ECOSYSTEM-BASED ADAPTATION THROUGH SOUTH-SOUTH COOPERATION

GOOD PRACTICE CASE STUDY

Paddy Land-to-Dry Land programme in the Miyun Reservoir Watershed of China's capital region

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Since 2006, Paddy Land-to-Dry Land (PLDL) programme has been implemented in the Miyun Reservoir Watershed to relieve Beijing's water crisis as inflows into the reservoir have decreased significantly due to both agricultural development and reduced precipitation. In the programme, local governments and communities in the upstream of Miyun Reservoir made efforts to convert the flood-irrigated rice paddies to dryland cultivation, with financial compensations by the Beijing government. So far, all 6,867 ha of rice paddies have been converted to dryland cultivation in the programme. It generated benefits of improved water quantity and quality that exceeded the costs of reduced agricultural output plus transaction cost, while both downstream beneficiaries and upstream providers gained from the programme. The PLDL programme has been successful in achieving environmental goals, as well as enhancing household livelihoods in the long run, thus contributing to improve the resilience of local communities in a changing climate.

Project outcomes

- All 6,867 ha of rice paddies converted to dryland cultivation in the upstream of Miyun Reservoir;
- Decreased irrigation water by 51.5-66.4 million m^3 per year;
- Reduced total nitrogen and total phosphorus export by 10.36 and 4.34 tons per year, respectively;
- Participants' total income increased relative to nonparticipants, although the agricultural income decreased;
- Participants' labour required for agricultural production and fuelwood use decreased, while spending on education and material assets increased relative to nonparticipants.

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Key lessons

- The PLDL programme has been implemented within the strategic framework of regional collaboration to achieve shared and sustainable goals between the upstream and downstream stakeholders.
- The programme is built on the Payments for Ecosystem Services (PES) principle. The payments made by the Beijing government annually are critical to provide incentives for upstream communities to provide ecosystem services valuable to the downstream, abate competition between the upstream and downstream for water resources, and lead to long-term shifts in livelihood activities that depend less on fragile ecosystems.
- Implementing PES programmes requires sensitive considerations, taking into account household livelihood dynamics and behavioural responses to incentives provided to ensure a fair compensation.

GOOD PRACTICE DESCRIPTION

LOCATION: Chengde and Zhangjiakou, two municipalities in China's Hebei Province with land area in the upstream watershed of Miyun Reservoir

IMPLEMENTATION PERIOD: 2006-2020

OPERATIONAL BUDGET: CNY 6,750 per ha per year during 2006-2007; CNY 8,250 per ha per year during 2008-2015; and CNY 10,500 per ha per year during 2016-2020, plus the transaction and programmatic costs about CNY 1,053 per ha per year

KEY STAKEHOLDERS: The governments of Beijing Municipality and Chengde and Zhangjiakou municipalities of Hebei Province

Background information and climate change vulnerabilities

The Miyun Reservoir is located in the northeast of Beijing, China. It is one of the major surface water sources of domestic water in the nation's capital city, covering a surface area of 188 km^2 with a storage capacity of 4,317 million m^3. The reservoir controls an upstream watershed with a drainage area of 15,800 km^2, of which only one quarter is located in Beijing and the remaining three-quarter in the neighbouring Hebei Province. The watershed has a semiarid, continental monsoon climate with annual mean temperature of 9–10 °C and annual mean precipitation of 489 mm, while summer precipitation from June to September accounts for more than 80% of the annual precipitation. The elevation ranges from 150 to 2,400 m and the topography is characterized by mountains with steep slopes and deep valleys. About 880 thousand people live in the watershed, of which more than 90% are engaged in agricultural work.

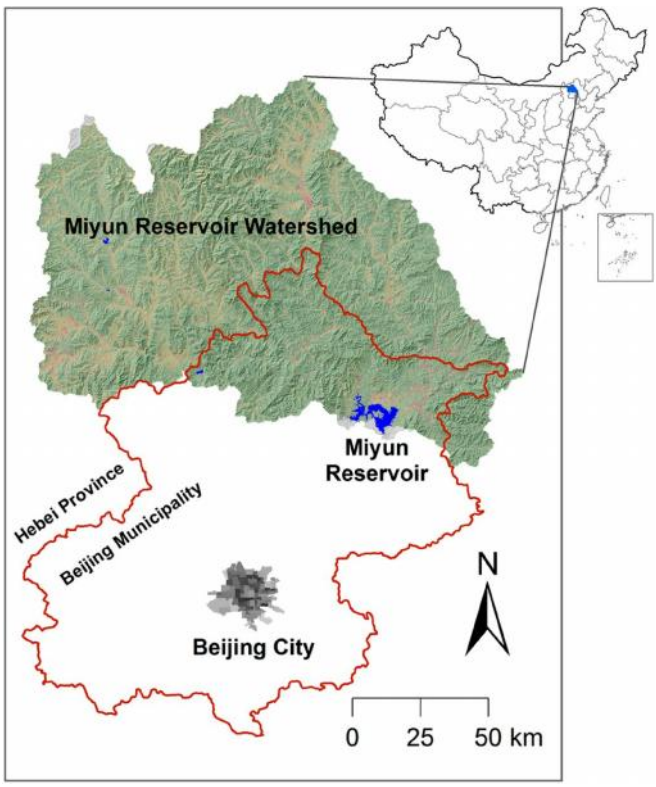

Figure 1: Miyun Reservoir Watershed (© Zheng et al., 2013)

From 1960s to 2000s, inflows into the reservoir have decreased by about 70% (~160 million m^3 per decade) due to upstream water withdrawals for agriculture and reduced precipitation due to a warmer and drier climate. At the same time, total nutrient concentration has increased by 3-4 times in the reservoir due to agricultural non-point-source pollutants. It is always a great concern for the government of Beijing Municipality to prevent the Miyun Reservoir from the decline in water quantity and quality, in order to meet Beijing's demand for water of a growing population.

Intervention technologies

In 2006, Beijing and Hebei Provinces jointly initiated the Paddy Land-to-Dry Land (PLDL) programme that aimed to increase water yield and reduce nutrient loads in the Miyun Reservoir. According to the agreements signed between Beijing Water Authority and Chengde and Zhangjiakou Municipalities, local governments and communities in the upstream of Miyun Reservoir made efforts to convert the flood-irrigated paddies for rice cultivation to dryland cultivation. Instead of growing rice, farmers were encouraged to grow dryland crops especially corn. Considering the loss in household income from converting productive rice paddies to less lucrative cornfields, the Beijing government paid an average of CNY 450 per mu[1] (CNY 6,750 per ha) per year for the converted land. The payments were increased to CNY 550 per mu (CNY 8,250 per ha) per year in 2008 and to CNY 700 per mu (CNY 10,500 per ha) in 2016.

Figure 2: Flooded rice paddies on steep slopes often contribute to decreased water quality and quantity. (© Brian Robinson / McGill University)

[1] 1 ha = 15 mu

Description of the results

Since the spring of 2007, all 103,000 mu (~6,867 ha) of rice paddies have been converted to dryland cultivation in the upstream of Miyun Reservoir. The vast majority switched to growing corn, while others turned to growing wheat, millet or potato. In total, 155 villages within 25 rural townships of Zhangjiakou and Chengde participated in the PLDL programme. It was estimated that the programme decreased irrigation water by 51.5 - 66.4 million m^3 per year. From a water balance perspective, the programme increased water yield by 18.2 million m^3 per year, which was calculated as the difference in evapotranspiration between paddy fields and cornfields. The programme reduced total nitrogen (TN) and total phosphorus (TP) export by 10.36 and 4.34 tons per year, respectively, which was calculated by using the average ratios of TN and TP loss with runoff and household data in 2011 on the amount of fertilizer use for each crop. The value of increased water yield and improved water quality was estimated to be about 1.5 times of the opportunity costs (i.e. costs of reduced agricultural output) of the upstream farmers plus transaction costs. Generally, the programme is regarded as successful in improving water quantity and quality in the Miyun Reservoir.

GOOD PRACTICE ANALYSIS[†]

Political ownership, collaboration and approval

How has the project secured support from political-level stakeholders and aligned its activities with wider development agendas to trigger further collaboration opportunities?

Since 2001, Beijing Municipality and Hebei Province have jointly initiated a series of regional collaborative activities. Through those activities, the Beijing government provides fiscal transfer payments, policy and technical support for socioeconomic development in underdeveloped areas of Hebei. The PLDL programme shows the political resolve of both sides to achieve shared and sustainable goals, that is, to protect critical water sources while sustain local livelihoods. It has been included as part of regional collaboration agreements between Beijing and Hebei to integrate conservation into their collaborative efforts for regional development. In 2006, Beijing and Hebei signed a memorandum of understanding to enhance their collaboration in economic and social development, clearly putting forward that Beijing would provide financial support for the PLDL programme and afforestation for water source conservation in the Miyun Reservoir Watershed. The commitments were reaffirmed in the subsequent intergovernmental conservations, especially under the framework agreement on Beijing-Hebei collaboration signed in 2010 and then renewed for the period of 2013-2015. It's worth noting that, at the end of 2015, the Chinese government released a national plan for the coordinated development in the Beijing-Tianjin-Hebei region. Oriented by this development plan, the PLDL programme has been highlighted as one of the key programmes during 2016-2020 for ecological conservation and restoration in Chengde and Zhangjiakou municipalities.

Financial sustainability

How has the project secured financing for sustaining and/or expanding its impacts beyond the initial project lifetime? Explain how the project secured national (e.g. government) and international (e.g. international donors) support for sustaining its impacts.

The PLDL programme has been built on payments for ecosystem services (PES). The PES approach establishes a financial relationship between the providers of ecosystem services in the upstream and their beneficiaries in the downstream. It offers incentives for upstream communities to provide ecosystem services valuable to the downstream and abates competition between the upstream and downstream for water resources. More importantly, it is potential to increase household's cash income and lead to long-term shifts in livelihood activities that depend less on fragile ecosystems. As mentioned above, payments have been made by the Beijing government annually during 2006-2015 within the strategic framework of Beijing-Hebei collaboration. Since 2016, payments by Beijing have been increased not only to support the PLDL programme, but also to launch programmes for the development of green and ecological corridors and clean-type small watersheds in the upstream of Miyun Reservoir. These programmes are complementary to each other in terms of sustaining their impacts on conservation and development in the watershed.

[†] This analysis is based on the "principles of good practice" developed by the EU/FP7-funded project AfriCAN Climate (2011-2014). These principles represent critical cross cutting issues shared by the majority of climate change projects, regardless of focus, scope and scale. They are intended to encourage critical reflection and help project developers and decision-makers draw out relevant lessons. Source: http://africanclimate.net/en/good-practice/8-principles-good-practice

Achieving co-benefits and balancing trade-offs

How were the costs and benefits external to the project taken into consideration, e.g. on employment, environment, health, poverty levels, food security etc? Explain how the project aimed to maximizing external co-benefits from project activities and avoid/minimizing external costs and damages.

The PLDL programme has achieved beyond environmental goals. It has created significant impact on livelihoods, through changes in livelihood portfolios and changes in household production and consumption activities. Household survey data from 2011 shows that, between 2006 and 2010, the PLDL participants' agricultural income decreased relative to nonparticipants, but remittance income increased. Those participants also decreased their labour for agricultural production and fuelwood use while increased spending on education, coal, liquefied petroleum gas, and material assets like televisions, motorcycles and cars relative to nonparticipants. These changes in the structure of household income and labour can help improve overall household living conditions. Interestingly, the survey data indicated that participants did increase rates of fertilizer application significantly, especially phosphorus, compared with nonparticipants. It may offset some of the desired effects of the PLDL programme. However, reductions in nutrient export to surface water prevail; therefore, the programme still has a positive net impact on water quality. In recent years, the local governments of Zhangjiakou and Chengde have initiated a combination of policy measures and demonstration projects for the promotion of green organic farming and high efficient water use in agriculture, which may improve the livelihoods aspect of PLDL programme in the long run.

Monitoring and Evaluation

How has the project demonstrated its impacts in terms of achieving objectives, outcomes, and outputs? Explain how M&E plans were developed, and how effectively they have been applied.

The PLDL programme is led by the local governments to distribute payments to participating households based on bottom-up reporting on the converted land area. Since its inception, water resource managers and the public are interested to understand the full impacts of the programme. In 2010, the Beijing government issued a benefit evaluation report of PLDL programme to review the implementation of the programme and evaluate its economic benefits. In recent years, several studies have been conducted to evaluate the programme's environmental benefits and costs, impacts on household livelihoods, as well as farmers' willingness to support and participate in the programme. Recommendations have been made in these studies for fair compensation and enhanced regional cooperation.

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