluation literatures do not meet the basic standards of study design and evaluation method, which largely attenuate the credibility of assessment results (Baylis et al. 2016). Therefore, to guide further research and practices, we conduct a systematic review of studies on China’s PES programs. We attempt to cover case studies investigating any of the three dimensions of outcomes – ecological effectiveness, economic efficiency, and social equity (3E). Our objectives are (1) to display the temporal trend and spatial distribution of existing literature on the impact evaluation of ecosystem service policies in China; (2) to synthesize the study design, evaluation methods, and ecological, economic, and social outcomes of existing case studies; and (3) to highlight some important challenges and gaps for the integrated monitoring and evaluation of ecosystem service policies in China and beyond.

Materials and methods

We conducted a comprehensive search of the Web of Science and the China National Knowledge Infrastructure (CNKI) databases (Figure 1). In the Web of Science database, our search strategies were: TS = (compensation* OR polic* OR payment*) AND (ecosystem service* OR ecological service* OR environmental service*) AND
China National Knowledge Infrastructure:
- Search strategy 1 (n=5739)
- Search strategy 2 (n=1176)
Web of Science:
- Search strategy 3 (n=384)

Figure 1. Procedures for literature selection. ①: Full text = (“payments for ecosystem services” and “case study”); ②: Themes = (“payments for ecosystem services” and “case study”) or Themes = (“payments for ecosystem services” and “case”). ③: TS = ((compensation* OR polic* OR payment*) AND (“ecosystem service*” OR “ecological service*” OR “environmental service*”)) AND (China)) and the indexes were SCI-EXPANDED, SSCI, and A&HCI. In both databases, the document type was “Article,” and deadline of search was December 2016. ④: This criterion means that case studies must at least empirically evaluate one dimension of the ecological effectiveness, economic efficiency, and social equity.

Results
Temporal trend and spatial distribution

Figure 2 shows that overall case studies on PES program assessment are increasing across years, although the trend is fluctuating from one year to another. According to our selection criteria, the earliest quantitative case was a forest recovery program in 2004 (Zhi et al. 2004). Meanwhile, forest programs dominated the literature pool (62%), followed by wetland (19%), grassland (17%), and farmland (2%). In addition, among the forest programs, except some cases like ecological forest program in Beijing (Mi et al. 2007), new soil and water conservation project in Fujian (Cao et al. 2009), and ecological forest program in Zhejiang (Zhou and Sheng 2009), 84.4% of cases were GTGP and NFCP. Only three cases of farmland PES programs were recorded, including two qualitative studies. Deng, Xiao, and Yan (2015) conducted a quantitative research on the performance of PES for green agriculture production. This case also involved a lake restoration project, and thus, we counted it as a wetland PES case as well. Nevertheless, in the later analysis, we only counted it as a wetland case because only this article mentioned farmland among the quantitative cases.

Figure 3 maps the spatial distribution of both quantitative and qualitative case studies. Provinces with the largest amount of studies were Shaanxi, Sichuan, Inner Mongolia, Yunnan, and Gansu. Except that Inner Mongolia is famous for its grassland ecosystems, all other dominated provinces are biodiversity hotspots. In particular, Shaanxi, Sichuan, and Gansu provinces are the only places with wild giant panda population. In contrast, wetland cases were scattered across provinces, such as watershed PES programs between Zhejiang and Anhui (Ma and Du 2015), as well as...
between Beijing and Hebei (Zheng et al. 2013), the farmland to lake program in Jiangxi (Huang, Shao, and Liu 2012), and the reservoir protection program in Liaoning (Wang and Wang 2016).

Study design and quantification level of existing case studies

According to our statistics, none of the existing case studies implemented an experimental design and only 27 cases adopted the quasi-experimental design. Seventy-eight cases utilized the nonexperimental design. In these 78 cases, the policy effect was reflected by the arithmetic difference of outcome indicators between the post- and pre-policy implementation, without considering the control group, confounding factors, and other control variables.

Figure 4 reflects the quantification level of the sorted 105 case studies. Our results show that 27 cases mentioned all the 3 aspects of 3E, while only 16 of them quantified the 3E. Thirty-one cases mentioned 2 aspects of 3E but only 10 of them quantified the 2E. The remaining 38 cases mentioned and quantified 1E (Figure 4(a)). If sorted by each aspect of 3E, 61, 28, and 55 cases quantified the effectiveness, efficiency, and equity, respectively (Figure 4(b)). Nevertheless, our statistics also show that only 22 of the 61 quantitative cases on effectiveness, 9 of the 28 quantitative
cases on efficiency, and 24 of the 55 quantitative cases on equity conducted rigorous statistical analyses.

**Evaluation results of 3E**

Figure 5 shows the evaluation results by different aspects of 3E. For effectiveness, 78.8%, 11.8%, and 9.4% of cases suggested positive, mixed, and negative outcomes, respectively. For efficiency, 54.5%, 27.3%, and 18.2% of cases suggested high efficiency, low efficiency, and inefficiency outcomes, respectively. For equity, the distribution of different outcomes was more even, with 35.4% of positive, 41.5% of mixed, and 23.2% of negative outcomes, respectively.

Figure 5(b) illustrates the evaluation results by different types of ecosystem and different aspects of 3E. Wetland PES programs reported the highest effectiveness, followed by forest and grassland PES programs. Except wetland PES programs, both forest and grassland PES programs still have a large potential for efficiency improvement. Equity appeared to be the biggest challenge as none of the three main ecosystem types of PES programs showed a high percentage of positive outcomes.

**Discussion**

Our review shows that there is a growing interest to assess the outcomes of PES programs in China. However, the spatial and ecosystem distributions of existing studies are quite uneven. Many case studies were poorly designed, rarely quantified, and evaluated without sophisticated methods. In addition, among the three dimensions of 3E, economic efficiency is the least studied. Here, we discuss the challenges and opportunities and provide insights for future research.

First, there is a spatial mismatch between the distribution of key ecosystem services in China and existing PES studies. Existing studies concentrate on part of the biodiversity hotspots, especially giant panda reserves in China. This is because protected areas in China (also named nature reserves) were initially established to protect endangered species particularly the icon species of giant panda (Loucks et al. 2001). Decision makers instinctively set these nature reserves as priority areas for the implementation of ecosystem service policies (e.g., NFCP, GTGP) since the late 1990s. However, the latest national assessment shows that China’s nature reserve network has a relatively low coverage of both its biodiversity and ecosystem services (Xu et al. 2017). China’s nature reserve network enclosed 15.1% of its land surface. Meanwhile, it protects 17.9% habitat for threatened mammals, 16.4% for threatened birds, but only 13.1% for threatened plants, 10.0% for threatened amphibians, and 8.5% for threatened reptiles. Nevertheless, it only encompasses 10.2–12.5% of its key regulating services such as water retention, soil retention, sandstorm prevention, and carbon sequestration (Xu et al. 2017). Therefore, future ecosystem service policies and research needs to pay more attention to understudied places with important ecosystem services such as Heilongjiang and Jilin Provinces in the northeast, Xinjiang and Qinghai Provinces in the northwest, and Fujian and Guangdong Provinces in the south (Figure 3). In addition, while 69% of existing studies congested on forest ecosystems, future research should focus on grassland and wetland ecosystems. In particular, there are too few case studies on coastal and marine ecosystems.

Second, it is a promising sign that policy makers and researchers become more and more interested in impact evaluation of China’s ecosystem service policies; however, there is still a long way to establish and adopt the state-of-art evaluation design and sophisticated methods and to quantify the causal mechanisms. Most (74%) of the reviewed cases even did not meet the basic standards for an impact evaluation, including the consideration of control groups, pre-
and postconditions, confounding factors, and rival hypotheses (Baylis et al. 2016). Moreover, none of the analyzed studies quantified spillover effects, although we know the fact that benefits of many ecosystem services (e.g., water regulation, air purification) go beyond the corresponding policy boundaries (Liu, Yang, and Li 2016). Therefore, to rigorously assess the environmental, economic, and social outcomes of PES policies and scientifically guide future decision-making, it is crucial to take a holistic approach accounting for all the 3E dimensions, promote the experimental or quasi-experimental design, include control groups, incorporate confounding factors, consider spillover effects, and systematically rule out rival hypotheses (Nolte et al. 2013; Ferraro and Hanauer 2014).

Third, the impacts of ecosystem service policies may differ across time, space, and social groups. It often needs to compare the trade-offs between short-term and long-term impacts. Ecological and socio-economic processes occur at multiple scales and any single scale may fail to capture certain dynamics and impacts. Therefore, it is necessary to compare policy effects at multiple scales or construct multi-level or hierarchical models for analyses (Agarwal et al. 2005; Yang et al. 2013b). In addition, the costs and benefits of ecosystem service policies often differ across various social groups or stakeholders. To sustain the long-term implementation of ecosystem service policies, a relatively equal distribution mechanism of costs and benefits is essential.

Finally, it is important to evaluate how ecosystem service policies have affected environmental, economic, and social outcomes in the past; however, to guide the revision of existing policies or create new policies for ecosystem management, it is also important to predict environmental, economic, and social outcomes in the future. Decision makers are often less interested in what have already happened and more willing to know pragmatic solutions toward a more promising future. Therefore, prospective studies (De Leo and Micheli 2015; Visconti et al. 2015) would help decision makers envision the environmental, economic, and social outcomes under different policy scenarios. Such

Figure 5. Results of impact evaluation by the three different dimensions. For the dimensions of effectiveness and equity, positive denotes that the results of the assessments are positive; mixed denotes that the evaluations include both positive and negative outcomes; negative denotes that the evaluation outcomes are negative. For the efficiency dimension, positive denotes that the results of the assessments are of high efficiency; in other words, the researchers claimed positive policy impacts on local economics, or the rate of return on investment was greater than one; mixed denotes that the policy outcomes are of low efficiency, that is, the researchers suggested more efficient policy implementation measures, or the rate of return on investment was between zero and one; negative denotes that the policy leads to negative ecological outcome and is also economically inefficient.
prospective studies usually require the construction of complex system models, such as spatially explicit agent-based models (Polasky et al. 2008; An et al. 2014), to simulate dynamic human–nature interactions under various policy scenarios in heterogeneous contexts over time and across space. To date, there have been relatively few such case studies in China. Therefore, there is a crucial need to fill such research gaps in future.

Disclosure statement
No potential conflict of interest was reported by the authors.

Funding
This work was supported by the Ministry of Science and Technology of China: [Grant Number 2016YFC0503404], National Natural Science Foundation of China: [Grant Number 71673247], Outstanding Youth Fund of Zhejiang Province: [Grant Number LR18D010001], Fundamental Research Funds for the Central Universities: [Grant Number 2017QNA6010], National 1000-Talent Plan for Young Professionals, and Zhejiang University’s 100-Talent Plan.

Author contributions
W.Y. designed the research; Q.L. collected and compiled the data and conducted the analysis; W.Y. and Q.L. wrote the first draft and revised the manuscript together. The authors declare no competing financial interests.

References
Agarwal, D. K., J. A. Silander Jr., A. E. Gelfand, R. E. Dewar, J. G. Mickelson Jr., and P. R. Ehrlich. 2005. “Tropical Deforestation in Madagascar: Analysis Using Hierarchical, Spatially Explicit, Bayesian Regression Models.” Ecological Modelling 185: 105–131. doi:10.1016/j.ecolmodel.2004.11.023.

An, L., A. Zvoleff, J. G. Liu, and W. Axinn. 2014. “Agent-Based Modeling in Coupled Human and Natural Systems (CHANS): Lessons from a Comparative Analysis.” Annals of the Association of American Geographers 104: 723–745. doi:10.1080/000445608.2014.910085.

Baylis, K., J. Honey-Rosés, J. Börner, E. Corbera, D. Ezzine-de-Blas, P. Ferraro, R. Lapeyre, U. M. Persson, A. Pfaff, and S. Wunder. 2016. “Mainstreaming Impact Evaluation in Nature Conservation.” Conservation Letters 9: 58–64. doi:10.1111/conl.12180.

Cao, S. X. 2008. “Why Large-Scale Afforestation Efforts in China Have Failed to Solve the Desertification Problem.” Environmental Science & Technology 42: 1826–1831. doi:10.1021/es070597h.

Cao, S. X., B. L. Zhong, H. Yue, H. S. Zeng, and J. H. Zeng. 2009. “Development and Testing of a Sustainable Environmental Restoration Policy on Eradicating the Poverty Trap in China’s Changing County.” Proceedings of the National Academy of Sciences of the United States of America 106: 10712–10716. doi:10.1073/pnas.0900197106.

Chen, X. D., F. Lupi, A. Vina, G. M. He, and J. G. Liu. 2010. “Using Cost-Effective Targeting to Enhance the Efficiency of Conservation Investments in Payments for Ecosystem Services.” Conservation Biology 24: 1469–1478. doi:10.1111/j.1523-1739.2010.01551.x.

De Leo, G. A., and F. Micheli. 2015. “The Good, the Bad and the Ugly of Marine Reserves for Fishery Yields.” Philosophical Transactions of the Royal Society B-Biological Sciences 370: 20140276. doi:10.1098/rstb.2014.0276.

Deng, Y. J., R. Xiao, and L. D. Yan. 2015. “Research on the Evaluation of Ecological Compensation Policies of Green Agricultural Producing Areas: A Case in Dongxihu District in Wuhan.” China Population, Resources and Environment 25: 120–126.

Farley, J., and R. Costanza. 2010. “Payments for Ecosystem Services: From Local to Global.” Ecological Economics 69: 2060–2068. doi:10.1016/j.ecolecon.2010.06.010.

Ferraro, P. J., and M. M. Hanauer. 2014. “Quantifying Causal Mechanisms to Determine How Protected Areas Affect Poverty through Changes in Ecosystem Services and Infrastructure.” Proceedings of the National Academy of Sciences of the United States 111: 4332–4337. doi:10.1073/pnas.1307712111.

Ferraro, P. J., and S. K. Pattanayak. 2006. “Money for Nothing? A Call for Empirical Evaluation of Biodiversity Conservation Investments.” PLoS Biology 4: e105. doi:10.1371/journal.pbio.0040105.

Fu, C., and Y. Q. Lin. 2009. “On Livelihood Assets of Immigrants of the Returning Farmland to Lake in Poyang Lake Region.” Journal of Nanchang University 40: 77–82.

Gross-Camp, N. D., A. Martin, S. McGuire, B. Kebede, and J. Munyarukaza. 2012. “Payments for Ecosystem Services in an African Protected Area: Exploring Issues of Legitimacy, Fairness, Equity and Effectiveness.” Oryx 46: 24–33. doi:10.1017/S0030605311001372.

Huang, L., Q. Shao, and J. Liu. 2012. “Forest Restoration to Achieve Both Ecological and Economic Progress, Poyang Lake Basin, China.” Ecological Engineering 44: 53–60. doi:10.1016/j.ecoleng.2012.03.007.

Li, J., M. W. Feldman, S. Li, and G. C. Daily. 2011. “Rural Household Income and Inequality under the Sloping Land Conversion Program in Western China.” Proceedings of the National Academy of Sciences of the United States of America 108: 7721–7726. doi:10.1073/pnas.1101018108.

Liu, J. 2015. “On the Incentive Effect of Ecological Transfer Payments on Environment Governance of Local Governments: Evidence from 46 Eastern Prefecture-Level Cities.” Journal of Finance and Economics 02: 54–65. doi:10.12735/jfe.v2i2p54.

Liu, J., W. Yang, and S. Li. 2016. “Framing Ecosystem Services in the Telecoupled Anthropocene.” Frontiers in Ecology and the Environment 14: 27–36. doi:10.1002/16-0188.1.

Liu, W., C. A. Vogt, J. Luo, G. He, K. A. Frank, and J. Liu. 2012. “Drivers and Socioeconomic Impacts of Tourism Participation in Protected Areas.” Plos One 7: e35420. doi:10.1371/journal.pone.0035420.

Loucks, C. J., Z. Lu, E. Dinerstein, H. Wang, D. M. Olson, C. Zhu, and D. Wang. 2001. “Giant Pandas in a Changing Landscape.” Science 294: 1465. doi:10.1126/science.1064710.

Lu, Y., and T. He. 2014. “Assessing the Effects of Regional Payment for Watershed Services Program on Water Quality Using an Intervention Analysis Model.” Science
of the Total Environment 493: 1056–1064. doi:10.1016/j.scitotenv.2014.06.096.

Ma, Q. H., and P. F. Du. 2015. “Evaluation on the Effect of Ecological Compensation in Xin’an River Basin.” *Chinese Journal of Environmental Management* 3: 63–70.

Mi, L., F. Gao, Y. M. Cui, and X. Y. Cui. 2007. “The Problems and Suggestions of the Policy of the Ecological Forest Compensation in Implementation in Beijing Mountainous Area.” *Forestry Economics* 11: 52–55.

Nolte, C., A. Agrawal, K. M. Silvius, and B. S. Soares-Filho. 2013. “Governance Regime and Location Influence Avoided Deforestation Success of Protected Areas in the Brazilian Amazon.” *Proceedings of the National Academy of Sciences* 110: 4956–4961. doi:10.1073/pnas.1214786110.

Ouyang, Z., H. Zheng, Y. Xiao, S. Polasky, J. Liu, W. Xu, Q. Wang, et al. 2016. “Improvements in Ecosystem Services from Investments in Natural Capital.” *Science* 352: 1455–1459. doi:10.1126/science.aaf2295.

Polasky, S., E. Nelson, J. Camm, B. Cauti, P. Fackler, E. Lonsdorf, C. Montgomery, et al. 2008. “Where to Put Things? Spatial Land Management to Sustain Biodiversity and Economic Returns.” *Biological Conservation* 141: 1505–1524. doi:10.1016/j.biocon.2008.03.022.

Rong, Y., F. Yuan, and L. Ma. 2014. “Effectiveness of Enclosures for Restoring Soils and Vegetation Degraded by Overgrazing in the Junggar Basin, China.” *Grassland Science* 60: 118–124.

SFA. 2014. *Analysis Report of 2014 National Forestry Statistical Report.* Beijing: State Forestry Administration.

Sierra, R., and E. Russman. 2006. “On the Efficiency of Environmental Service Payments: A Forest Conservation Assessment in the Osa Peninsula, Costa Rica.” *Ecological Economics* 59: 131–141. doi:10.1016/j.ecolono.2005.10.010.

Uchida, E., J. T. Xu, and S. Rozelle. 2005. “Grain for Green: Cost-Effectiveness and Sustainability of China’s Conservation Set-Aside Program.” *Land Economics* 81: 247–264. doi:10.3368/le.81.2.247.

Viña, A., X. Chen, W. Yang, W. Liu, Y. Li, Z. Ouyang, and J. Liu. 2013. “Improving the Efficiency of Conservation Policies with the Use of Surrogates Derived from Remotely Sensed and Ancillary Data.” *Ecological Indicators* 26: 103–111. doi:10.1016/j.ecolind.2012.10.020.

Visconti, P., M. Bakkenes, R. J. Smith, L. Joppa, and R. E. Sykes. 2015. “Socio-Economic and Ecological Impacts of Global Protected Area Expansion Plans.” *Philosophical Transactions of the Royal Society B-Biological Sciences* 370: 20140284. doi:10.1098/rstb.2014.0284.

Wang, Y., and Z. Z. Wang. 2016. “On the Ecological Compensation Policy of the Water Conservation District: A Case Study of Dahuofang Reservoir.” *Journal of Liaoning University (Philosophy and Social Sciences)* 44: 36–40.

Wunscher, T., S. Engel, and S. Wunder. 2008. “Spatial Targeting of Payments for Environmental Services: A Tool for Boosting Conservation Benefits.” *Ecological Economics* 65: 822–833. doi:10.1016/j.ecolecon.2007.11.014.

Xu, W. H., Y. Xiao, J. J. Zhang, W. Yang, L. Zhang, V. Hull, Z. Wang, et al. 2017. “Strengthening Protected Areas for Biodiversity and Ecosystem Services in China.” *Proceedings of the National Academy of Sciences of the United States of America* 114: 1601–1606. doi:10.1073/pnas.1620503114.

Yan, E., H. Lin, Y. Dang, and C. Xia. 2014. “The Spatiotemporal Changes of Vegetation Cover in Beijing-Tianjin Sandstorm Source Control Region during 20002012.” *Acta Ecologica Sinica* 34: 5007–5020.

Yang, W., W. Liu, A. Viña, J. Luo, G. He, Z. Ouyang, and J. Liu. 2013a. “Performance and Prospects on Payments for Ecosystem Services Programs: Evidence from China.” *Journal of Environmental Management* 127: 86–95. doi:10.1016/j.jenvman.2013.04.019.

Yang, W., W. Liu, A. Viña, M. Tuanmu, G. He, T. Dietz, and J. Liu. 2013b. “Nonlinear Effects of Group Size on Collective Action and Resource Outcomes.” *Proceedings of the National Academy of Sciences, USA* 110: 10916–10921. doi:10.1073/pnas.1301733110.

Zhai, D. L., J. C. Xu, Z. C. Dai, C. H. Cannon, and R. E. Grumbine. 2014. “Increasing Tree Cover while Losing Diverse Natural Forests in Tropical Hainan, China.” *Regional Environmental Change* 14: 611–621. doi:10.1007/s10113-013-0512-9.

Zhang, Q. 2016. “Economic Incentive Effect Analysis of Grassland Ecological Subsidy Award Mechanism.” *Gansu Social Sciences* 5: 234–238.

Zheng, H., B. E. Robinson, Y.-C. Liang, S. Polasky, D.-C. Ma, F.-C. Wang, M. Ruckelshaus, Z.-Y. Ouyang, and G. C. Daily. 2013. “Benefits, Costs, and Livelihood Implications of a Regional Payment for Ecosystem Service Program.” *Proceedings of the National Academy of Sciences of the United States of America* 110: 16681–16686. doi:10.1073/pnas.1312324110.

Zhi, L., N. Y. Li, Z. W. Tian, J. Wang, and D. Y. Lin. 2004. “Evaluation of Social Impacts of the Project of Converging Cropland to Forestland in the Western China: Taking Huize County and Qingzheng as Examples.” *Scientia Silvae Sinicae* 40: 2–11.

Zhou, Z. G., and P. P. Sheng. 2008. “Countermeasures for Construction and Development of Key Ecological Forest in Zhejiang.” *Journal of Zhejiang for Science and Technology* 28: 80–85.
Appendix A.

1. Zhi, L., N. Y. Li, Z. W. Tian, J. Wang, and D. Y. Lin. 2004. Evaluation of Social Impacts of the Project of Converting Cropland to Forestland in the Western China: Taking Huize County and Qingzhou as Examples. Scientia Silvae Sinicae 40: 2–11.

2. Weyerhaeuser, H., A. Wilkes, and F. Kahl. 2005. Local impacts and responses to regional forest conservation and rehabilitation programs in China's northwest Yunnan province. Agricultural Systems 85: 234–253. doi:10.1016/j.agsy.2005.06.008.

3. Guo, X. M., Z. Y. Gan, C. Z. Li, and H. Luo. 2005. Problems, reasons and policy suggestions of sloping land conversion program: Investigation in Tianquan County of Sichuan Province in 100 forest farmers. China Rural Observation 3: 72–79.

4. Chen, Y. Q., L. M. Liu, M. Lai, and J. L. Li. 2006. The Research on the Policy System of Cropland Conversion Program: A Case Study at Wuchuan County. Research of Soil and Water Conservation 13: 120–122 + 125.

5. Ma, Z. Y., N. P. Song, and Y. Guo. 2006. Detailed research on the Chinese policy of reverting cultivated land to forests. Social Sciences in Ningxia 4: 61–65.

6. Niu, D. W., Y. P. Bai, J. D. Wu, and M. J. Zhang. 2006. The Current Ecological Compensation Situation and the Problems Analysis of Ecological Construction in Central Area of Gansu Province: Taking Converting Farmland to Forest or Grass in An’ning District of Dingxi City as the Example. Ecological Economy 2: 23–27.

7. Wang, Q. O. 2006. On the compensation mechanism after grazing forbidden: A discussion. Pratacultural Science 23: 73–77.

8. Yang, X. J., K. Chen, J. T. Xu, and J. X. Wang. 2006. Empirical Analyses on the Economic Sustainability of Forest Restoration: A Case Study in Shaanxi. Ecological Economy 5: 36–38 + 41.

9. Chen, H., S. H. Liu, and J. P. Yang. 2007a. Preliminary Analysis on Issues Existing in Policies of Ecological Compensation in Forest Rehabilitation from Slope Agriculture: A Case Study on Zima Township of Qinglong County in Guizhou. Forest Inventory and Planning 32: 88–92.

10. Chen, K., Q. P. Wang, and X. J. Yang. 2007b. Experimental Analyses of Returning Farmland to Forest Follow-up Industry Economic Sustainability. Problems of Forestry Economics 27: 238–242.

11. Guo, X. M., and M. Pang. 2007. Performance judgment of the Sloping Land Conversion Program and thinking of following policy design: An Empirical Analysis from Sichuan Province. Research on Development 4: 57–61. doi:10.13485/j.cnki.1004-0537.2007.04.033.

12. Li, F. and H. F. Chen. 2007. Analysis on Social-Economic Impact of Forest Eco-Compensation Mechanism in Hainan Province. China Population, Resources and Environment 17: 113–118.

13. Liu, Y. H., N. P. Song, and L. Wang. 2007. Case Study on Pattern of Converting Cropland to Forest and Grassland in Loess Plateau: Taking Yanzhuang District in Ningxia as an Example. Journal of Desert Research 27: 419–424.

14. Mi, F., L. Gao, Y. M. Cui, and X. Y. Cui. 2007. The Problems and Suggestions of the Policy of the Ecological Forest Compensation in Implementation in Beijing Mountainous Area. Forestry Economics 11: 52–55. doi:10.13483/j.cnki.jlyfxr.2007.11.010.

15. Pang, M. 2007. Effectiveness of Grain to Green Program Evaluation and Policy Difficult Analysis: A Case Study of Sichuan Province. Forestry Economics 7: 51–54. doi:10.13483/j.cnki.jlyfxr.2007.07.016.

16. Sun, X. Z., G. D. Xie, and L. Zhen. 2007. Effects of Converting Arable Land into Forest (Grassland) and Eco-Compensation: A Case Study in Yanzhuang County, Guyuan City of Ningxia Hui Autonomous Region. Resources Science 29: 194–200.

17. Bennett, M. T. 2008. China’s sloping land conversion program: Institutional innovation or business as usual? Ecological Economics 65: 699–711. doi:10.1016/j.ecolecon.2007.09.017.

18. Zhang, L., Q. Tu, and A. P. J. Mol. 2008. Payment for environmental services: The sloping land conversion program in Ningxia autonomous region of China. China & World Economy 16: 66–81. doi:10.1111/j.1749-124X.2008.00107.x.

19. Bao, F., J. P. Yan, and H. Sun. 2008. Effect Evaluation of Reforesting Application on Farmland in the Alpine Farming-pastoral Ecotone. China Environment and Poverty Alleviation. Environmental Management 45: 488–501. doi:10.1007/s00267-009-0501-0.

20. Jin, Y. 2008. Discussion on Yunnan Forest Economic Benefit Compensation and Strategies for the Improvement. Forest Inventory and Planning 33: 90–95.

21. Pan, S. B., and X. D. Ren. 2008. Study on ecological compensation based on community participation: Taking returning farmland to forest project in the Fanjing Mountain National Nature Reserve as a case. Journal of Huabei Coal Industry Teachers College (Natural Science) 29: 35–39.

22. Pei, W. G., B. Zhang, L. Zhang, and X. K. Liu. 2008. Discussion on Benefit Appraisal and Ecological Compensation Technology of Henan Provincial Natural Forest Protection Project: Taking Luanchuan County as an Example. Central South Forest Inventory and Planning 27: 11–13 + 16.

23. Wang, H. W., Q. Y. Song, and J. F. Zhang. 2008. Performance Analysis of Sloping Land Conversion Program in WuLaNChaBu Inner Mongolia Agricultural Science and Technology 2: 74–75 + 77.

24. Zhi, L., K. L. Z. W. Song, C. H. Zhang, M. Yang, and A. Zhang. 2008. Assessment on Benefits of Implementing Cropland Conversion to Forestland Program in Heqing County, Yunnan Province. Journal of Southwest Forestry College 28: 84–88.

25. Zhou, Z. G., and P. F. Sheng. 2008. Countermeasures for Construction and Development of Key Ecological Forest in Zhejiang. Forestry Economics & TECH. 26: 80–85.

26. Cao, S. X., B. L. Zhong, H. Yue, H. S. Zeng, and J. H. Zeng. 2009. Development and testing of a sustainable environmental restoration policy on eradicating the poverty trap in China’s Changting County. Proceedings of the National Academy of Sciences of the United States of America 106: 710–716. doi:10.1073/pnas.0901971096.

27. Uchida, E., S. Rozelle, and J. Xu. 2009. Conservation Payments, Liquidity Constraints, and Off-Farm Labor: Impact of the Grain-for-Green Program on Rural Households in China. American Journal of Agricultural Economics 91: 70–86. doi:10.1111/j.1467–8276.2008.01184.x.

28. Fu, C., and Y. Q. Lin. 2009. On Livelihoods of Immigrants of the Returning Farmland to Lake in Poyang Lake Region. Journal of Nanchang University (Social Science) 4: 329–334. doi:10.13596/j.cnki.1008–3758.2010.04.014.

(Continued)
36 Li, J. M. W. Feldman, S. Li, and G. C. Daily. 2011. Rural household income and inequality under the Sloping Land Conversion Program in western China. Proceedings Of The National Academy Of Sciences Of The United States Of America 108: 7721–7726. doi:10.1073/pnas.1101818108.

37 Cao, Y. 2011. Practice analysis of regional ecological compensation in Wuxi, Taihu. Modern Economic Research 8: 66–69.

38 Jia, Y. N. 2011. Analysis of the effect of ecological compensation program in Minority Areas: Taking Xinjiang as an example. Inner Mongolia Science Technology & Economy 1: 3–4–6.

39 Pang, M. 2011a. An Empirical Study on the Pattern of Ecological Compensation in the Post-Period of Sloping Land Conversion Program. Rural Economy 5: 50–53.

40 Pang, M. 2011b. Investigation of Ecological Compensation in Project of Grain for Green in Pingwu County of Sichuan Province. Journal of West China Forestry Science 40: 94–97.

41 Sun, C. J., and Y. Cao. 2011. The Current Status and Policy Suggestion on Ecological Compensation of Source Water Protective on Area in Shanghai: Taking Qingpu as an Example. Environmental Science and Management 36: 4–8.

42 Wang, L. A., and F. L. Zhong. 2011. Performance of Sloping Land Conversion Program in Western Mountain Areas: Taking Wudu District of Longan city as an example. Research on Development 1: 94–97. doi:10.13483/j.cnki.kfyj.2011.01.002.

43 Wang, X. H., Y. F. Chen, E. X. Chen, Y. Y. Zhang, and Y. L. Luo. 2011. Ecological benefit evaluation study of three-North Shelterbelt forest project based on GIS: A case study in Zhongyang County, Shanxi Province. Bulletin of Soil and Water Conservation 31: 171–175 + 267.

44 Zhao, C. J., H. B. Zhang, and C. Y. Wu. 2011. Effect Evaluation of Grain for Green Program in Western Hainan. Journal of Anhui Agricultural Science 39: 2107–2109.

45 Gong, C. C., G. Xu, L. Chen, and S. X. Cao. 2012. Cost-effective compensation payments: A model based on Buying Green Cover to sustain ecological restoration. Forest Policy and Economics 14: 143–147. doi:10.1016/j.forpol.2011.08.007.

46 Huang, L., Q. Shao, and J. Liu. 2012. Forest restoration to achieve both ecological and economic progress, Poyang Lake basin, China. Ecological Indicators 24: 43–50. doi:10.1016/j.ecolind.2012.03.007.

47 Liang, Y., S. Li, M. W. Feldman, and G. C. Daily. 2012. Does household composition matter? The impact of the Grain for Green Program on rural livelihoods in China. Ecological Economics 75: 152–160. doi:10.1016/j.ecolecon.2012.01.019.

48 Lu, Y., H. B. Fu, X. M. Feng, Y. Zeng, Y. Liu, R. Y. Chang, G. Sun, and B. F. Wu. 2012. A Policy-Driven Large Scale Ecological Restoration: Quantifying Ecosystem Services Changes in the Loess Plateau of China. Plos One 7: e31782. doi:10.1371/journal.pone.0031782.

49 Dong, J. X. 2012. The construction and implementation of ecological compensation mechanism in Tianjin City. Tianjin Economics 1: 41–43.

50 Hou, C. C., Y. Zhao, L. Zhang, J. D. Jiang, W. Li, and J. P. Yan. 2012. The Impacts of Ecological Compensation on Regional Development: A Case of the Yellow River Water Supply Area of Gannan. Journal of Natural Resources 27: 50–61.

51 Qiu, M. Q. 2012. Protection Measures and Compensation Strategies of Ecological Public Welfare Forest in Changsha City. Modern Agricultural Sciences and Technology 19: 167–168 + 173.

52 Kelly, P., and X. X. Huo. 2013. Land Retirement and Nonfarm Labor Market Participation: An Analysis of China's Sloping Land Conversion Program. World Development 48: 156–169. doi:10.1016/j.worlddev.2013.04.002.

53 Li, Y. L., Vina, W. Yang, X. D. Chen, J. D. Zhang, Z. Y. Ouyang, Z. Liang, and J. G. Liu. 2013. Effects of conservation policies on forest cover change in giant panda habitat regions. China Land Use Policy 33: 42–53. doi:10.1016/j.landusepol.2012.12.003.

54 Liang, F., and A. P. J. Mol. 2013. Political Modernization in China: Economic and Livelihood implications of political engagement. China Economic Journal 4: 78–89. doi:10.1111/cej.12044.

55 Gong, C., C. G. Xu, L. Chen, and S. X. Cao. 2012. Cost-effective compensation payments: A model based on Buying Green Cover to sustain ecological restoration. Forest Policy and Economics 14: 143–147. doi:10.1016/j.forpol.2011.08.007.

56 Huang, L., Q. Shao, and J. Liu. 2012. Forest restoration to achieve both ecological and economic progress, Poyang Lake basin, China. Ecological Indicators 24: 43–50. doi:10.1016/j.ecolind.2012.03.007.

57 Liang, Y., S. Li, M. W. Feldman, and G. C. Daily. 2012. Does household composition matter? The impact of the Grain for Green Program on rural livelihoods in China. Ecological Economics 75: 152–160. doi:10.1016/j.ecolecon.2012.01.019.

58 Lu, Y., H. B. Fu, X. M. Feng, Y. Zeng, Y. Liu, R. Y. Chang, G. Sun, and B. F. Wu. 2012. A Policy-Driven Large Scale Ecological Restoration: Quantifying Ecosystem Services Changes in the Loess Plateau of China. Plos One 7: e31782. doi:10.1371/journal.pone.0031782.

59 Dong, J. X. 2012. The construction and implementation of ecological compensation mechanism in Tianjin City. Tianjin Economics 1: 41–43.

60 Hou, C. C., Y. Zhao, L. Zhang, J. D. Jiang, W. Li, and J. P. Yan. 2012. The Impacts of Ecological Compensation on Regional Development: A Case of the Yellow River Water Supply Area of Gannan. Journal of Natural Resources 27: 50–61.

61 Qiu, M. Q. 2012. Protection Measures and Compensation Strategies of Ecological Public Welfare Forest in Changsha City. Modern Agricultural Sciences and Technology 19: 167–168 + 173.

62 Nie, X. M., Z. Li, J. Z. Zhang. 2013. On Grazing Forbidden in Qinghai Lake Basin with Tianjun County as Example. Journal of Anhui Agricultural Science 41: 1978–1984. doi:10.15989/j.cnki.0517-69.

63 Chen, D. F., S. N. Zhang, and S. Y. Xu. 2013. Strategy Research and Practice on Xinjiang’s Sloping Land Conversion Program: Taking West China Forestry Science 40: 94–97.

64 He, J. 2014. Governing forest restoration: Local case studies of sloping land conversion program in Southwest China Karst area A case study of Guiyang. Habitat International 44: 339–348. doi:10.1016/j.habitatint.2014.07.009.

65 Chen, X., A. Vina, W. Yang, X. D. Chen, J. D. Zhang, Z. Y. Ouyang, and J. G. Liu. 2013. Effects of conservation policies on forest cover change in giant panda habitat regions. China Land Use Policy 33: 42–53. doi:10.1016/j.landusepol.2012.12.003.

66 Frayer, J., Z. L. Sun, D. Muller, D. K. Munroe, and J. C. Xu. 2014. Analyzing the drivers of tree planting in Yunnan, China, with Bayesian spatial-temporal modeling. Habitat International 44: 339–348. doi:10.1016/j.habitatint.2014.07.009.

67 He, J. 2014. Governing forest restoration: Local case studies of sloping land conversion program in Southwest China Karst area A case study of Guiyang. Habitat International 44: 339–348. doi:10.1016/j.habitatint.2014.07.009.

68 Liu, Y., X. J. Huang, H. Yang, and T. Y. Zhong. 2014. Environmental effects of land-use/cover change caused by urbanization and policies in Southwest China Karst area A case study of Guiyang. Habitat International 44: 339–348. doi:10.1016/j.habitatint.2014.07.009.

69 Lu, Y., and T. He. 2014. Assessing the effects of regional payment for watershed services program on water quality using an intervention analysis model. Science of the Total Environment 493: 1056–1064. doi:10.1016/j.scitotenv.2014.06.096.

(Continued).
(Continued).

106 Zhao, M. J., R. S. Yin, L. Y. Yao, and T. Xu. 2015. Assessing the impact of China’s sloping land conversion program on household production efficiency under spatial heterogeneity and output diversification. China Agricultural Economic Review 7: 221–239. doi:10.1108/CAER-07-2013-0094.

107 Deng, Y. J., R. Xiao, and L. D. Yan. 2015. Research on the Evaluation of Ecological Compensation Policies of Green Agricultural Producing Areas: A Case in Dongxihu District in Wuhan. China Population, Resources and Environment 25: 120–126. doi:10.3969/j.issn.1002–2104.2015.01.017.

108 Han, X. H. 2015. Empirical Analysis of the Influence of Conversion of Cropland to Forestland Project: Taking Ankang of Shaanxi as an Example. Forestry Economics 6: 40–43. doi:10.13843/cnkijyli.2015.06.008.

109 Kong, L. Y., and L. Luo. 2015. Analysis of the Problems of Forestry Ecological Compensation Based on Process Model: Taking Shihezi City as an Example. Forestry Economics 6: 96–99. doi:10.13843/cnkijyli.2015.02.017.

110 Li, G. P., Y. Guo, and D. W. Liu 2015a. Enhancing Management Efficiency in Natural Reserves: A Case Study of Nuibeilang National Natural Reserve. Tourism Tribune 30: 76–85.

111 Li, L., X. P. Shi, and S. J. Chen. 2015b. Payment for ecosystem service of cultivated land in Suzhou city of Jiangsu Province. Beijing Agricultural 12: 267–268.

112 Li, P., and C. J. Li. 2015. Study on the Efficiency Measurement of Payments for Ecosystem Services for River Basin Water Resources: A Case Study of Yichang City in Central China. Seeker 10: 34–38. doi:10.16059/j.cnki.cn34-1008/c.2015.10.007.

113 Li, X. J., H. Cao, and F. Q. Li 2015c. Influence of Ecological Compensation Participation on Farmer’s Income: A Case Study in Wuling Mountain Areas. Journal of Huzhong Agricultural University (Social Sciences Edition) 6: 51–57. doi:10.13300/j.cnki.cn44.2016.02.005.

114 Lu, C. X., F. Q. Yu, X. J. Liu, and G. C. Dhruba Bijaya. 2015. Responses of Ecosystems to Ecological Compensation in a Key Ecological Function Area of the Loess Plateau. Journal of Resources and Ecology 6: 369–374.

115 Lu, Z. L., and M. J. Li. 2015. The forest ecological compensation mechanism dominated by government in Western Minority Areas: Taking Guangxi Autonomous County of Longsheng as an example. Guilai Tribune 31: 90–95.

116 Ma, Q. H., and P. F. Du. 2015. Evaluation on the effect of ecological compensation in Xin’an River basin. Chinese Journal of Environmental Management 3: 63–70.

117 Qiruona, Q., Eyelisige, Y. Y., Zhao, and C. Chaluomeng. 2015. Analysis of grassland ecological compensation mechanism in the Inner Mongolia Autonomous Region. Legal, Political, and Social Science 6: 168–170.

118 Wang, Y. Q., and H. J. Liu. 2015. Study on the effect of payment for ecosystem service program in grassland pastoral areas: Taking Xilinguole Meng as an example. Modern Marketing 9: 42–43.

119 Xu, D. W., and B. Li. 2015. Research on Regional Ecological Compensation Performance Appraisal Based on Propensity Score Analysis. China Population, Resources and Environment 25: 34–42. doi:10.3969/j.issn.1002–2104.2015.03.005.

120 Yang, C. 2015. Problems and countermeasures on compensation implementation of forest ecological benefit in Lanping county. Forestry Construction 5: 7–15.

121 Zhang, D. H. 2015a. The influence of poverty assessment grants incentives grassland ecological protection: Taking Inner Mongolia Alashan banner as an example. Sea of learning 5: 60–66. doi:10.16099/j.cnki.cn32-1308/c.2015.06.010.

122 Zhang, L. L. 2015b. The financial transfer payment of ecological compensation analysis on sloping land conversion program in Yunnan Buyan Business 27: 144.

123 Zhang, S. C. 2015c. Current situation and problems of ecological compensation in Hebei River Basin. Modern Business 8: 91–92. doi:10.14097/j.cnki.5392/2015.08.049.

124 Ho, P. 2016. Empty institutions, non-credibility and pastoralism: China’s grazing ban, mining and ethnicity. Journal of Peasant Studies 43: 1163–1184. doi:10.1108/03066301612832483.

125 Li, G. D., C. L. Fang, and S. J. Wang. 2016. Exploring spatiotemporal changes in ecosystem-service values and hotspots in China. Science of the Total Environment 545: 609–620. doi:10.1016/j.scitotenv.2015.12.067.

126 Liu, Z., and A. Henningsen. 2016. The effects of China’s Sloping Land Conversion Program on agricultural households. Agricultural Economics 47: 295–307. doi:10.1111/agec.12230.

127 Lu, X., Y. Z. Xiao, X. Polasky, J. Liu, W. Xu, Q. Wang, L. Zhang, Y. Xiao, E. M. Rao, L. Jiang, F. Lu, X. K. Wang, G. B. Yang, S. H. Gong, B. F. Wu, Y. Zeng, W. Yang, and G. C. Daily. 2016. Improvements in ecosystem services from investments in carbon management. Science 352: 1455–1459. doi:10.1126/science.aaf2295.

128 Tuanmu, M.-N., A. Vina, W. Yang, X. Chen, A. M. Shortridge, and J. Liu. 2016. Effects of payments for ecosystem services on wildlife habitat recovery. Conservation Biology 30: 827–835. doi:10.1111/cobi.12669.

129 Wang, P., S. A. Wolf, J. P. Lassoie, G. L. Poe, S. J. Moreale, X. K. Su, and S. K. Dong. 2016. Promise and reality of market-based environmental policy in China: Empirical analyses of the ecological restoration program on the Qinghai-Tibetan Plateau. Global Environmental Change-Human and Policy Dimensions 39: 35–44. doi:10.1016/j.gloenvcha.2016.04.004.

130 Du, X., J. J. Cheng, and A. Z. Cao. 2016. Study on the Problems of the Ecological Compensation Mechanism for Returning Farmland to Forest: Taking the Yiling County as an Example. China Forestry Economics 47: 1–28. doi:10.16059/j.cnki.cn32-1539/j.2016.01.007.

131 Ke, C. D. 2016. Exploration of ecological protection and economic development: Based on the research of ecological compensation program in Tingxi county of Xiamen city and the development in small towns. Journal of the Party School of CPC Xiamen Municipal Committee 1: 30–34.

132 Liu, R. Q. 2016a. The mechanism of rural land ecological compensation: practice case and system optimization. Rural Economics 3: 10–14.

133 Liu, Z. H. 2016b. Investigation and Reflect on the Payment for Ecosystem Service: A case study of the key ecological functional areas in Nanling. Rural economy and science and technology 27: 27–28.

134 Ma, J., and J. Yao. 2016. Ecological compensation problem research on the minority herdsmen in the world natural heritage site: Taking Tianshiyuan of Xinjiang, the world heritage site as an example. Tourism Research 8: 52–57. doi:10.3969/j.issn.1674–5841.2016.02.008.

135 Tian, X. Y., and Y. Dai. 2016. Performance evaluation of payment for ecosystem service of River Basin: Taking Xiangjiang as an example. Business 28: 104–105 + 173.

136 Wang, Y., and Z. Z. Wang. 2016. On the Ecological Compensation Policy of the Water Conservation District: A Case Study of Dahuofang Reservoir. Journal of Liaoning University (Philosophy and Social Sciences) 44: 36–40. doi:10.16197/j.cnki.linnjuse.2016,0919.001.

137 Yang, H., C. Z. Wang, and H. Zhu. 2016. Research on grassland ecological compensation and its effects in Wenchuan County of Xinjiang. Example. Forestry Economics 36: 121–126. doi:10.16832/j.cnki.1005–9709.2016.02.005.

138 Yao, X. Y. 2016. Research on Performance Evaluation of Ecological Compensation in World Natural Heritage Scenic Area. Issues of Forestry Economics 36: 121–126. doi:10.16832/j.cnki.1005–9709.2016.02.005.

139 Zhang, Q. 2016. Economic incentive effect analysis of grassland ecological subsidy award mechanism. Gansu Social Sciences 5: 234–238. doi:10.15891/j.cnki.cn62-1093/c.2016.05.042.

CNKI: China National Knowledge Infrastructure; WOS: Web of Science.