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Crop Yield Responses to Climate Change in Nepal

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Abstract

Crop yield in rainfed agriculture depends highly on seasonal climate patterns. The empirical relationships between crop yield and seasonal climate variables are important for predicting agricultural production. The study assesses the effects of seasonal climate variables on crop yield and the uniformity of effects across crops, growing seasons and regions in Nepal. Three tropical districts (Banke, Chitwan and Morang) in three regions (western, central and eastern) of Nepal and seven major crops as rice, maize, wheat, potato, lentil, chickpea and rapeseeds were considered. The observed district level average data of crop yields and seasonal climate variables (rainfall and temperatures) during 1976 to 2011 were considered for the regression analysis. A multivariate regression (time series) analysis was employed to evaluate the empirical relationships between crop yield and seasonal climate variables. The dependent variable in the regression equation was the first difference (change) in crop yield (ΔYield). The independent variables in the regression equation were the first differences (changes) of total seasonal rainfall, average seasonal maximum temperature, average seasonal minimum temperature, standard deviation of monthly rainfall, standard deviation of monthly maximum temperature and standard deviation of monthly minimum temperature. The regression analysis was done for each crop across corresponding growing season and district. The regression results yielded with the coefficient of determination (R^2) value ranges from 0.07 to 0.61. The regression results show that the climate variables significantly influence the crop yield, but not uniformly on all crops and in all growing seasons and districts. Increase or decrease of maximum and minimum temperature shows heterogeneous effects on yield of some crops. Deviations of climate variables within growing seasons also show heterogeneous effects on crops yields. The study concludes that the climate variables and their deviations across growing seasons are the important determinants of the crop yield. The effects of seasonal climate variables on crop yield depend on crop types, growing seasons and regions. The effects can be significantly positive or negative or insignificant. It is, therefore, difficult to generalise the effects of climate variables on crops yields.

Keywords: Climate change, climate variables, crop yield, regression analysis

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