



# Assessing the potential for niche market development to contribute to farmers' livelihoods and agrobiodiversity conservation: Insights from the finger millet case study in Nepal



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## ARTICLE INFO

### Article history:

Received 15 March 2016

Received in revised form 1 June 2016

Accepted 17 June 2016

Available online 13 July 2016

### Keywords:

Agrobiodiversity conservation

Niche markets

Farmer livelihoods

Finger millet

Nepal

Choice experiment

## ABSTRACT

This paper explores the potential for niche market development of neglected and underutilized species as an intervention for improving both smallholder livelihoods and the agrobiodiversity conservation. We consider the case of finger millet, which plays an important role in the food security of Nepalese poor and marginalized farmers. Despite such importance, production and consumption are decreasing as a result of, *inter alia*, the expanding availability of more profitable crops, a lack of awareness regarding its nutritional qualities by urban consumers and limited R&D dedicated to this crop. Nevertheless, the potential to improve the ability of farmers to capture the values related to the positive environmental and nutritional externalities associated with the production and consumption of local landraces, suggests that the conservation through use of such genetic resources can support the achievement of development goals. We analyse both the demand and supply side of a potential niche market for local finger millets. Using a choice experiment we find that urban consumers have a willingness to pay a premium price sufficient to compensate producers' conservation opportunity costs. We also identify a range of challenges for such an intervention to be considered effective from both an economic and ecological perspective.

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## 1. Introduction

Despite providing a key input into the agricultural development process and forming a cornerstone of global food security, agricultural biodiversity is being lost at an unprecedented rate, according to the FAO's State of the World Report (FAO, 2010). An important part of this loss is the unintended effect of increased agricultural intensification. While this intensification creates benefits for humanity (Cassman, 1999), there is also an increasing evidence that this loss can have important negative consequences (Heal et al., 2004; Millennium Ecosystem Assessment, 2005), including the depletion of resources with high productivity and food market potential in the type of marginal environments typically managed by poor smallholder farmers (Cavatassi et al., 2011; Di Falco et al., 2011; Coromaldi et al., 2015). In particular, within this context, the replacement of local landraces by modern

varieties is recognized as one of the main drivers of *on-farm* crop genetic erosion (Jarvis et al., 2011; Tilman et al., 2002; Harlan, 1975) and can result in a reduction in dietary diversity (Pingali, 2012). Such crop diversity loss threatens to deprive local communities of important assets for strengthening food security, incomes and resilience in the face of climate change (Bellon and van Eten, 2013; Vasconcelos et al., 2013). As agrobiodiversity provides a mixture of private and public benefits<sup>1</sup>, markets tend to capture only a part of the total economic value, thus underestimating their true worth (Narloch et al., 2011). Consequently, many economies remain blind to the huge value of diversity and its role in health, nutrition and functioning ecosystems thereby leading to less genetic resources being conserved and used than is considered socially desirable (SCBD, 2010; Heal et al., 2004; Pearce and Moran, 1994).

<sup>1</sup> Private benefits include direct use values (e.g. crop, plant and livestock products for food, clothing, shelter, medicinal and socio-cultural purposes). Public benefits include indirect use values such as agroecosystem resilience, maintenance of gene flow, evolutionary processes, soil and water quality, pollinators and traditional knowledge as well as non-use values as option and existence values, where the former is a kind of insurance value given risk aversion and uncertainty about the future – such as that arising from climate change or new disease challenges (Biol et al., 2006; Altieri, 1999).

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As a means of addressing such a market failure, a niche product development approach may be used with the aim of harnessing the underdeveloped market potential of such resources (Pascual and Perrings, 2007; Krishna et al., 2013; Bellon, 2004; Rojas et al., 2009). In the case of neglected and underutilized species (NUS<sup>2</sup>), it is increasingly being promoted as a mechanism that can take advantage of existing market channels by exploiting attractive (e.g. positive nutritional externalities or taste traits) associated consumption characteristics (Krishna et al., 2010; Gruère et al., 2006; Lybbert et al., 2002; Smale et al., 2009), with consumers ultimately paying for the *on-farm* maintenance of local landraces (Gotor et al., 2013). This approach is also a typical example of what Ferraro and Kiss (2002) refer to as an indirect strategy for investing in agrobiodiversity conservation. Often seen as positive and self-sustaining, niche market development is associated with support for increased orientation towards expanding agricultural markets and value chains improvements. It is argued that such support can potentially generate enhanced private benefits for farmers through, *inter alia*, increased choices of input suppliers and product outlets, increased accessibility to credit, better management capacity, improved employment opportunities and associated income generation (Eaton and Shepherd, 2001). Moreover, the potential financial sustainability over the longer-term of such market-driven approaches makes them highly attractive for developing countries (Dawson et al., 2007).

The success for this type of approach will depend on the price premium that consumers are willing to pay for the niche products and if this can compensate farmers sufficiently for any opportunity costs that they may incur from cultivating a landrace instead of a potentially higher yielding modern variety (Smale et al., 2004; Narloch et al., 2011). However, particularly in marginalized areas, existing market frictions may lead to failures on both the demand and supply side, with consequent local landrace farm-gate prices providing only limited signals of their total economic value (Pascual and Perrings, 2007; Gauchan et al., 2005). Such frictions include the fact that consumers may be unaware of the quality attributes uniquely associated with a specific landrace but for which they would be willing to pay a price premium. In particular, this may occur in urban settings, where households, accustomed to packaged industrial products, do not recognize the specific superior nutritional or health-related traits of traditional foods (Pingali, 2007; Gockowski et al., 2003). Further, although a positive price premium might be paid by consumers, smallholders may nonetheless face high transaction costs that prevent them from competitively sustaining a stable demand or participating in an integrated value chain (Markelova et al., 2009; Neilson, 2008).

A range of studies have examined the impact on subsistence farmers' livelihoods of developing traditional food products for local markets (Donovan and Poole, 2014; Reardon et al., 2003; Rao et al., 2012; Kruijssen et al., 2009). A number of others have sought to assess the impact of niche market development on crop genetic resource conservation (Gauchan et al., 2005; Krishna et al., 2010; Isakson, 2011; Gruère et al., 2006; Drucker and Appels, 2015).

We contribute to the existing body of literature by assessing the potential opportunities and challenges for such niche market development to contribute to both farmer livelihood and genetic resource conservation goals, as a result of a reduction in informational market frictions in the case of finger millets in Nepal.

Nepal is rich in plant and crop diversity with more than 200 cultivated species (Upreti and Upreti, 2002). However, agriculture is changing rapidly with the introduction of intensive cash crop monocultures

combined with labour migration out of the villages. Previous and current national agricultural programs have focused on the release of new hybrid varieties (Nepalese National Planning Commission, NPC, 2010) with a resulting growing and persistent replacement of traditional landraces (Joshi et al., 2012). Public investment in NUS (including finger millet) R&D and promotion is lacking (Bhandari et al., 2010). As of 2012, the national system had released or registered 95 varieties of rice, 59 of maize and 24 of wheat. By contrast, there are only five registered varieties of finger millet (SQCC, 2015). This is despite the fact that finger millet is the fourth most commonly grown cereal in Nepal in terms of area after rice, maize and wheat (ABPSD, Agri-Business Promotion and Statistics Division, 2014). While the production area has been stable, yield growth has fallen behind relative to other cereals. The yields of rice, maize and wheat in 2010–2014 were 41%, 46% and 77% higher than their respective averages for the 1990–1994 period (ABPSD, Agri-Business Promotion and Statistics Division, 2014). Over the same period the yield of finger millet has been largely stagnant (–2%).

Finger millet is mainly utilized as a subsistence crop and as fodder for livestock by poor rural farmers. It is consumed on only a limited scale by the growing urban population. Urban consumers, considering finger millet a low status food, reveal a low willingness to pay for the standard millet they find in the market and prefer other substitute crops such as maize. Nevertheless, finger millet has the potential for successful niche market development since it possesses unique nutritional, (diabetic) health and taste characteristics of which consumers are unaware but that could be highly valued if properly promoted in a niche market (Adhikari, 2012).

It is in this context that we attempt to assess the magnitude of these private consumption externalities by determining the degree to which urban Nepalese consumers may be willing to pay a price premium for finger millet products that would in turn be sufficient to compensate farmers for their opportunity cost of maintaining this crop in their production systems. To carry out such an assessment we rely on two primary datasets that depict the demand and the supply side of the finger millet market. The first dataset is the result of a choice experiment carried out in Pokhara, Nepal's second largest city. The second is a rural household survey conducted in three mid-hill villages in the Pokhara valley.

Exploring different econometric specifications, results from the choice experiment identify consumers' willingness to pay for unique attributes of finger millet landraces by distinct segments of the population; while rural farmer incentives to maintain the related landraces are explored in the terms of the net margins that different landrace niche market products could generate relative to competing traditional and improved varieties. We also identify potential volumes demanded and the income implications for participating farmers. Likely impacts of such niche market development on finger millet genetic resource conservation goals and insights on its implementation are also considered.

The remainder of this paper is organised as follows: the next Section describes the conceptual framework, while Section 3 describes the choice experiment design, econometric framework, farmer survey and data collection process. Section 4 then discusses the results before conclusions are presented in Section 5.

## 2. Conceptual Framework

Given that modern varieties may be expected to outperform landraces in intensified agricultural production systems as they have been selected to have a high degree of responsiveness to external inputs, farmers will face increasing opportunity costs associated with maintaining diversity within such production systems (Jackson et al., 2007). Since significant public and private values are associated with the maintenance of local landraces but not be reflected in their market prices, as a result of market failures, such replacement can result in less than

<sup>2</sup> NUS may also be referred to as orphan, abandoned, new, underutilized, neglected, lost, underused, local, minor, traditional, forgotten, alternative, niche, promising or underdeveloped (Padulosi and Hoeschle-Zeledon, 2004). For the purposes of this study we use Gruère et al.'s (2006) definition, which defines a NUS as any agricultural or non-timber forest species, collected, managed or cultivated that simultaneously captures the following three characteristics: i) the species is locally abundant, but globally rare; ii) there is little scientific knowledge about the (use of the) species but local users possess practical knowledge about it; and iii) the use of the species is limited relative to its economic potential.

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