



Institute for Plant Production
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Agrestal flora associated with
paddy rice in Nabanhe Nature Reserve
(Yunnan, PR China), as affected by
altitude and management.

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5. Summary

Aim of this study was to characterise the structure of associated vegetation in paddy rice of NabanHe Nature Reserve, located in subtropical-tropical transition zone, Xishuangbanna, southern Yunnan (PR China). As part of an interdisciplinary project (<http://lilac.uni-hohenheim.de/>), researching the impact of the ongoing land use change in tropical China, the investigation of rice's agrestal flora and husbandry should help for a better understanding of the agro-ecosystem's ecological status and the underlying interactions between rice field-management and associated vegetation. Five sites, ranging from 600 to 1000 meter above sea level, were surveyed according to Braun-Blanquet. Cluster analysis, diversity measurements and interviews with farmers, displaying methods of analysis.

On the basis of the interviews, rice field cultivation in NabanHe Nature Reserve depends on the fields' altitude level and probably also on the farmers' ethnic group, correlating with the former factor (less data). Only in the lowlands (New Houses, Pabin), machines were used for husbandry, whereas on hillside fields farmers worked their fields only manually. Local rice varieties were cultivated in low extent mainly for cultural issues (sticky rice). The bulk of the seeds were provided from an external agricultural station (Gadong), being a high-yielding variety. Pesticides and mineral fertilizer were applied to a wide extent, indicating a high-input-agro-ecosystem regarding nutrients and pesticides. Unfortunately, only Chinese names of used fertilizers and pesticides are on hand but the behind agents and ingredients are still unknown. The ongoing land use change due to rubber plantation has also impact on paddy rice husbandry, expressed in husbandry negligence and fallow during the dry season.

Rice field associated vegetation consisted of 78 identified species, belonging to 24 plant families, whereof more than 30% were monocots (Poaceae + Cyperaceae) and only 5 families included over 50% of species. The current agrestal flora was characterized by the dominance of only a few species. Important rice weeds were *Rotala rotundifolia*, *Cyperus pulcherrimus*, *Spilanthus paniculata* and *Byxa aubertii*, whereas on dikes *Ageratum conyzoides*, *Fimbristylis miliacea* and *Spilanthus paniculata* showed the highest impact.

There is only little information about these important rice weeds, like habitat requirements, origin and global distribution, indicating their primarily local importance.

However, especially the dike flora was characterized by numerous well-known pantropical species, whereof many are not native to South-East-Asia. These species' appearance suggests a highly anthropogenic influenced ecosystem, with impacts of global agricultural trade.

Interestingly, an unknown Asteraceae which could not be identified by local botanists was very abundant in the nature reserve. According to them, this species occurred only recently a few years ago and probably displays a new invasive species.

Comparative analysis in diversity has shown a high heterogeneity of NabanHe's rice fields. The appearance and dominance of rice weeds seems highly influenced by the husbandry and altitude level, which were correlated with ethnic groups, difference in field size and infrastructure. Generally, fields of higher altitude showed a higher number of species and a higher diversity, whereas dikes' diversity and species richness did not differ notably. However, the most and less divers sites were located at the same altitude level (Mandian), reflecting the heterogeneity of husbandry. Most species appeared at the highest point of investigation (Research Station).

Cluster analysis of the field plots showed a clear dissimilarity between the upper and lower sites, whereas dike plots did not show a clear grouping/dissimilarity according to altitude. However, the present study can not claim further conclusions about the underlying environmental factors and gradients interacting with the surveyed vegetation.

Therefore, further studies should investigate the environmental factors, especially the pH, conductivity and nutrient availability of water and soils. Due to the observed low appearance of animals, especially insects, ecotoxicological measurements, regarding pesticides like DDT, also seem reasonable. Further vegetation surveys at other seasons, especially during the flooded period of rice fields, are also relevant for a complete overview of the occurring associated vegetation of rice. Research on possible interactions between rubber plantations and the agrestal flora of rice are considered as worthily. Since there is only little knowledge about the most important rice weeds, *Rotala rotundifolia*, *Spilanthes paniculata*, *Cyperus pulcherrimus*, and a possible new invasive species, further investigation about these species is needed for a better understanding of NabanHe Nature Reserve's ecological condition.