HARVESTING OF CROPS IN INLAND WETLANDS

Josef Settele
UFZ – Helmholtz Centre for Environmental Research, Germany

Keywords: irrigated rice, socioeconomy, Philippines, Ifugao, primary forest, land-use dynamics, land-use scenarios, landscape level

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Summary

Changes of the inland wetland systems (in which crop production is of relevance), combined with the continuous adaptation of people to new conditions are inevitable and ongoing. Projects and plans aimed at improvements have no easy task, as the space for optimization in subtly balanced traditional systems might be rather small. Improvements that are too enthusiastic may accelerate the system's destruction. It is of major importance to enhance creativity and the openness to small-scale experiments of local people, instead of bringing in numerous solutions of vague applicability from outside. These are conditions that have to be generally accepted and which should be a guideline for all future activities.

Development of crop production in inland waters has to consider the socioeconomic context in which local development is driven. Scenarios and development plans are implicitly based on socioeconomic conditions and assumptions or predictions of the future development of these conditions. Thus, socioeconomy is of basic relevance for all future development directions and has to be regarded as an integrated part of the conservation of biodiversity within (wetland and other) agricultural systems, as humans are an integral part of these.

The most challenging task for future agroecological activities, however, is the combination of approaches to integrate socioeconomy and field ecology. This should always be tried on a landscape level, as it becomes obvious, especially in wetland systems, that water supply as an inevitable precondition depends on landscape compartments far beyond the crop-production areas. The case study of the Philippine province of Ifugao (with its famous irrigated rice terraces) shows how to move into this direction. Hopefully, we will be able to strengthen such approaches and thus achieve positive results for the integration of biodiversity and (wetland) crop production.

1. Introduction–Rice: The Globally Dominant Crop in Inland Wetlands

If one looks at the issue of crop harvesting in inland wetlands on a global scale, and if one refers to crops in the strict sense of agricultural crops, there is nearly nothing more important than wetland rice in this context. Due to their extremely low relevance, small-scale systems like the growth of watercresses (*Nasturtium*) in Central Europe or production of taro (*Colocasia*) in the tropics will not be further treated here.

2. Classification of Rice Culture

Rice culture is classified according to water regimes into upland systems with no standing water (not of relevance within this contribution), lowland systems with 5–50 cm of standing water, and deepwater and floating systems with more than 51 cm to 5–6 m of standing water. Figure 1 shows the world’s rice land classification by water regime and predominant rice types.

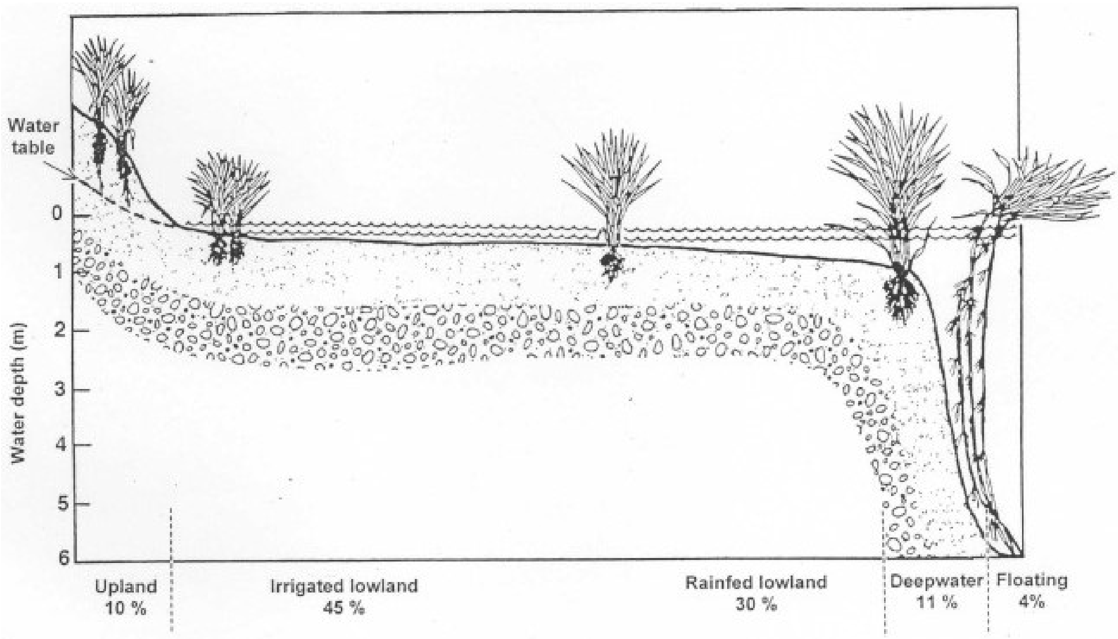

Figure 1: Global rice land classification by water regime and predominant rice types; (*Source:* DeDatta S. (1985.) *Principles and Practices of Rice Production;* 618 pp. New York: John Wiley and Sons) (slightly modified)

In many rice-growing areas of the tropics, particularly in South and Southeast Asia, the year is divided into fairly distinct wet and dry seasons. In most areas, the bulk of the rice is produced in the wet season and dependence on rainfall is the most limiting production constraint for rainfed rice culture. Because rainfall received during the dry season is not enough to grow a crop of rice, rice grown in that season is entirely an irrigated crop and, because development of irrigation facilities is costly and moves slowly, the area planted to rice in the dry season is limited.

In all of the rice-growing countries in Asia, lowland rice culture is the most predominant system, while in Africa and Latin America (which only make up a small percentage of global rice production) upland culture dominates. About 30% of the world's rice is grown as rainfed lowland and about 45% as irrigated lowland (see Figure 1).

Only 32% of the rice-growing area is irrigated, but it produces ~50% of the rice in South and Southeast Asia. More than 20% of the irrigated area is double cropped and the rest is single cropped. In temperate Asia (China, Japan, and Korea) most rice land and in the United States, Europe, and Australia, the entire rice land is irrigated. In those temperate countries, rice is not grown if irrigation water is not available.

3. Historical, Present, and Future Policy to Manage Rice Crops in Inland Wetlands with Respect to Biodiversity, Exemplified with a Case Study of Irrigated Rice Terraces in the Philippines

3.1 Selection of and Introduction to the Case-Study System

Due to the dominance of irrigated rice crops, this contribution will entirely focus on them as the most relevant representative in the context of inland wetlands. Furthermore, to show the interactions of management and biodiversity, which also includes many socio-economic, cultural, and thus historical aspects, the contribution will concentrate on one integrative case study where all the different aspects and consequences of future management scenarios can be exemplified. For this purpose (and due to the long-term experience of the author) the rice terraces of the Philippine province of Ifugao have been selected. As they are flooded throughout the year they also represent real (human-made) inland wetlands.

Figure 2: Impression of the typical clay-walled rice terraces around Banaue/Ifugao in Northern Luzon/Philippines; (*Picture: J. Settele*)

Because of their uniqueness (compare Figures 2 and 3) the rice terraces of Northern Luzon have been designated as a World Heritage Site by the UNESCO. Throughout the centuries, the people of Ifugao have shaped this landscape and thus created a permanent basis for living. The village structure, with small groups of houses usually scattered across the terraced landscape, allows production and consumption of food in the same landscape units. Therefore, nutrient cycles are often regarded as more-or-less closed. This guarantees sustainability. One important component of this balanced system and its surrounding landscape is a high biodiversity, compared to other agricultural landscapes.

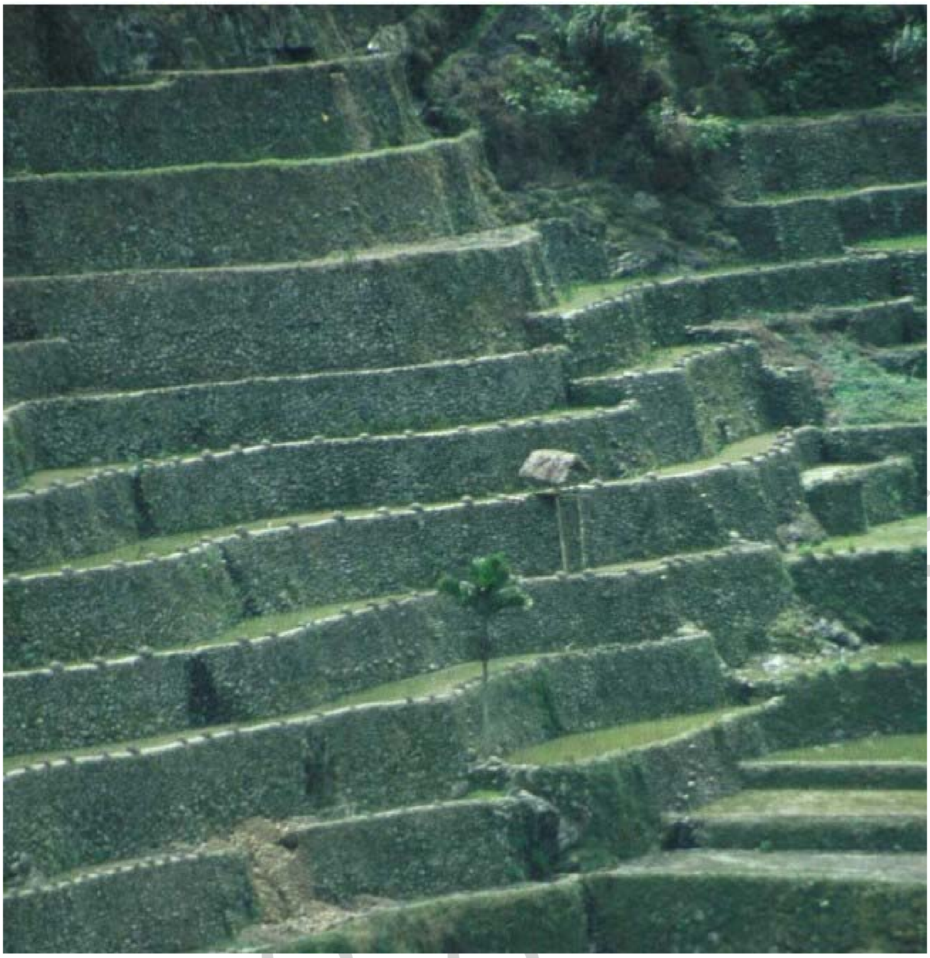

Figure 3: Impression of the typical stone-walled rice terraces around Batad/Ifugao in Northern Luzon/Philippines; (*Picture: J. Settele*)

However, population growth, improved education, and hope for better living conditions in other regions are causing drastic changes. Documentation of the traditional system and analysis of its ecology was the aim of recent research within the system (see bibliography for examples). These, together with investigations on the effects of changes of agricultural practices, form the basis for recommendations to direct developments in order to continue sustainable use of those ecosystems in the future. This contribution summarizes the present state of knowledge and, derived from that, tries to deduct some general conclusions for future management policies.

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Biographical Sketch

Josef Settele, born in 1961, did his PhD in agricultural sciences. His thesis dealt with the effects of land-use changes on the community structure and dynamics of invertebrates in Philippine rice terraces. From early childhood he was fascinated by insects and entomology became the guiding light for his career. His second interest is invertebrate conservation biology with a strong focus on butterflies as model organisms. He passed his habilitation in landscape and agricultural ecology with a grid-based modeling study on butterfly metapopulations. Since 1993, he has been employed at the UFZ - Helmholtz Centre for Environmental Research,, where in 2001 he changed from the Department of Conservation Biology and Natural Resources to the Department of Community Ecology, where he became head of the animal ecology section. Since 2002 he is adjunct professor of Ecology at the Martin-Luther-University Halle-Wittenberg. He teaches different topics within ecology for students of biology, ecology, and agriculture at several German universities. He coordinates and/or is otherwise involved in several multidisciplinary and international research projects dealing with land use, nature conservation and biodiversity. He coordinated the EU project ALARM (Assessing LArge scale environmental Risks for biodiversity with tested Methods), which consisted of a global network of 68 partner institutions in 35 countries (www.alarmproject.net).