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SPECIAL FEATURE

Editorial

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Triggered by major natural disasters in the late 1990s, the Chinese government has been undertaking several unprecedented ecological restoration programs (ERPs) to deal with its increasingly severe problems of soil erosion, flooding, dust storms, and habitat loss, among others. These ERPs include the Sloping Land Conversion Program (SLCP), the Natural Forest Protection Program (NFPP), and the Desertification Combating Program around Beijing and Tianjing (DCBT). It is expected that they will not only improve domestic ecological conditions and rural livelihoods but also contribute to regional and global environmental causes (Liu and others 2008; Wang and others 2007). While there have been studies of the ERPs, many issues remain to be carefully examined. In particular, it is still unclear whether the ERPs have been effectively implemented, what their induced ecological and socio-economic impacts are, and how their performance can be improved.

To address these questions, my colleagues from the Forest Economics and Development Research Center of China's State Forestry Administration and Michigan State University and I organized an international symposium in Beijing, on October 19, 2007. After the event, I decided to edit a journal special issue/feature as well as a book based on the conference presentations. My thinking was that getting these papers quickly published in a book would highlight the research advances in assessing China's ERPs and thus provide urgently needed literature sources, conceptual frameworks, models, and tools for continued investigation of them. Many, if not all, of the papers were quality empirical studies of the program effectiveness and effects completed by well-established and competent authors and thus deserved to be considered as peer-reviewed articles.

Fortunately, when I approached the Environmental Economics, Management, and Policy team of Springer with these ideas, they indicated their strong interest and willingness to work with me on the book project. They also suggested that I contact Dr. Virginia Dale, the Editor-in-Chief of *Environmental Management*, for a possible special issue/feature. Dr. Dale was very receptive and encouraging, too. Thanks to their enthusiastic assistance and the hard work of all contributors, the book, titled *An Integrated Assessment of China's Ecological Restoration Programs*, was released a while ago (Yin 2009) and now, the Special Feature is in print. As its Guest Editor, I would like to take this opportunity to express my sincere gratitude to Dr. Dale and her assistant, Ms. Linda O'Hara, for their superb supervision and coordination of the review process. In addition, many individuals kindly served as reviewers and editorial board members while the manuscripts underwent anonymous review. Their careful and constructive comments and suggestions have helped the authors a great deal in improving their manuscripts. For that, I am especially grateful. Also, I appreciate the funding from the U.S. National Science Foundation, which has made it possible for me to pursue these endeavors in the first place.

Included in this Special Feature are 10 papers that address a wide range of issues regarding the impact significance and implementation efficacy of China's ERPs. It begins with an up-to-date description of the programs (Yin and Yin 2010) and an extensive survey of the literature that has assessed them (Yin and others 2010). Then, it presents a study of the driving forces of the historical land use and land cover change (LUCC) in the upper Yangtze basin

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(Xiang and others 2010) and attempts to quantify the carbon and erosion dynamics (Zhao and others 2010; Li and others 2010). The remaining five articles are efforts to estimate the ERP socioeconomic impacts, as reflected in income, employment, productivity, and other dimensions of rural livelihoods.

Yin and Yin (2010) cover the initiation, implementation, and challenges of China's ERPs. Overall, it appears that with substantial government investments, tremendous progress has been made in implementing them. For instance, the forest area and volume have expanded significantly with implementation of the NFPP. Similarly, under the SLCP a large amount of degraded farmland and grassland has been rehabilitated, and the forest and grass coverage has expanded substantially. As a result, the ecological and socioeconomic conditions have seen improvement. To complete them successfully and to improve the ecosystem functions and services, however, the authors argue that it is essential for China to embrace a more balanced and comprehensive approach to ecological restoration, adopt better planning and management practices, emphasize local people's active engagement, establish an independent and competent monitoring network, and conduct timely and integrated assessments of the ERPs.

After having reviewed the literature on assessing the ERPs, Yin and others (2010) observe that (1) the implementation effectiveness has not been examined as extensively as the impact significance; (2) efforts to assess the impact significance have concentrated on the SLCP, particularly its socioeconomic effects—growth of income, alternative industry, and employment, and likelihood of reconversion; and (3) most of the socioeconomic studies are based on household surveys and discrete choice and difference in differences models. Future work should thus pay more attention to the NFPP and other programs, and the environmental impacts and the implementation effectiveness of all of the ERPs. To these ends, the authors recommend that analysts gather more field data regarding the evolving ecosystem conditions and socioeconomic information of higher aggregation and conduct their research across scales, with more extensive application of the geospatial technology for measurement and more effective empirical models.

Xiang and others (2010) use a fractional logit model to determine the effects of social, economic, and institutional factors on the changes of cropland, forestland, and grassland. Based on a panel dataset covering 31 counties over four time periods from 1975 to 2000, they show that population expansion, food self-sufficiency, and better market access drove cropland expansion, while industrial development contributed significantly to the increase of forestland and the decrease of other land uses. Similarly, stable tenure had a positive effect on forest protection. The use of the fractional logit model and the findings of key LUCC drivers are interesting. Moreover, this article illustrates the limitations of the conventional choice models and calls for developing structural and other alternative models to capture the dynamic linkages, feedback, and endogeneity of the drivers to shed new light on human impacts on LUCC and environmental conditions.

Zhao and others (2010) simulate the terrestrial ecosystem carbon dynamics in the Jinsha watershed of the upper Yangtze basin, using the General Ensemble Biogeochemical Modeling System. With a unique combination of spatial and temporal dynamics of such major factors as climate, soil properties, nitrogen deposition, and LUCC, they show that the ecosystems of the watershed acted as a carbon sink during the period of 1975–2000, with an average rate of 0.36 Mg/ha/year and vegetation biomass accumulation accounted for 90.6% of the sink. Also, the carbon sink/source pattern had a high degree of spatial heterogeneity, with sinks associated with forest areas without disturbances and sources caused by stand-replacing disturbances. This result underscores the critical role of land-use history and climate variation in determining the regional carbon sink/source pattern.

Land degradation caused by soil erosion has made the Loess Plateau one of the poorest regions in China. To improve the situation, the government has taken a number of measures, including the SLCP as the latest. Li and others (2010) attempt to answer the questions of whether and to what extent these measures have accomplished the designed objective(s). Based on a distributed soil erosion model, the authors tackle the changes of water runoff and soil erosion in the Zuli River basin. With the assistance of remote sensing and GIS technologies for land surface parameterization, their simulations reveal that the improved ground cover in recent years, especially forestland and grassland, has resulted in an erosion reduction of 38.8%, compared to the mean level of the 1990s. On the other hand, the evolving rainfall pattern has caused soil erosion to increase by 13.1%. In combination, the authors obtain a net decrease of soil erosion by 25.7%. This evidence suggests that restoration efforts can indeed mitigate the regional water and soil loss.

The other five articles are studies of the socioeconomic impacts of the ERPs, with different sample sites, datasets, and modeling approaches. Four of them feature versions of the difference-in-differences (DID) method and repeated cross-section or panel data, and one measures the agricultural productivity change induced by the SLCP. Gauvin and others (2010) note that the ERPs are often designed with dual goals—to enhance ecosystem services and to alleviate poverty; however, reaching both can be challenging. If the household's supply of ecosystem services is not positively correlated with poverty, tradeoffs may exist

between meeting the two goals. Moreover, even if the supply of ecosystem services and poverty were positively correlated, program managers need to adopt targeting approaches so that the poorer households with land that is less costly to set aside and that provides a higher environmental benefit are selected. To explore strategies by which both the goals of the SLCP can be achieved cost effectively, they develop a framework to understand the implications of alternative targeting when policy makers have both environmental and poverty alleviation goals. It is found that there is a substantial gain in the cost effectiveness of the program by targeting parcels based with low opportunity cost and high environmental benefit managed by poorer households.

Yao and others (2010) observe that in addition to participation status and household/parcel characteristics, the SLCP's impacts on income growth and labor transfer are determined by the local economic conditions, program extent, and political leadership. To test this proposition, they compiled a dataset of 600 households in three counties of the Loess Plateau region, with observations for times both prior to and after the program initiation (1999 and 2006), both aggregate and categorical incomes, and both participating and non-participating households. They find that participation status, economic condition, program extent, and political leadership have all had significant impacts on household income and off-farm employment. Also, the effects of participation on crop production income, animal husbandry income, and off-farm income vary substantially. These results carry great policy implications regarding how to improve the effectiveness of the ERP.

Mullen and others (2010) assess the impact of the NFPP on rural household livelihoods. To that end, they apply a series of policy evaluation microeconometric techniques to quantify the program's effects on two interrelated facets of household livelihoods: income and off-farm labor supply. They discover that the NFPP has had a negative impact on incomes from timber harvesting, due to logging restrictions. However, they show that off-farm labor supply has increased more rapidly in NFPP areas. As such, the NFPP has actually had a positive impact on total household income from all sources. Furthermore, this result is strongest for employment outside the village. Based on these findings, the authors present an intriguing discussion with regard to how to mitigate the negative impact of the program and strengthen its positive impact on family livelihoods.

China's ERPs, sometimes referred to as "the Priority Forestry Programs," or PFPs, by the SFA, also include the Wildlife Conservation and the Nature Reserve Development Program (WCNR) and the Shelterbelt Development Program (SBDP). In addition to improving the environmental and resource conditions, a frequently reiterated goal of these PFPs is to enhance the income of rural residents. Thus, a question of broad interest is the following: How has implementing the PFPs affected the farmers' income and poverty status? Liu and others (2010) address this question, using a fixed-effects model and panel data from close to 2,000 households in Sichuan, Hebei, Shaanxi, and Jiangxi. The evidence indicates that the SLCP, the SBDP, and the NFPP have made a positive impact and, by far, the SLCP has the largest effect. In contrast, the impact of the WCNR, if any, is negative; and the DCBT has not had an effect due to its short time span of execution. Further, the impacts vary in different economic sectors. The authors argue that regardless of their current impacts, all the PFPs hold great potentials in enhancing the positive effect and mitigating the negative effect on farmers' income. For that purpose, more attention should be paid to program designing and income increase from cash crops, off-farm employment, and training.

Using the Malmquist index method and household survey data, Yao and Li (2010) find that during the period of 1998–2004, the total factor productivity (TFP) in Wuqi of northern Shaanxi grew by 15.8%. By decomposing the TFP, they further show that its increase is due exclusively to the improvement of technical efficiency. To validate these findings and put them in perspective, they take a further step to derive the TFP change with county-level aggregate data. It is revealed that driven by slight technological change and scale efficiency, the TFP experienced a slow growth during the period of 1992–1998. The tremendous cropland reduction and production mode shift, induced by implementing the SLCP, caused a substantial TFP decline during the first 3 years of the program. Due to continued improvement of technical efficiency, however, its growth accelerated later. Altogether, their empirical evidence corroborate the fact that implementing the SLCP has contributed to the agricultural TFP growth in the longer term, and that the efficiency improvement has resulted mainly from increased public expenditures for extension services and diffusion of knowledge. Wuqi's experience has proved that it is possible to achieve environmental conservation and productivity increase simultaneously, even when facing a huge cropland reduction and production mode alternation.

In short, this Special Feature represents one of the few publications that can be collectively viewed as an integrative assessment of China's ERPs, and the overwhelming evidence reported in it leads us to the conclusion that, by and large, these programs have already made significantly positive impacts, both socioeconomically and environmentally. Thus, the government agencies, local farmers, business employees, policy practitioners, and other stakeholders ought to be encouraged by these affirmative findings.

However, as demonstrated by many authors, the country faces great challenges in improving the implementation and impacts of these programs. For instance, it seems that flexible payment mechanisms and competitive selections based on a reliable environmental benefits index could greatly improve the cost effectiveness (Yin and Yin 2010). Also, in contrast to its enthusiasm to plant trees, the State Forestry Administration has shown less interest in other measures of restoration even if they are better suited (Normile 2007; Wang and others 2007). The time has come to rethink and refine the program formulation and methods of site/species selection, and to incorporate resource management, such as tending and thinning, into ecosystem rehabilitation (Wang and others 2007; Yin and others 2005).

Accordingly, great opportunities exist for the science community to assess the ERPs more effectively through working at multiple scales, collaborating across disciplines, deploying geospatial technologies, using longitudinal datasets, and building more appropriate models. What else can be more exciting and rewarding than pursuing these opportunities?

References

Gauvin C, Uchida E, Rozelle S, Xu JT, Zhan JY (2010) Cost effectiveness of payments for ecosystem services with dual goals of environment and poverty alleviation. Environmental Management. doi:10.1007/s00267-009-9321-9

Li C, Qi J, Feng Z, Yin R, Guo B, Zhang F, Zou S (2010) Quantifying the effect of ecological restoration on soil erosion in China's Loess Plateau Region: an application of the MMF approach. Environmental Management. doi:10.1007/s00267-009-9369-6

Liu JG, Li SX, Ouyang ZY, Tam C, Chen XD (2008) Ecological and socioeconomic effects of China's policies for ecosystem services. Proceedings of the National Academy of Sciences of the United States of America 105:9477–9482

Liu C, Lu JZ, Yin RS (2010) An estimation of the effects of China's forestry programs on farmers' income. Environmental Management. doi:10.1007/s00267-010-9433-2

Mullan K, Kontoleon A, Swanson TM, Zhang S (2010) Evaluation of the impact of the Natural Forest Protection Program on Rural Household Livelihoods. Environmental Management. doi:10.1007/s00267-009-9288-6

Normile D (2007) Getting at the roots of killer dust storms. Science 317:314–316

Wang GY, Innes JL, Lei JF, Dai SY, Wu SW (2007) China's forestry reforms. Science 318:1556–1557

Yao S, Guo Y, Huo X (2010) An empirical analysis of the effects of China's Land Conversion Program on farmers' income growth and labor transfer. Environmental Management. doi:10.1007/s00267-009-9376-7

Yao SB, Li H (2010) Agricultural productivity changes induced by the Sloping Land Conversion Program: an analysis of Wuqi County in the Loess Plateau region. Environmental Management. doi:10.1007/s00267-009-9416-3

Yin RS (ed) (2009) An integrated assessment of China's ecological restoration programs. Springer, Dordrecht. ISBN:978-90-481-2654-5

Yin RS, Xiang Q, Xu JT, Deng XZ (2010) Modeling the driving forces of the land use and land cover changes along the Upper Yangtze River of China. Environmental Management. doi:10.1007/s00267-009-9377-6

Yin R, Yin G (2010) China's primary programs of terrestrial ecosystem restoration: initiation, implementation, and challenges. Environmental Management. doi:10.1007/s00267-009-9373-x

Yin RS, Xu JT, Li Z, Liu C (2005) China's ecological rehabilitation: the unprecedented efforts and dramatic impacts of reforestation and slope protection in western China. China Environment Series 6:17–32

Yin RS, Yin GP, Li LY (2010) Assessing China's ecological restoration programs: what's been done and what remains to be done? Environmental Management. doi:10.1007/s00267-009-9387-4

Zhao SQ, Liu SG, Yin RS, Li ZP, Deng YL, Tan K, Deng XZ, Rothstein D, Qi JG (2010) Quantifying terrestrial ecosystem carbon dynamics in the Jinsha watershed, Upper Yangtze, China from 1975 to 2000. Environmental Management. doi:10.1007/s00267-009-9285-9