

# **Master Thesis**

*In the study program "Environmental Management"*

## **Assessing the Provisioning Ecosystem Service Food Rice and its Linkages to Human Well-being in Lao Cai and Tien Giang Province of Vietnam**

Presented by

**Lê Thùy Dương**

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1<sup>st</sup> examiner: PD Dr. Benjamin Burkhard

2<sup>nd</sup> examiner: Prof. Dr. Felix Müller

Institute for Natural Resource Conservation

Faculty of Agricultural and Nutritional Sciences  
Christian-Albrechts-Universität zu Kiel

## **Abstract**

Population growth in Asia lays a stress on rice production to ensure food security for 60% of the world's population. In order to enable sustainable development of rice production, it is crucial to investigate human well-being of the rice farmers and reveal connections of the provisioning ecosystem service food rice and human well-being. As Vietnam is one of the largest rice producers and exporters in the world, the study chose Lao Cai and Tien Giang provinces of Vietnam as the research regions. Indicators were used in this study as tool enabling the assessment of human well-being and the provisioning ecosystem service food rice in the past and present.

Face-to-face surveys were conducted in Lao Cai in April 2013 and in Tien Giang in May 2013. Data from the statistical database of the General Statistics Office of Vietnam and data from the survey were analyzed to find out trends of each indicator. The adapted indicator sets were used in a pilot attempt to assess human well-being and the provisioning ecosystem service food rice in the study regions. Trends of human well-being of rice farmers and the provisioning ecosystem service food rice in each region and the conceptual linkages between the two domains are the outcomes of this study.

*Keywords: Human well-being, provisioning ecosystem service food rice, indicator, linkages, rice production, Lao Cai, Tien Giang.*

## 5. Conclusion

The first main outcome of this study is the final indicators set to evaluate *human well-being* of rice farmers and the *provisioning ecosystem service food rice* in Lao Cai and Tien Giang. The proposed indicator set was developed using the studies *How's life?* (OECD, 2011) and *Conceptualizing the link between marine ecosystem services and human well-being: the case of offshore wind farming* (Busch et al., 2011) as guidelines. Implementation of the indicator set in the research regions showed some difficulties and obstacles which led to adaptations of the indicators. The adapted indicator set includes new indicators and omits the indicators which were proven to be inapplicable in the study areas. After the adaptation of the indicator set, all the proposed categories of human well-being were covered, except the education category. There was no available data from the survey and the statistical database related to the indicators of education. The adapted indicator set is a compromise between the ideal indicators set and the practical conditions found in the study regions.

The indicator set is applicable to quantify the trends of *human well-being* and the *provisioning ecosystem services food rice* in Lao Cai and Tien Giang. Economic well-being, health and personal well-being in both regions were increasing during the ten years of the study. The development of social well-being was not clear. However, there was an extension of urban population in both areas. The quality of the environment, i.e. natural water quality and air quality decreased in Lao Cai. In Tien Giang, the air quality remained the same from 2002 to 2012, while the natural water quality degraded. Even though there were obstructions in data collection, the obtained data from the survey and statistical database were valuable to derive the trends of the indicators. However, it is suggested that more detailed studies on each indicator should be conducted to enable the achievement of more profound insights.

In this study, the direct linkages between the *provisioning ecosystem services food rice* and the environmental quality, health, social well-being and economic well-being dimensions of human well-being were identified. The linkage of the *provisioning ecosystem services food rice* to personal well-being was indirect via economic well-being. The conceptual model of the linkages applies to the study regions condition. In order to generalize the conceptual model to other regions, it is proposed to carry out quantitative indicator assessments.

Regarding suggestions for the future development of Lao Cai and Tien Giang, it is recommended to take the rice farmers and their benefits as the focus of development in the regions. More systematic management of fertilizer and pesticide use should be implemented in parallel with transferring more knowledge of the paddy field ecosystem to the farmers.

Better understanding of farmers and effective guidelines from local authorities would lead to more sustainable development in the regions. In Lao Cai, the interviewed farmers were poor and only had limited accesses to equipment, inputs and training in rice cultivation. More effective support from the government is needed in the region. In Tien Giang, it is important to help the rice farmers balancing the rice production with the development of other plants that bring higher sources of income.

This study hopes to contribute its work to the indicator assessment of the LEGATO project as a small move forward in comprehending how ecosystem services and human well-being are influencing each other. Moreover, the findings of this study are promising to give a hand in the development toward more sustainable rice agriculture in Tien Giang and to ensure food security in Lao Cai.