

## **The Future of Mountain Agriculture**

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## The Future of Mountain Agriculture

By Stefan Mann. Berlin and Heidelberg, Germany: Springer-Verlag, 2013. vi + 176 pp. US\$ 129.00, € 103.95. ISBN 978-3-642-33583-9.

Producing crops and livestock in mountain environments can present many difficult challenges. Compared to surrounding lowlands, highland farmers contend with shorter growing seasons, greater distance to markets, and the ever-present challenge posed by gravity. The soils are usually less favorable, and the weather more prone to extreme events that can lead to sudden disaster. These and other issues are presented and analyzed in this timely volume on the future of mountain agriculture.

The brief introduction by the editor, Stefan Mann, describes the approach for the 9 chapters that follow. Specifically, will mountain agriculture be viable over the next century, particularly as regional economics become more globalized in focus? In this new economic framework, “it is worthwhile to ask whether the system of mountain farming, in its stunning diversity, will in general continue to provide food, labor and ecosystem services” (p 2). As the world population continues to surge, the fertile lowlands of the world will produce at full tilt. But will mountain regions continue to provide crops and livestock products, or will highland practices gradually be preserved in isolated “museums” far from the mainstream economy?

The volume offers fairly equal coverage to most of the regions where mountain agriculture is found. The first chapter investigates agricultural land use and landscape change in the American Rocky Mountains—the sole focus on North America. Chapters 2 and 3 analyze recent agricultural innovations and strategies in the Andean region,

“where the challenge of increasing agricultural production while conserving or improving the natural environment has attained a sense of urgency” (p 21). The next two chapters investigate agricultural issues in the African highlands. Of these, Chapter 4 advocates for integrating traditional ecological knowledge into agricultural production in the High Atlas of Morocco, and Chapter 5 forecasts the future of farming on Mount Kilimanjaro in a time of rapid climate change. Chapters 6 and 7 move to Europe and, in keeping with the overall theme of the book, investigate how mountain agriculture will remain viable in the Pyrenees and the Alps, respectively. Chapter 8 takes a different approach, by investigating food security challenges in Tajikistan’s Pamir Mountains. The ninth and final chapter reviews the impact of natural resources and infrastructure on mountain farming in the Himalaya.

For the most part, the various authors maintain their collective focus on the future of mountain agriculture in this nascent century. Working through the book, readers find it is evident that, despite different geographical locations, mountain farmers the world over grapple with a similar mixture of challenges. These include responding to changing markets, procuring access to adequate water resources, adapting to climate change and shifting demographic traits, incorporating technology, and reacting to competition posed by other emerging forms of land use. It becomes clear that, in the developing world at least, food production is taking a back seat to the rising demands of recreation and biodiversity concerns.

Readers of edited volumes often select only the chapters that pertain to their regional geographic interest or, in this case, a specific agronomic output. Although each chapter in this edited volume can stand alone on its own good merits, the full range of shared challenges along with their regional differences is realized only by reading the entire collection. For

example, we might expect that most mountain farms in the developed world are either going out of production or are coalescing into larger contract or corporate operations, as is the case in their adjacent lowlands. The case studies from the Alps and the Pyrenees confirm this, but in the Rocky Mountains the structural change is heading in the opposite direction as land subdivision into smaller parcels is increasing the number of farms and ranches.

The authors identify and provide concrete evidence about factors that limit agricultural efficiency within mountains of the developing world. In the Nepal Himalaya and Tajik Pamir, for example, poor roads hinder the transition from traditional cropping patterns to the more market-oriented specialty production that increases family incomes. Supporting infrastructure is vital for mountain farmers, who usually make up most of the population. Because food is a global commodity, price hikes may benefit mountain farmers who have capacity to transport their harvest to large population centers. This is the case in some Andean regions. In contrast, Tajikistan still relies on food imports, so price hikes threaten food security in areas isolated by poor roads and winter snow.

Price hikes are not the only external factor influencing highland farmers. Global warming is significantly changing both the timing and volume of mountain runoff. In the case of Mount Kilimanjaro, the authors use a revenue function approach to demonstrate the relationship between climatic variables and crop productivity. They predict that warming temperatures and increasing CO<sub>2</sub> levels (which improve rates of photosynthesis) will increase maize revenues by up to 56%. On the other hand, coffee and banana production will likely decrease as water scarcity in the lower altitudes will reduce both the yield and quality of these crops. The authors believe that adapting agricultural productivity to climate change in this iconic East

African highland will require comprehensive planning.

We also learn how growing water shortages in the increasingly arid High Atlas of Morocco are threatening the sustainability of thyme (*Thymus satureioides*) collection. This evergreen herb is used both locally and in the distant population centers of Marrakech and Casablanca. In this region, the longstanding land tenure systems, a growing population, the upward march of globalization, and other cultural factors, combined with topographical challenges posed by harvesting in the still-moist higher elevations, are “jeopardizing not only the traditional agricultural manage-

ment but also endangering the traditional Berber way of life of the Agoundis valley” (p 69).

This book is a worthwhile read for anyone interested in how highland farmers are responding to the same changes that are roiling lowland agriculture. The 9 chapters are engaging and methodically researched. The authors include significant quantitative data to support their assertions on the sociocultural dynamics in their respective areas. The figures support and enhance the text, although employing better cartographic design on some of the maps have increased their usefulness. For the most part, the authors answer the

central questions presented above. After reading these case studies, readers will undoubtedly wonder about the future of mountain agriculture in Australasia, Appalachia, China, Japan, and Scandinavia—among others. Prospective researchers would do well to apply the approach used in this volume.

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