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Impact of Climate Change on Livestock Production in Pakistan Using Statistical Copulas

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Abstract

Livestock is produced on the world's largest land resource, covering 45 % area, which is mostly in harsh and vulnerable environment unsuitable for other purposes. Climate change can adversely impact livestock's natural resource base, quantity as well as quality. In Pakistan, livestock is the first largest sub-sector of Agriculture. It contributes 58.55 % to agriculture value addition and 11.60 % to the national GDP. Further, the country is the fourth largest milk producer in the world. Around 90 % of small ruminants are being reared by resource poor farmers. This sector is not only main source of livelihood but also provides financial security to small farmers. However, the country is ranked seventh among the top ten climate affected countries, therefore, climate change is considered a significant threat for sustainable livestock production of the country. Higher temperatures may decline livestock production by reducing animal weight gain, reproduction, and feed intake. Though the relationship between temperature and livestock production is assumed to exist at their extreme tails of distributions. Therefore, this study employs copula technique to model tail risk between climate change vulnerabilities and livestock production. FAO data of temperature (°C), livestock production index (US$) and milk yield (tonnes/milking animals) from 1972 to 2014 were used. Static and time-varying copulas are used to jointly model temperature with livestock production and with milk production. The best-fitted copula was time-varying t copula. The results revealed that increased temperature volatility due to change in climate is likely to influence the livestock production and milk yield negatively. As livestock is vital to eliminate food insecurity and rural poverty, it is necessary to identify and implement climate change mitigation strategies and solutions.

Keywords: Climate change, copula, livestock production, milk, Pakistan, temperature

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