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Socio-economic vulnerability, adaptation to agro-climatic risk and the potential of user-tailored climate services for the Andean Highlands: The case of quinoa production in the region of Puno

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In the semi-arid Altiplano in Peru, smallholder farmers are extremely exposed to climatic hazards like drought, frost and hail. These unfavorable weather and climate events can lead to significant crop losses and thereby provoke periods of food insecurity for subsistence farmers. The use of specific climate information can serve as an adaptation strategy to reduce the impact of these natural hazards. In this context, the Climandes project (a project of the Global Framework for Climate Services led by WMO) aims at developing user-tailored seasonal forecast products for the agricultural sector in the Peruvian Andes such as indices on increased frost risk, the occurrence of long dry periods, or the start of the rainy season.
In order to develop such user-tailored climate information and link it efficiently to the existing implementation context, it is important to understand the complex interrelation between climate variability and change, socio-economic vulnerability and adaptation limits. Moreover, as it has been widely shown, the process of making climate information useful for end-users, in particular for smallholder farmers in developing countries, remains a considerable challenge due to existing cognitive, cultural and institutional constraints. In this sense, it is necessary to identify these constraints and formulate strategies to overcome them.
While there exist different studies about climate change and anomalies in Puno, there is no consolidated evidence on the corresponding socio-economic vulnerabilities in the specific agricultural context of Puno. In order to fill this gap, we conducted a field survey collecting primary data in the Andean highlands based on a representative sample of 726 smallholder farmers in the region of Puno (Peru). The assessment primarily focused on exploring smallholders' agro-climatic risk exposure, socio-economic profiles, existing coping strategies as well as prevailing barriers to utilization of science-based climate information. The study was complemented with an artefactual experimental game performed with 176 smallholders to identify and describe their risk preferences. The existing economic literature shows that farmers' risk preferences generally play a decisive role for agricultural decision-making indicating the importance of understanding farmer's risk profile when evaluating the potential use of climate information at the individual level.
First results indicate that smallholders in the region are regularly exposed to extreme weather events such as frost, hailstorms and droughts. Under these conditions, farmers often do not have the capacity and sufficient resources to prevent periods of food insecurity at the end of the growing period. Hereby climate information can support the agricultural production decisions and improve food security but only if developed in close collaboration with the end-users.