Can Indigenous Bhutanese Farmers Forecast the Monsoon Rains?

The Project

On a recent trip to Bhutan, Professor Ben Orlove encountered a piece of local knowledge concerning potato agriculture. Potatoes are one of the main cash crops in Bhutan, and if there are heavy rains in July and August the potato crop is susceptible to rot. According to villagers in the Bumthang province of Bhutan, little snow or hard frosts in the previous winter indicate that these late rains are particularly likely. If the forecast is good for the next year, farmers may be encouraged to buy more fertilizer or plant larger areas. The goal of this research project is to determine if there is any scientific basis to these local beliefs.

This figure, from *Marketing Bhutanese Potatoes: Experiences, Challenges, and Opportunities* by W. Roder, K. Nidup, and S. Wangdi, is the source we are currently using for potato production in Bhutan. As the figure shows, while there is an overall upward trend, there are years where production decreases. Are these decreases related to the farmers’ monsoon forecast, or some other factor? For this study, we are working with productivity (yield/area) rather than total production as the traditional belief applies to productivity, and the increasing production trend is already clearly documented and attributable to increases in total land planted and the introduction of fertilizers. However, productivity is a difficult measurement to work with in a mountainous are like Bhutan, as soil and climate vary drastically throughout the country. The farmers believe that they can forecast the bad/heavy rains, so they plant more in some years than in others. The additional areas that they plant in some years have different qualities (soil or elevation), so these additional areas have different mean yields than the areas they plant in other years. They also rotate their fields some years. The variation in yield from year to year reflects variation in land characteristics as well as variation in precipitation, an important consideration for our research.

Research Questions

*Are monsoon rains sometimes heavy in July-August as farmers claim?* Yes, our data shows that there are years of heavier late summer monsoon rains.

*Are there any reliable scientific forecasts of summer monsoon rains?* When they plant? And if so, are these available to the farmers? There are currently no scientific forecasts of summer monsoon rains, and farmers have little access to scientific forecasts in general.

*Is there data on the two pieces in the farmers’ belief (winter snow and summer rain)?* There is probably data on winter snow, although this has proven hard to find. Professor John Chiang at UC Berkeley is currently working on the summer rain data.

*Is there evidence that heavy monsoon rains in July-August have a negative effect on potatoes?* Heavy rains can lead to potato rot, although this has not been investigated in detail.

*Can fluctuation in potato production be attributed to these monsoon rain forecasts?* This is currently the question we are working on answering.

Current Tasks

• Locating the villages where this belief exists
• Collecting data on rain and snowfall in these villages
• Finding data on potato production in Bhutan
• Determining if this belief exists in other regions of Bhutan and surrounding areas

Challenges of Research

Until the mid 20th century, Bhutan remained a very isolated country nestled in the Himalayan mountains. While the Bhutanese government currently reports a vast quantity of statistical information, because of Bhutan’s history of isolation, these statistics only begin in the mid 1990s. The limitations of the Bhutanese archive present a significant challenge to this project, as collecting reliable data on a long time series has proven to be difficult.

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Bhutan and the Potato

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