Guest editorial

Climate change impacts and adaptations in arid and semi-arid regions

More than a third of the Earth is covered by arid and semi-arid climates, with many regions already intolerable for human beings. The environment and ecosystems in these regions are very fragile and sensitive and have high drought risks. Climate change is causing serious water scarcity, heat waves and other disasters today and in the near future, leading to reduction in food security and agricultural productivity. Transboundary rivers from the glacial mountains and humid climate zones are often the only sources of water in arid and semi-arid lands. Because of extreme differences in topographical features, altitudes and atmospheric conditions, climate and environmental conditions vary considerably across arid and semi-arid regions. However, there are limited special issues focusing specifically on climate change on arid and semi-arid regions. This issue of *International Journal of Climate Change Strategies and Management* will fill this gap and will make the community of practice aware of disastrous consequences of climate change on arid and semi-arid regions and offer innovative approaches toward a sustainable environment.

Recent climate change has exacerbated water scarcity and then affected agriculture practices and outputs significantly, especially in arid and semi-arid regions, which possibly further lead to the pervasion of poverty in developing countries. Known adaptation and mitigation strategies adopted by farmers include alteration in crop production, soil and water management, land use and livestock management (Shanabhoga *et al.*, 2020). Since farmers' agriculture production decision is a careful trade-off between risk minimization and profit maximization simply based on their perceptions of climate disasters, discrepancies between farmer perceptions and climatological evidence will negatively impact on farmer adaptation options and outcomes. Rapholo and Lawrence (2020) investigated a South African case and found that age, level of education, farming experience and accessibility to information influenced the likelihood of farmers to correctly perceive climate variability. Especially, coping and adaption strategies of over one-third of the farmers could be negatively impacted by wrong perceptions of climate variability. As a solution, Rankoana (2020) recommended community-based practices on restrictions and regulations on rural water consumption from the reticulation system to minimize potential drought risks and ensure water security under climate change. Shanabhoga *et al.* (2020) investigated an Indian case and confirmed the similar fact, i.e. different farmers practiced different adaptation/mitigation approaches in adopting these adaptation strategies because of their knowledge, expertise and availability of resources. Huang *et al.* (2020) investigated a Chinese case and revealed that farmers' adoption of soil and water conservation measures in the arid Loess Plateau of China is directly linked with the level of soil erosion, government subsidies and cultivated land area. To speed up the adoption process of modern agricultural technology to minimize negative impacts of climate change on arid regions of China, Tong *et al.* (2020) also worked on a Chinese case and proposed to establish a price difference insurance system for

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agricultural production, improve the risk responsibility management ability of vulnerable families and support the risk-sharing function of informal institutions.

Except for agriculture, recent climate change also affects grassland ecosystem in arid and semi-arid regions through excess atmospheric nitrogen deposition. Except for temperature and precipitation, nitrogen deposition has become the most important environmental factor affecting the productivity, community structure, species diversity, nutrient cycling and other ecosystem functions of grassland ecosystems. Liu *et al.* (2020) revealed how nitrogen deposition regulates the clonal growth of *Leymus chinensis*, a typical clonal plant in arid and semi-arid regions. This study provides an assessment for the survival prediction of cloned plants under nitrogen deposition related to climate change and has important theoretical and practical significance for the sustainable management of grassland ecosystem in arid and semi-arid regions. Kang *et al.* (2020) revealed a positive correlation between grassland ecosystem service value and climate factors. Compared with the annual average precipitation, the annual average temperature was found to have a more significant impact on ecosystem service value. These findings would support sustainable planning, use and management of grassland resources in arid and semi-arid regions and help to enhance grassland region adaptive capacity to reduce climate change vulnerability. Lee and Dang (2020) revealed recent arid trend in south Vietnam that will negatively impact irrigation water for planting crops in the dry season.

The establishment of carbon markets inevitably has a huge impact on the social and economic development of arid and semi-arid regions. Li *et al.* (2020) simulated the carbon price trends under different economic development and energy consumption levels, which can help the government plan ahead to formulate various countermeasures to minimize the negative impact of carbon policies and promote the integration of arid and semi-arid regions into the national carbon market.

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References

Huang, X., Lu, Q. and Yang, F. (2020), "The effects of farmers' adoption behavior of soil and water conservation measures on agricultural output".

Kang, B., Shao, Q., Xu, H., Jing, F., Wei, X. and Shao, X. (2020), "Research on grassland ecosystem service value in China under climate change based on meta-analysis: a case study of Qinghai Province".

Lee, S.K. and Dang, T.A. (2020), "Extreme rainfall trends over the Mekong Delta under the impacts of climate change".

Li, Z., Yang, L., Li, S. and Yuan, X. (2020), "The long-term trend analysis and scenario simulation of the carbon price based on the energy-economic regulation".

Liu, L., Zhou, C., Pei, X., Guo, L., Li, J., Wu, R. and Huang, D. (2020), "Nitrogen deposition regulates the clonal growth of Leymus chinensis, a typical clonal plant in arid and semi-arid regions".

Rankoana, A.S. (2020), "Climate change impacts on water resources in a rural community in Limpopo Province, South Africa: a community-based adaptation to water insecurity".

Rapholo, M.T. and Lawrence, D.M. (2020), "Are smallholder farmers' perceptions of climate variability supported by climatological evidence? Case study of a semi-arid region in South Africa".

Shanabhoga, M.B., Bommaiah, K., Suresha, V.S. and Dechamma, S. (2020), "Adaptation strategies by paddy growing farmers to mitigate the climate crisis in Hyderabad-Karnataka region of Karnataka State, India".

Tong, Y., Sarkar, A., Lu, Q., Nurgazina, Z., Zharkyn, M. and Peau, A.K. (2020), "Impact mechanism of external shocks on farmers' adoption of modern irrigation technology: mediating role of economic vulnerability and moderating effects of risk-taking networks".