Community-based Wise-Use and Sustainable Management of Wetland: Case Study from Polder Xipanshanzhou, Dongting Lake, China

PAN Mingqi\textsuperscript{1,2,3}, YU Xiubo\textsuperscript{*} and ZHANG Chen\textsuperscript{4}

1 Institute of Geographic Sciences and Natural Resources Research, CAS, Beijing 100101, China; 2 Graduate University of Chinese Academy of Sciences, Beijing 100049, China; 3 Institute of Policy and Management, CAS, Beijing 100190, China; 4 Institute of Subtropical Agriculture CAS, Changsha 410125, China

Abstract: The frequent occurrence of extreme flood events in the late 1990s and the past decade has brought about an ongoing debate on the relationships between wetland resources, wetland ecosystem services, and human development and livelihoods of communities in the Dongting Lake area. This paper is prepared for analysing the best practices in wise-use and sustainable management of wetland and their socioeconomic benefits in Polder Xipanshanzhou in Dongting Lake. The quantitative (monetary values) and qualitative socioeconomic data of 1683 samples from questionnaire surveys during 2000 to 2008 were used for this study, of which 1173 were obtained in Polder Xipanshanzhou. Five conclusions are drawn from the study: (i) the community-based alternative activities and wise-use in Polder Xipanshanzhou after “Returning Farmland to Lake” (RFL) resulted in more income, increased well-being, reduced vulnerability to food shortage, poverty and flooding, and more sustainable use of the natural resource base; (ii) women, elder farmers, and low-income groups benefited much more from these activities; (iii) livelihood continued to improve as compared with that when the project started in 2000, and project participating households earned more income and owned more properties than non-project households. Even after the external funding stopped in 2001, its positive accumulated effects have still been significantly contributing to the improvement of livelihoods of this community; (iv) social structures within Polder Xipanshanzhou have been evolving in a positive way, community-based grass-roots organizations have emerged and developed well, and the capacities of community-based participatory co-management, self-governing and self-development, as well as local awareness of environmental issues have been improving, which attract more local people to be interested in such wise-use activities; and (v) the success can be attributed to the mobilization of local communities, favorable national policies, Public-Private Partnership (PPP), institutional arrangements in local communities, and adaptive management and innovative approaches.

Key words: community-based; wise-use; alternative livelihoods; Polder Xipanshanzhou; case study; Dongting Lake; Returning Farmland to Lake (RFL)

Wetlands are one of the most important natural resources and have been providing numerous goods and services to societies (Maltby 1991; Schuyt K 2005; Ramsar Convention Secretariat 2007). Communities around wetlands, which depend on natural resources provided by them, are not only a component of the whole wetland ecosystems, but also the managers of these systems. However, humans have not dealt well with the relationships between “Man” and “Wetland” due to irrational human activities and other factors such as land use/land cover change (LUCC) and river training activities especially during the past several decades, and these have...
caused much loss of the wetland ecosystem’s functions and services that can be seen in severe flooding events happening in parts of the world. Therefore, in recent years wetland protection researchers, ecologists, sociologists, and so on have been paying greater attention to how to harmonize wetland protection and community-based development in a sustainable way (Chambers and Conway 1992; Mitsch et al. 1998; WWF International 2003; Jones et al. 2003; Marianne 2005; Schuyt 2005; Ramsar Convention Secretariat 2007). Research on community-based wise/sustainable use of wetlands has become one of the most popular fields in wetland science.

In this paper, we select Polder Xipanshanzhou in Dongting Lake as a case study site (Fig. 1), using quantitative (monetary values) and qualitative socioeconomic data for 2000–2008 from questionnaire surveys, to answer the following questions: will wetland wise-use and sustainable management activities also improve people’s livelihoods and to what extent will these changes improve community-based livelihoods? How to manage and restore wetlands for nature and livelihoods at the same time and how to make these mutually supportive and sustainable?

1 Background
1.1 Dongting Lake and the “Returning Farmland to Wetland” (RFL)
Dongting Lake is the second largest freshwater lake in China and one of the two biggest lakes naturally connected with the Yangtze River. It is also one of the most important wetlands in China and supports a rich biodiversity, including important fish and waterfowl populations and many threatened species (Chinese River Dolphin, Yangtze Finless Porpoise, Lesser White-fronted Goose, and so on). For these reasons, three of its wetland nature reserves were listed in the “Ramsar List of Wetlands of International Importance”.

In October 1998, China implemented the policy of “Returning Farmland to Lake” (RFL) (Zhou et al. 2001; Li et al. 2002a; Li et al. 2002b) to mainly protect the middle and lower reaches of the Yangtze River basin from frequent flooding and severe damages. The Dongting Lake area, the extensively reclaimed plain, was naturally listed as one of the most important parts of the RFL policy. Since then, research, awareness-raising and conservation interventions for survival and conservation of Dongting Lake wetlands have been initiated (Zhou et al. 2001; Jiang 2006; Pan 2009).

There are mainly two ways of RFL in Dongting Lake (Zhou et al. 2001; Jiang 2006; Pan 2009). The first is “Complete Restoration”, where the residents in the polders have to abandon their farmlands and let them become part of Dongting Lake and they themselves are relocated to other higher lands or other places with rare or no flood obsessions. The other is “Semi-restoration”, which differs from “Complete Restoration” in that it only displaces the residents in the polders to higher lands (even in the same polders) or other places, but they can still use the
farmlands during non-flooding seasons.

To find alternative livelihoods for those affected by “Semi-restoration”, in the year when the RFL policy was implemented, four sites, in which Polder Xipanshanzhou in the West Dongting Lake was included, were chosen for alternative livelihood and wise-use activities for local communities by the local government and other organizations.

1.2 RFL and wetland wise-use activities in Polder Xipanshanzhou

The Polder Xipanshanzhou, neighboring Yuanjiang City, West Dongting Lake, was constructed and reclaimed in 1972. Before restoration in 1998 all 177 farming households with a population of 580 lived on former lakebed in a 106 ha polder and grew rice. The poor market for rice, high production costs and losses to floods left these villagers with a mere average annual income of around 2000 CNY (1 USD = 8.27 CNY). While after 1998, through “Semi-restoration”, the 580 residents were relocated to higher parts of the same polder. This change had created a series of problems for the local communities, of which livelihood was the most important (Mao 2002; Wit and Yu 2005; Yu et al. 2006; Pan 2009).

Government agencies, research institutions and NGOs have initiated a series of joint programmes to try to solve this problem. From early 2000, alternative livelihoods and wetland wise-use activities were identified by working with the village communities through Participatory Rural Appraisal (PRA) approaches (Beebe 1987; Cuff 2001; Yu et al. 2006). These included a combination of fish farming, livestock (ducks, cattle, pigs, and sheep), and high value-added organic agricultural production, especially organic orange orchards. It also involved the installation of household biogas cooking systems to free women from the drudgery of collecting firewood and to mitigate the environmental impact of trees removal.

The government has provided each family in the polder with 15 000 CNY to build a new house on the high land in the village since 1998. Then in late 1999 the dyke was breached and the polder was inundated (Pittock et al. 2003). From April to August 2000, 540 000 CNY and some additional funding for alternative livelihoods, technical support and communications for wise-use activities in the local community were invested by WWF, which benefited 176 households (Table 1).

Table 1 Wise-use activities Conducted in Polder Xipanshanzhou.

<table>
<thead>
<tr>
<th>Livelihood types</th>
<th>Funding per household (CNY)</th>
<th>Wise-use activities</th>
<th>Benefited households</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pig raising</td>
<td>2550</td>
<td>10 pigs per batch and 2–3 batches per year</td>
<td>149</td>
</tr>
<tr>
<td>Cattle/sheep raising</td>
<td>5000</td>
<td>4 cows or 10 sheep and more</td>
<td>4</td>
</tr>
<tr>
<td>Duck breeding</td>
<td>6000</td>
<td>400 ducks per batch and 2 batches per year</td>
<td>4</td>
</tr>
<tr>
<td>Cage aquaculture</td>
<td>6000</td>
<td>6 cages, and 25m² per fish cage</td>
<td>15</td>
</tr>
<tr>
<td>Others</td>
<td>5000</td>
<td>300 chickens or greenhouse vegetable</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>-</td>
<td>-</td>
<td>176</td>
</tr>
</tbody>
</table>

2 Data and methodology

2.1 Data

First hand data were collected from field work, including interviews with different institutions and governmental departments as well as socioeconomic surveys with the local residents.

There are three categories of surveys, which are: (i) Project participating households in Polder Xipanshanzhou that are the farmers who participated in these alternative wise-use activities; (ii) Non-project households in Polder Xipanshanzhou that are the farmers who did not participate in the alternative wise-use activities; and (iii) Non-project households in neighboring polders, which are the farmers who did not participate in the alternative wise-use activities and lived outside Polder Xipanshanzhou. Family members and their ages, household income, income structure, farming activities and alternative wise-use activities, social organizations and their structures, and awareness and behaviour to wetland conversation are among the questions in the questionnaires.

Since 2000, 9 socioeconomic surveys have been conducted in the West Dongting Lake by Systematic Sampling, where 1173 samples from Polder Xipanshanzhou have been collected, while 510 samples from other polders have been also taken for comparison (Yu et al. 2006; Pan 2009) (Table 2).

2.2 Methodology

Classic sociology and statistical methods are used in this research. The analytical framework consists of five overarching questions, which are: (i) what are the outcomes of the wise-use activities? (ii) what is the distribution of socioeconomic benefits? (iii) what would have happened to people’s livelihoods without the project? (iv) is the improvement in livelihoods sustainable? and (v) why has the project been successful in improving livelihoods? The analyses of these alternative wise-use
activities are discussed in details in the following section.

3 Analysis of wise-use activities in Polder Xipanshanzhou

3.1 Outcomes of the wise-use activities

DFID defines “livelihoods” as the “capabilities, assets and activities required for a means of living” (Carney et al. 1999). Based on this definition, four livelihood outcomes, that is, improved income, increased well-being, reduced vulnerability, and more sustainable use of the natural resource base in Polder Xipanshanzhou have been achieved owing to the above-mentioned alternative wise-use activities.

(1) Improved income, increased well-being, and reduced vulnerability

According to the surveys, more income (project-resulted income) for local farmers has been generated. In 2000, the average project-resulted income was 1465 CNY per household, accounting for 28.16% of the average total income, while in 2006 project-resulted income was 7072 CNY per household, accounting for 40.75% of the total income (see Table 3).

Moreover, the average household income of farmers involved in wise-use activities increased steadily, from 2902 CNY in 1999 to 17354 CNY in 2006.

By ranking the participating farmers’ household income from low to high according to the survey data, and divide them into five income groups of level 1 to 5, it can be seen that project households in all income groups obtained increasingly higher income since 1999 (Fig. 2).

According to the interviews with the farmers, their well-being has improved with the income increase, which is indicated by improvement of housing conditions, use of biogas, number of telephones and mobiles, diversified food, health, satellite TV receivers, as well as ecological

income) for local farmers has been generated. In 2000, the average project-resulted income was 1465 CNY per household, accounting for 28.16% of the average total income, while in 2006 project-resulted income was 7072 CNY per household, accounting for 40.75% of the total income (see Table 3).

Moreover, the average household income of farmers involved in wise-use activities increased steadily, from 2902 CNY in 1999 to 17354 CNY in 2006.

By ranking the participating farmers’ household income from low to high according to the survey data, and divide them into five income groups of level 1 to 5, it can be seen that project households in all income groups obtained increasingly higher income since 1999 (Fig. 2).

According to the interviews with the farmers, their well-being has improved with the income increase, which is indicated by improvement of housing conditions, use of biogas, number of telephones and mobiles, diversified food, health, satellite TV receivers, as well as ecological


Table 2 The number of samples in questionnaire surveys carried out since 2000 (Unit: household).

<table>
<thead>
<tr>
<th>Year</th>
<th>Sample</th>
<th>Polder Xipanshanzhou</th>
<th>Other polders*</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>1999</td>
<td>68</td>
<td>68</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>2000</td>
<td>279</td>
<td>206</td>
<td>485</td>
</tr>
<tr>
<td>2002</td>
<td>2001</td>
<td>136</td>
<td>136</td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>2002</td>
<td>96</td>
<td>252</td>
<td>348</td>
</tr>
<tr>
<td>2004</td>
<td>2003</td>
<td>120</td>
<td>52</td>
<td>172</td>
</tr>
<tr>
<td>2005</td>
<td>2004</td>
<td>169</td>
<td></td>
<td>169</td>
</tr>
<tr>
<td>2006</td>
<td>2005</td>
<td>96</td>
<td></td>
<td>96</td>
</tr>
<tr>
<td>2007</td>
<td>2006</td>
<td>102</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>2007</td>
<td>107</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1173</td>
<td>510</td>
<td>1683</td>
</tr>
</tbody>
</table>

* Other polders include the other polders around Polder Xipanshanzhou.

Table 3 Project-resulted income and the total income in 2000 and 2003 in Polder Xipanshanzhou.

<table>
<thead>
<tr>
<th>Year</th>
<th>Sample</th>
<th>Project-resulted income (A) (CNY per household)</th>
<th>Total Income (B) (CNY per household)</th>
<th>% (A/B*100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>136</td>
<td>1465</td>
<td>5203</td>
<td>28.16</td>
</tr>
<tr>
<td>2003</td>
<td>147</td>
<td>2881</td>
<td>10 344</td>
<td>27.86</td>
</tr>
<tr>
<td>2004</td>
<td>96</td>
<td>3196</td>
<td>15 430</td>
<td>20.71</td>
</tr>
<tr>
<td>2006</td>
<td>102</td>
<td>7072</td>
<td>17 354</td>
<td>40.75</td>
</tr>
</tbody>
</table>

Table 4 Income distributions in some years (Unit: % of total income).

<table>
<thead>
<tr>
<th>Year</th>
<th>Project income</th>
<th>Rice</th>
<th>Migrant income</th>
<th>Others</th>
<th>Total income</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>64.5</td>
<td>35.6</td>
<td>11.7</td>
<td>17.8</td>
<td>6</td>
</tr>
<tr>
<td>2003</td>
<td>42.8</td>
<td>14.94</td>
<td>8.12</td>
<td>35.14</td>
<td>13.94</td>
</tr>
<tr>
<td>2004</td>
<td>32.75</td>
<td>12.04</td>
<td>5.58</td>
<td>49.06</td>
<td>12.61</td>
</tr>
<tr>
<td>2006</td>
<td>32.02</td>
<td>25.33</td>
<td>30</td>
<td>32.1</td>
<td>5.88</td>
</tr>
</tbody>
</table>
restorations. Vulnerability to food security problem and poverty has also been reduced with the income increase.

(2) More sustainable use of the natural resource base
With the decreased cropland due to RFL, the project households were funded to find alternative livelihoods, such as pig, chicken, and cattle farming, organic oranges, as well as aquaculture, thus subject the wetlands to less human disturbances through, for example, organic farming practices and less chemical fertilizer and pesticide use (Tan et al. 2003; Pan 2009). The direct income from wise-use activities and migrant workers accounted for almost 2/3 of their total income from 2001 to 2006 (Table 4). According to the survey in 2005, among the 96 households in Polder Xipanshanzhou, 55 households with 98 farmers had at least one family member working in urban areas outside of their county, accounting for 40% of the total labor force of the interviewed households. With migration to urban areas, the pressure on local natural resources was lessened significantly.

### 3.2 Distribution of socioeconomic benefits

In order to assess which part of the population has benefited from the wise-use activities, the samples are separated into gender, age, and income groups to analyse the equity of socioeconomic benefit distribution.

(1) Gender group
The rural women seem to be more aware of the need to maintaining the quality of their environment as compared with their husbands who are more interested in how much money they can make from the exploitation of the environmental resources. Women constitute more than half of the labor force on the countryside, and men often are away in the cities for temporary jobs. The interviews with farmers showed that women actively participated in the livelihood scheme and generated income from the project.

(2) Age group
Elder farmers helped to implement and carry out the wise-use schemes and activities. According to the survey in 2005, among the 96 farmers interviewed, 27 were 50–60 years old, and 19 were above 60 years old, accounting for 28.13% and 19.79% of the farmers interviewed. Whereas there was only a very small percentage of farmers sampled below 35 years of age because the majority of them went to urban areas for work. Fig. 3 indicated that elder farmers involved in the alternative wise-use activities and benefited from the project.

(3) Income groups
The project benefits the lower income groups. The percentage of the lowest income households (level 1) participating in the project increased from 2.83% in 1999 to 6.12% in 2003, meanwhile, the percentage of the highest income households (level 5) participating in the project decreased from 59.60% in 1999 to 44.32% in 2004 (Fig. 4).

### 3.3 Livelihoods without the project

Measuring the contribution of the project to livelihood improvements cannot tell what would have happened to local livelihood without the project - perhaps it would have improved in some other ways as well without the project.

According to the survey (Wetland Ambassador Action Campaign 2002), the cash income of project households in Polder Xipanshanzhou averaged 4456 CNY in 2001, higher than 3583 CNY of non-project households in Polder Xipanshanzhou, and much higher than 2456 CNY of non-project households in neighboring polders (Table 5).

Besides, organic farming has also made great contributions to households’ income. For example, households with organic orange planting had 1000 CNY more while those grew organic vegetables earned 4000 CNY more in both 2006 and 2007.

### 3.4 Sustainability of the improvement in livelihoods

Improvement to livelihoods is of great importance only if it is sustainable. The data clearly show that when the funding stopped in spring 2001, the alternative livelihood
activities continued, with both the project-resulted income and total income of the Polder Xipanshanzhou increased steadily.

Moreover, the capacity-buildings and institutional arrangements developed by the project will also contribute greatly to the sustainability of the livelihoods in these communities. The examples are that organic orange, organic Lily flower and other organic vegetables are certified by the Organic Food Development Center, Ministry of Environmental Protection of China; trainings on techniques and management skills of organic farming and eco-tourism are conducted; grass-root organizations such as the Organic Farming Association headed by local farmers have taken the responsibilities for livelihood development and biodiversity conservations; and the establishment of a market system has made these activities sustainable and possible to develop further.

3.5.3 Public-private partnership (PPP)
On the one hand, the Hunan Youth Development Foundation (provincial level) and Yuanjiang Youth Development Foundation (county level) jointly designed and implemented the wise-use activities in Polder Xipanshanzhou along with WWF. In the meantime, the Chinese Academy of Sciences and the Ministry of Environment also provided strong technical support with training and monitoring services.

Furthermore, the project has made a deliberate and generally successful effort to contact and work with non-traditional partners, including partners from the emerging private sector, such as travel agents, grass-root organizations from local communities, environmental groups, and so on. They actively involved in these activities by providing marketing information, environmental education, and other opportunities.

3.5.4 Institutional arrangements in the local community
From the very beginning of the project implementation the local communities set up a Project Management Group and a Project Monitoring Group to supervise and facilitate the wise-use activities. The Project Management Group was consisted of 3 farmers, and the Project Monitoring Group was consisted of 6 farmers, who were elected by local farmers. The two groups played important roles in funding management and livelihood development in local communities.

After three years of project implementation, an Organic Farming Association at the local community was set up. The Organic Farming Association is also consisted of local farmers, and it has been playing an important role by helping the farmers with capacity-building to promote organic agriculture as well as eco-tourism.

3.5.5 Adaptive management and innovative approaches
In addition to the talent and hard working of the staff, the adaptive management skills and innovative approaches were also successfully employed. When the project started in the spring of 2000, a PRA survey and planning approach was used to facilitate the development of the livelihood strategies. During the project implementation phase, the partners were actively involved; the monitoring and evaluation approaches provided prompt feedback for
project adjustment. With regard to the wise-use activities, flood-adaptive farming started first, and followed by the biogas and organic farming activities to solve the non-point pollution problems. Later the ecological restoration of wetland and surrounding forest and the responsible eco-tourism and eco-homestead programmes were introduced.

4 Conclusions and discussions

The frequent occurrence of extreme flood events in the late 1990s and the past decade has brought about an ongoing debate on the relationships between wetland resources, wetland ecosystem services and human development and livelihoods of communities in the Dongting Lake area. Based on 1683 samples surveyed in the West Dongting Lake, this paper is prepared for analysing the best practices in wise-use and sustainable management of wetland and their socioeconomic benefits in Polder Xipanshanzhou in Dongting Lake from 2000 to 2008. Five conclusions are drawn from the study: (i) the community-based alternative activities and wise-use in Polder Xipanshanzhou after RFL resulted in higher income, increased well-being, reduced vulnerability to food shortage, poverty and flooding, and more sustainable use of the natural resource base; (ii) women, elder farmers, and low-income groups benefited much more from these activities; (iii) livelihoods continued to improve as compared with that when the Project started in 2000, and project households earned more income and owned more properties than non-project households. Even after the external funding stopped in 2001, its positive accumulated effects have been significantly contributing to the improvement of livelihoods of this community; (iv) social structures within Polder Xipanshanzhou has been evolving in a positive way, community-based grass-roots organizations have emerged and developed well, and the capacities in community-based participatory co-management, self-governance and self-development, as well as local awareness of the need for environmental protection have been improving, which attract increasingly more local people to such wise-use activities; and (v) the reasons for the success are motivations in the local community, favorable national policies, public-private partnership (PPP), institutional arrangements in local communities, and adaptive management and innovative approaches.

Acknowledgements

The authors would like to acknowledge CHEN Chengwen, WANG Li and HUANG Ming for their research reports. Special thanks should go to Changsha Programme Office of WWF China for sharing survey data and many useful materials. Also, many thanks also go to the anonymous reviewers for their valuable advice and suggestions.

References


基于社区的湿地合理利用和可持续管理
——来自洞庭湖区西畔山洲垸的案例分析

摘要：过去十年来频繁发生的几次极端洪涝灾害事件引发了人们对洞庭湖地区湿地资源保护、湿地生态服务与人类发展和社会生计之间关系的持续讨论。本文根据2000-2008年间所获取的1683份系统问卷调查数据，从定量和定性的角度重点分析了洞庭湖区西畔山洲垸内的湿地合理利用和可持续管理等最佳实践及其社会经济效益，得出如下研究结论：（1）退田还湖后，在西畔山洲垸开展的基于社区的湿地资源合理利用活动在恢复、保护湿地的同时，大幅提高了社区经济收入和福利水平，同时又降低了社区应对粮食短缺、贫困、洪灾等方面的脆弱性，增强了社区可持续发展的自然资源基础；（2）社区妇女、年长的农民以及低收入群体从这些实践活动活动中获益较大；（3）自2000年开展上述合理利用活动以来，参与这些活动的家庭收入持续增加，比没参加活动的家庭获得了更高的收入，也拥有了更多的财产，而即使在2001年这些由外部主导的替代生计活动停止资助以后，其仍然对社区内的收入提高具有显著的累积贡献作用；（4）区域内社会组织结构发生积极变化，社区基层组织从无到有，社区参与共管、自治能力以及社区居民的环保意识都得到了大幅提高，社区自我发展的能力已经形成。目前，越来越多的周边社区居民已经加入有机柑橘、有机蔬菜等有机农业生产活动或对加入表示出极大的兴趣；（5）生计水平提高的原因可以归结为当地社区的自我驱动和积极参与、国家政策机遇、公私合作的伙伴关系（PPP）的建立、社区基层组织建设以及适应性管理方法的应用等。

关键词：基于社区的; 合理利用; 替代生计; 西畔山洲垸; 案例研究; 洞庭湖; 退田还湖