

# No hassle with the hazelnut? The economy-wide impacts of a large-scale contract farming scheme in Bhutan

## Introduction

The Mountain Hazelnut Venture (MHV) is a large-scale contract farming scheme, particularly in the context of Bhutan. The objective of the MHV scheme is to plant 10 million hazelnut trees on about 9,000 hectares of formerly fallow land, i.e. about 12% of cultivated land in Bhutan (ADB, 2015). An estimated 15,000 farmers, about 20% of all agricultural households, are expected to benefit from hazelnuts as an additional income source. MHV is also the first 100% owned foreign direct investment project in the Eastern Himalayan Kingdom.

Generally, the government of Bhutan holds a rather sceptical stance towards such foreign and large-scale investments in the agricultural sector, where still about 50% of the Bhutanese labour force are employed in (ADB and NSB, 2013). Bhutan pursues the political objective of increasing its self-sufficiency in cereals. The dependency on cereal imports from India, comprising 35% of domestic demand, is perceived to be a potential threat given the general geopolitical tensions and risks of natural disasters in the region. The concept of MHV has convinced the government of Bhutan through its commitment of planting hazelnuts only on formerly fallow land. Due to labour shortages and other farming constraints, it is estimated that about 20% of total arable land has been abandoned by farmers (MoAF, 2013).

Hazelnuts are the second most valuable tree-nuts after almonds in the world and the growing global demand for European confectionary offers the hazelnut market a bright prospect (IFC, 2016). MHV maintains two large hazelnut nurseries in Central Bhutan, where seedlings suited for an agro-climate between 1,600 and 3,000 meters of altitude are produced using tissue culture micro-propagation. A wide spanning network of field monitors provides training, seedlings and most other inputs at no cost to farmers, who have agreed to participate in the scheme (MHV, 2017). The government of Bhutan and MHV have negotiated a fixed floor price of 0.50 USD kg<sup>-1</sup>, which farmers receive upon delivery to predetermined collection points. At maturity of hazelnut trees (about six years after planting) the average yield per tree is expected to be about 4.5 kg tree<sup>-1</sup> (MoAF, 2016). MHV expects the peak harvest in the year 2025, when hazelnuts worth about 19 million USD are harvested, which makes hazelnuts the second most important crop after paddy in Bhutan (in value terms) (Sean Watson, 2017; FAO, 2017). MHV de-shells the nuts at its own processing facility, before they are exported via the Kolkata port in India. With projected annual exports of approximately 20,000 tons of shelled hazelnuts, Bhutan would be among the five largest hazelnut exporters in the world.

Bhutan is one of the most mountainous countries in the world and only 3% of the land area is arable land. The country's geography can be classified into three agroecological zones (AEZ): AEZ1 below 1,200 meters of altitude, AEZ2 between 1,200 and 1,800 m and AEZ3 above 1,800 m. Crudely, in each zone a third of farmers and of cultivated land is located, however, with distinct differences in cropping patterns. Hazelnuts are only suitable for the higher parts of AEZ2 (above 1,600 m) and for areas below 3,000m in the AEZ3. Preliminary research has shown that in this altitude range hazelnut cultivation offers a higher land return to Bhutanese farmers compared to most other cash crops such as oranges, apple and potato (MoAF, 2016). The scheme is expected to result in substantial welfare gains for participating households, which would be in line with the numerous case studies (Barrett *et al.*, 2012; Ton *et al.*, 2018; Bellemare and Bloem, 2018). However, the existing income gap between farmers in the lower and higher altitudes could also increase further. Compared to other crops in Bhutan, hazelnut cultivation is also characterized by a relatively low labour-intensity (about 100 person-days hectare<sup>-1</sup>). About 60 person-days are required within the short harvest period of about one month

between August and early September (depending on altitude and varieties). With labour shortages being the main farming constraint in Bhutan, the additional demand for labour to harvest hazelnuts within such a short-time window is expected of further exacerbating the existing seasonal bottlenecks of labour supply (Feuerbacher, 2018). Hence, if cultivated on former fallow land, hazelnuts arguably do not compete for land with other cultivars; however, they compete with most crops (paddy, maize and potato) for labour during the same periods than hazelnuts.

Against this background, the principle objective of this paper is to investigate how the MHV scheme impacts farmers' welfare, rural labour markets and the overall economy, including the degree of cereal self-sufficiency.

## **Methods and Data**

To assess the ex-ante effects of the MHV scheme, an economy-wide simulation modelling approach is employed. An existing and comparative-static computable general equilibrium (CGE) model, STAGE2 (McDonald and Thierfelder, 2015), is adjusted for the purpose of this study. The underlying model database is a 2012 social accounting matrix (SAM) of Bhutan, which entails a detailed representation of the agricultural sector of Bhutan including the disaggregation by agro-ecological zones and the depiction of seasonal labour market.

The adjustments of STAGE2 mainly concern the behavioural relationships of factor supply and demand. Rainfed and irrigated land is disaggregated by AEZ and its supply is governed by an asymptotic land supply curve (Eickhout *et al.*, 2009). Permanent cropland not planted with hazelnuts is assumed to remain fixed, while cropland planted with hazelnuts is supplied through a perfectly elastic, i.e., horizontal, supply curve. The supply of hazelnut land is limited by the actual availability of fallow land within the respective AEZs. The disaggregation of agricultural households by whether they participate within the MHV scheme or not allows the channelling of the additional land income to the respective landowners. Seasonal underemployment is modelled using a wage curve following Blanchflower and Oswald (1995).

Only very few farmers have adopted hazelnuts in 2012, i.e., the model's base year. Consequently, the SAM is adjusted to reflect a marginal hazelnut growing activity in both AEZ2 and AEZ3 accompanied with a hazelnut post-harvest processing activity (for deshelling). Being a 100% FDI project, the capital required for the MHV hazelnut processing is treated as foreign capital with unlimited surplus. Any return to foreign capital is treated as income to the rest of the world. The seasonal labour market is reflected in the model by disaggregating the production structure accordingly following an earlier approach by Feuerbacher (2018). The model is setup to use a long-term closure horizon. Capital, land and labour are perfectly mobile within their segments. A flexible exchange rate is assumed, which adjusts the current account balance. The capital market is savings driven and flexible direct taxes adjust the fixed government account.

Using an export demand function, an exogenous demand for hazelnut exports is shocked stimulating the cultivation of hazelnuts. The magnitude of the export demand shock is chosen such that the envisaged export quantity of 20,000 tons of hazelnuts is achieved.

## **Preliminary results**

Not surprisingly, at the macro level the MHV scheme yields substantial economic benefits. The exports of hazelnuts result in an increase of exports by 14.9%, boosting real GDP by 5.7%. However, cereal self-sufficiency drops by 4.2% because of the rise in hazelnut production and absorption of labour during the end of the general cropping season. Seasonal wages strongly increase in AEZ2 and AEZ3,

with peaks in wages during the August and September months. In AEZ3, output of literally all other crops drop, particularly for paddy (9.6%) and maize (21.6%). This decline in production is partially offset by increases in Maize production in AEZ1 and AEZ2. However, production of paddy rice, which in its milled form is frequently traded unlike maize, drops across all AEZs. Overall, production of cereals decline by 3.1% and production of other crops by 2.7%.

Changes in welfare are measured by equivalent variation as a share in base income. Those agricultural households participating in the hazelnut scheme experience a whopping increase in welfare of 23.5% and 22.3 % in AEZ2 and AEZ3, respectively. Other agricultural households, particularly those in the lower altitude regions (AEZ1), experience only moderate increases between 1.3 and 3.1%. Non-agricultural households, which mostly reside in urban areas, experience a modest drop in welfare (0.3-0.9%). Generally, the preliminary results suggest that the MHV scheme will contribute to rural development and much needed growth in Bhutan's agricultural sector. However, there is a trade-off with the production of other crops through the seasonality of the labour market, which is taken into account by explicitly depicting seasonal labour markets. The promotion of labour saving technologies utilized during the hazelnut harvest time could potentially reduce this conflict. Concluding, the MHV scheme results in broad and positive economy-wide benefits largely for participating households, but also for agricultural households in general. Yet, more scenarios have to be analysed to investigate to what degree these results are sensitive to variations in hazelnut yield and price arrangements.

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