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Modelling and Measuring the Economic Success of Farming Families Using Remote Sensing and GIS: A Case from Mountains of Nepal

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Abstract

Development of socio-economic condition in many mountainous areas of Asia mostly influenced by their spatial position. Socio-economic differentiation across the spatial gradient is due to the differentiation of resource availabilities, management, availability and the condition of infrastructure. The co-existence between biophysical and socio-economic condition raised the question whether a relationship between these two sectors and which factors determine the future development. This paper presents the methodology to model the economic success of farming-families and measures the impact of development strategies on economic success using spatial models.

Socio-economic conditions were assessed based on a survey with in-depth interviews with randomly sampled families. Biophysical and infrastructure data and satellite images were analysed in image processing and GIS. Road infrastructures were analysed using cost weighted distance model and land quality indexes were prepared. Socio-economic data were integrated in GIS by means of interpolation. GIS based regressions were constructed to establish the functional relation between economical and biophysical variable. Model results were compared with the survey results and based on the relation impact of assumed improving and worsening environment to the economic success were tested and presented.

Model shows economic success of farming families (farm family income) can be estimated through the biophysical variables (cost distance to market, land quality indexes and land productivity. Improvement of land quality through soil conservation shows the promising results in the currently low-income areas. Similarly, development and improvement of the road network, water management and combined strategies show their impact will be highest in the remote areas that are currently least accessible, low income. Water management strategies show an increment of annual income by 71–95 % to those of upland agricultural areas, which has currently no irrigation. Combined strategy of water management and road network shows an increment of income by 90–160 % for the low-income areas. Soil degradation scenario shows income loss would be higher around currently low-income areas in future, if current situation continue. In conclusion, if the tested strategies will be implemented an improvement of economic conditions, in the currently disadvantaged areas with low levels of natural resource endowment and economic success, could be achieved.

Keywords: Farm family income, GIS, Nepal, remote sensing, spatial differentiation, spatial modelling

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