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# Indigenous farmers' perceptions of problems in the rice field agroecosystems in the upper Baram, Malaysia

Alexander Hollaus<sup>1</sup>, Christoph Schunko<sup>1</sup>, Rainer Weissshaidinger<sup>2</sup>, Poline Bala<sup>3</sup> and Christian R. Vogl<sup>1\*</sup>

## Abstract

**Background:** Rice field agroecosystems produce food for more than half of the world's population and deliver important services supporting farmers' livelihoods. However, traditional rice field agroecosystems are facing a variety of problems, including pests or markets that are hard to access. This research explored indigenous farmers' perceptions of the problems, their causes and consequences, and the solutions applied to address them in the rice field agroecosystem. Furthermore, the study investigated how indigenous farmers related these problems to the surrounding landscape elements and to microzones in the fields.

**Methods:** Data were collected in two villages in the upper Baram, Sarawak using a qualitative approach that included sketch drawings and face-to-face interviews. Forty-three indigenous farmers of the Kenyah, Penan and Sa'ban ethnic groups were interviewed in their rice fields. The sketch drawings were used to identify the perceived landscape elements, while the oral interviews were employed to identify perceived microzones. Furthermore, the interviews elicited the perceived problems in the rice field agroecosystem and their relations to landscape elements and microzones.

**Results:** The findings identified a total of nine environmental problems, e.g. animal disturbance, six social problems, e.g. difficult to access farm inputs, and eight agricultural technology system problems, e.g. poor soil quality, with some found to be rooted in complex causes and affecting agricultural productivity. While some problems were perceived at field level, microzones were frequently used as sub-field indicators of the problems. The surrounding landscape elements were perceived as both a source of the problems and as a means of avoiding them. To solve the problems, farmers applied preventive and reactive strategies based on traditional knowledge and scientific knowledge, resulting in a hybridisation of knowledge systems.

**Conclusions:** By including environmental, social, agricultural technology system problems and different spatial scales, this research contributes to addressing issues that can be overlooked when focusing on only one dimension of the problems. These results contribute to a better understanding of how indigenous farmers perceive, cope with and adapt to problems in rice field agroecosystems, which is important for landscape management.

**Keywords:** Indigenous and local knowledge, Landscape ethnoecology, Spatial perceptions, Indigenous agroecology, Rice field, Landscape management, Borneo

## Background

Rice field agroecosystems (RAEs) are important man-made ecosystems that produce rice (*Oryza sativa*) as a staple food for more than half of the world's population

\*Correspondence: christian.vogl@boku.ac.at

<sup>1</sup> University of Natural Resources and Life Sciences, Vienna, Department of Sustainable Agricultural Systems, Division of Organic Farming, Gregor-Mendel-Strasse 33, 1180 Vienna, Austria  
Full list of author information is available at the end of the article



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