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2012 Environ. Res. Lett. 7 015603

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# Environmental risk, resilience and migration: implications for natural resource management and agriculture

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Received 14 September 2011

Accepted for publication 22 November 2011

Published 17 January 2012

Online at [stacks.iop.org/ERL/7/015603](http://stacks.iop.org/ERL/7/015603)

## Abstract

This letter probes the causal links between migration, remittances and resilience to environmental change. Three case studies have been chosen, Western Mexico, the Central Plateau of Burkina Faso and Eastern India, where satellite imagery shows recent regeneration of vegetative cover and where there is evidence of high rates of migration. The findings are analysed through a framework that draws on concepts of ecological anthropology, new economics of labour theories and livelihood analyses of migration drivers and impacts.

**Keywords:** migration, remittances, agriculture, resilience, intensification

## 1. Introduction

The links between climate change and migration are hotly debated with alarmist projections on the one hand which estimate that between 200 million (Myers 2005) and a billion people (Christian Aid 2007) will be displaced by 2050 resulting in mass migration into Europe. On the other hand are more balanced assessments which, based on past experience and current migration patterns, foresee more mobility within developing regions rather than movements between continents (Foresight 2011). Migration is in fact already an important adaptation strategy for the poor coping with gradual onset climate stresses and shorter, sudden shocks (Tacoli 2009).

The three regions being investigated have a long history of migration which is linked to environmental change as well as other economic, social and demographic factors. Migration from Mexico to the United States Studies has been driven by a combination of changes in labour demand and supply, US immigration policy changes, migrant networks, reform of communal land tenure and the North American Free Trade Agreement (NAFTA) (Martin 2003). In Burkina Faso, climate change appears to have a stronger link with short-term migration, which is an important diversification strategy rather than long-term migration, because that requires

more resources which impoverished households may not have (Henry *et al* 2004). Finally, in the case of Eastern India, rural–urban and rural–rural migration to nearby towns and agricultural fields has given tribal subsistence farmers an alternative to risky rainfed farming. Severe droughts can reduce yields by 40% (Pandey *et al* 2007) and migration is critical for coping in such conditions. But other reasons for migration include higher wages, room for negotiation with employers on wage rates, number of days work, meal quality and timing (Rogaly *et al* 2001).

Against this backdrop, this letter attempts to answer the following questions:

- (1) Under what circumstances do households with migrants invest (capital and labour) in agriculture and natural resource management?
- (2) How do household factors (assets, education, kinship networks, individual attributes) and contextual factors (agro-climatic conditions, markets, policies etc) shape migration and natural resource management practices and outcomes?

The letter begins with a discussion of the core concepts used. This is followed by a discussion of the three regions in

terms of the factors that drive migration, the characteristics of migrant households, and the impacts of migration and remittances on natural resource management at the household level. Observed differences in impacts between regions or communities are explained by examining the household and contextual factors that have mediated these impacts. The letter concludes with a discussion based on the findings to identify causal pathways.

### 1.1. Analytical framework

A core concept in this letter is that of resilience which can be both social and ecological. Social resilience is the ability of groups or communities to cope with external stresses and disturbances as a result of social, political and environmental change. Ecological resilience is the ability of ecosystems to maintain themselves in the face of disturbance. Both are in fact closely related and need to be addressed together to analyse the impacts of environmental variability (shocks and stresses) on communities that are dependent on natural resources (Adger 2000).

Exactly how environmental shocks and stresses impact on different households depends on their assets at the household level (physical, natural, human, social and financial) and the opportunities and constraints posed by the policy and institutional context within which livelihood activities are pursued (the sustainable livelihoods framework developed by Chambers and Conway 1992, Scoones 1998 and others). Viewed through such a lens, migration is a livelihood strategy (de Haan 1999, Ellis 2003) in the same way that farming is not an aberration as portrayed in pessimistic discourses of migration. Research on migration and resilience has shown that migration impacts on the social resilience of individuals and communities, as well as on the sustainability of the underlying resource base (Adger *et al* 2002). Relevant here are also economic theories related to the relationship between population and natural resources which posit that increases in population pressure on land with fixed technology lead to diminishing returns which can lead to agricultural intensification (Boserup 1965 and Tiffen *et al* 1994), and migration (Bilsborrow and Delargy 1990) among other survival strategies. Only in extreme cases will the entire family migrate away altogether (Bilsborrow and Delargy 1990, p 129). Which particular response or combination of responses occurs depends on agro-climatic conditions and the market and policy context.

Neither economic theories nor livelihoods discourses on migration explicitly recognize the role of remittances in the process. This was treated in detail by the New Economics Labour Migration analysts: Stark (1982) and Stark and Bloom (1985) argue that farming households participate in migration as a strategy to overcome constraints on production and investment resulting from missing or incomplete credit and insurance markets in rural areas. Market imperfections require rural households to self-finance production and self-insure against production and income risks. This hypothesis has been tested and confirmed by others including Lucas (1985), Taylor and Yunez-Naude (1999) and Taylor and Martin (2001).

But merely having a migrant in the family does not guarantee improvements in agriculture. The literature shows that both agricultural intensification and disintensification are possible outcomes of migration.

### 1.2. Intensification

Migrant remittances have been identified as one of the factors enabling agricultural intensification. Evidence from Morocco (de Haas 2007) and Ghana (Tsegai 2004) shows for example that initial negative effects of migration caused by the loss of labour (see below) may be offset over time as the inflow of remittances allows households to purchase agricultural inputs. This is more likely to occur in the case of international remittances as these tend to be larger (de Haas 2007, Adams 2005, Wouterse 2008) and only if a favourable institutional, environmental and market context supports agricultural development (De Haan 2005, Taylor *et al* 1996).

### 1.3. Disintensification

Foremost among disintensification discourses is the lost labour argument, according to which migration deprives rural households of critical labour resulting in falling productivity. The loss of labour could potentially lead to the adoption of labour-saving strategies or the abandonment of labour intensive crops, or a decrease in labour inputs to agriculture and fall in productivity (Lipton 1980, Rubenstein 1992). However if the departing member did not participate in agriculture before s/he left, the impacts would be different and could in fact reduce consumption requirements and labour availability related to those. Zimmerer (1993) found that migration led to the abandonment of traditional soil conservation techniques in Bolivia. Furthermore, the departure of male and female migrants would have distinct effects on the agricultural activities of origin households. The departure of men has been blamed for the feminization of agriculture.

However others have argued that labour losses will not be felt in situations where there is widespread under-employment in agriculture and surplus labour (Vargas-Lundius and Villareal 2008). Clearly, household level impacts will depend on the size of the household, dependency ratios and availability of labour. A few studies show that women left behind may be able to get help from extended family and social networks for farm work (see David 1995 on the Sahel and Lamichhane 2008 on Nepal). Finally, seasonal migration may enable people to seasonally allocate labour to agriculture and migration as migration typically occurs after the main rainfed growing season (Deshingkar and Farrington 2009).

In some circumstances migration can lead to the abandonment of land. This can occur with prolonged absence of the migrant and inability to meet the labour requirements of agriculture. Jokisch and Lair (2002) find increasing abandonment of land by migrants from Ecuador going to the US. Research in Central Mexico shows that land abandonment is especially likely if the land is marginal (López *et al* 2006). However there is a generalized trend of land abandonment in

marginal areas in industrialized societies which is not unique to migrant households (López *et al* 2006).

What all of these examples show is that a variety of outcomes are possible depending on household and contextual factors. These are explored in greater detail through the three case studies under review.

## 2. Western Mexico

Historically Western Mexico (Jalisco, Michoacan, Guanajuato, Nayarit and Zacatecas) has been the most important sending area for migration to the United States (Massey and Espinosa 1997). Mexico has suffered from long-lasting economic crises despite its rapid industrialization after the Second World War. Globalized markets for labour and agricultural commodities such as maize have resulted in lucrative earning opportunities in the US and decreasing profitability of smallholder farming in Mexico (Radel and Schmook 2008). Poorer households have limited access to formal credit to underwrite productive investments in education, farming, cattle raising, manufacturing or retail sales. Migration to the United States is an attractive means of acquiring capital quickly, through social networks that reduce the costs and risks of undocumented entry (Singer *et al* 1995, Taylor 1986, 1987).

Migration has impacted on agriculture and natural resources in a variety of ways. Hostetler (2007) documents six kinds of ‘remittance landscapes’ including transformations from (a) forest to pasture, (b) forest to agriculture, (c) forest to urban, (d) agriculture to pasture, (e) agriculture to urban and (f) change of agricultural system. Here (a), (d) and (f) could be regarded as agricultural disintensification, and (b) and (d) could be regarded as intensification. An example of (b) is avocado cultivation in Michoacán, which grew extremely rapidly in the past decade and is now worth 800 million dollars in trade. (Rhoda and Burton 2010). While investing in avocado farming is not unique to migrants, remittances have allowed subsistence farmers to enter the market (Romero 2006). A example of (f) is the switch to less labour intensive crops (Schmook and Radel 2008).

The Mexico Migration Project provides some insights into the circumstances in which migrants do/do not invest in intensification. The project studied socio-economically diverse communities of different sizes covering 5500 households selected through a random sampling technique. The project found that the share of migration earnings spent on improving agricultural production, was less than 50% on average and varied widely between communities. (Durand and Massey 1992, p 27). This variation was explained by several factors. First, access to farmland, whether or not ejido land, and land quality are important determinants of migration and investment in agriculture. Ejidos are communal lands granted to specific families in the 1930s for the perpetual use of their family. Ejidos provide rural families with land but no access to the means to make it productive; thus they create a need for regular infusions of cash to finance the purchase of seeds, fertilizers, irrigation, labour, and other inputs used (see

Massey *et al* 1987, 1993)<sup>1</sup>, confirming the hypothesis of Stark and others. But other studies show ejido lands being rented out by migrants (Heath 1992, p 700). Clearly other household characteristics matter as we discuss below.

Second, the level of remittances also matters: in the Mexico Migration Project, remittances were found to have a positive impact on agriculture only if they are ‘substantial’ (Quinn 2009). Also, research in ejido areas has shown that it is the relatively better endowed households who are more likely to migrate in the first place (Davis *et al* 2000, p 118) and they are therefore better placed to invest in land. Third, individual attributes such as the ability to invest money profitably have also been identified as important prerequisites (Cederstrom 1990). Fourth, the duration is also important: migrants who have been abroad for a longer period of time direct remittances towards ‘productive’ investment—including agricultural intensification and expansion—after household consumption needs have been satisfied (Stuart and Kearney 1981, Basok 2003, Cohen and Rodriguez 2005).

While there is clear evidence of the impacts of migration on agricultural intensification through capital investment, there is little discussion of soil and water conservation, which suggests that either there is insufficient local knowledge and government support for soil and water conservation (SWC) techniques and/or there is insufficient labour at the household level to invest in SWC because of migration. These issues need further probing. While improved agricultural yields would reduce the vulnerability of poor farmers and improve their resilience to shocks, the impacts on the ecological functions of the systems where such intensification has occurred are not fully explored.

## 3. Burkina Faso

Burkina Faso is a poor, densely populated country in the West African semi-arid tropics. Agriculture is the main source of subsistence for the population but is risky due to unreliable rainfall and poor quality soils. Migration has long been an important coping strategy in the Sahel (Adams and Mortimore 1997) allowing people to manage climate variability. Migration patterns differ by region and ethnic group: the Mossi from the Central Plateau region have historical links with Côte d’Ivoire which continue to the present (although migration to that country is much reduced after political upheaval). The Fulani, who live in the north, are mainly cattle and goat herders and Côte d’Ivoire has been an important market for them too. The Lobi in the south migrate from one rural area to another to find land to rent.

NOAA satellite imagery shows that the Sahel as a region suffered from prolonged drought starting with severe droughts in 1982–5. Drought conditions persisted until 1993 and this was followed by a relatively wet and green period in 1994–2003 (Anyamba and Tucker 2005).

<sup>1</sup> The Mexican government has introduced reforms aimed at improving the returns to ejidos in the 1990s but migration to the US has continued. A survey of ejido households in the late 1990s indicated that off-farm employment continued to be important (De Janvry and Sadoulet 2001).

However the greening is not uniform, suggesting that factors other than rainfall may have contributed to a differential greening response (Herrmann *et al* 2005). The spots where this is likely to have occurred have been identified as, *inter alia*, parts of Senegal, Mauritania, Mali, Niger, the Central Plateau of Burkina Faso and large portions of Chad. Herrmann *et al* identify improvements in SWC techniques as a possible cause.

According to Reij *et al* (2005) the Central Plateau was characterized by expanding declining cereal yields, a reduction in vegetation, falling ground-water levels and mass outmigration in the early 1980s. This, according to Reij and colleagues, led to the adoption of SWC techniques. Impact studies conducted a few years later found significant increases in crop yields, more tree cover and greater availability of forage for livestock, improved soil fertility and rising ground-water tables (Reij *et al* 2005).

One study makes the link between migration and the adoption of SWC measures. A survey of 115 migrant and 135 non-migrant households by Konsiega in 2004 found that migrant households had a significantly higher average adoption rate of stone bunds. Yields had increased by 40–100% depending on the region, the rainfall in the year of the study and the spacing of stone bunds. The choice of which field was protected by stone bunds was partly the decision of the field owner, partly dependent on receiving project benefits and partly related to the physical characteristics of the field (Konsiega 2004, p 7). However SWC is more labour intensive (rather than capital intensive) which suggests that these activities were done either by migrants in between trips, returning migrants or other members of the household. Reij *et al* (2005) notes that the huge success of SWC was made possible by substantial public investment in SWC between 1985 and 2000. It is possible that households with migrants were better educated and were better able to access support under government and NGO schemes. This issue needs further investigation.

The link between migrant remittances and intensification through capital investment has been made but the impacts differ between different types of migration. Research by Wouterse (2008) in the Central Plateau covering 223 households across four villages showed that cropping was the main economic activity, but migration within Africa and to Europe was common among young men from large households. The education level of migrants was extremely basic and did not differ by destination. More than 90% of the migrants stayed away for more than a year and seasonal migration was rare. Until recently, the primary destination for regional migrants was Côte d'Ivoire, but this has nearly vanished due to political instability. Many Burkinabé now migrate to the capital city Ouagadougou. Both international and regional migrants remit but the former remit roughly six times the amount that regional migrants remit (400 000 FCFA as opposed to 50 000 FCFA). The research indicates that intercontinental migration discourages labour intensive activities but facilitates livestock investment, which is capital intensive but not as labour intensive as cropping. Regional migrants remain engaged in low return, labour intensive

activities such as subsistence farming. No mention is made of SWC adoption rates. According to Wouterse, this indicates that continental migration is a survival strategy stemming from a lack of wealth but positively related to household size.

#### 4. Jharkhand in Eastern India

The Eastern Indian state of Jharkhand was historically populated by forest dwelling tribals<sup>2</sup>. Roughly 28% of its 7.9 million ha is under forest and 24% under cultivation. Although poverty has declined from 44% to 33% in the last decade, there is widespread poverty in rural areas, especially among tribals who constitute 23% of the population. Tribals are the most deprived segment of the Indian population with the lowest levels of human development indicators, resulting from a combination of poor governance, low levels of education and other multiple deprivations.

Migration was first documented in the late 19th century when tribals went to work in Indigo production in Bengal. Migration later shifted to the tea plantations in Assam, railway and road-building projects in other parts of the country and as far as Burma (De Haan 2002). It is likely that large-scale migration was triggered in part by the Indian Forest Act of 1878 which restricted the rights of local communities to forests. Deforestation has continued unabated through the 20th century driven by government licences granted to industrialists and contractors. The livelihoods of rural people were further affected by the nationalization of the trade in minor forest products in the 1970s (Jewitt 2008, p 73).

A majority of the cultivators in Jharkhand combine farming with seasonal migration. Most are small and marginal farmers growing upland varieties on poor soils. Yields are too low to sustain an average household through the year, so migration of some or all household members has become an important coping strategy.

A study of 12 villages across the state show that on average, one-third of the households have at least one member migrating (Dayal and Karan 2003). Around 70% of these are poor tribals with low levels of education and landholding. While 98% of the households in Dayal and Karan's sample reported an improvement in their lives because of migration, roughly 22%, mainly those with more than five acres of land, invested in agriculture. They were able to use skills that they had acquired in the green revolution areas of Punjab and Haryana where they migrated for farm work. This indicates that productive investment is likely to occur when the assets required for such investment and knowledge/skills are available. Other studies have also shown that migrants use earnings to buy fertilizers and draught animals but on a very small scale (Nitya, personal communication). Land is an important indicator of status in tribal society and own account cultivation continues to be a high priority for many of those who migrate (Rogaly 2003, p 624). In fact migration earnings are being invested in agriculture to reduce the need to migrate (Rogaly, personal communication). It has to be mentioned here that the quantum of remittances involved is

<sup>2</sup> Indian official term for indigenous populations.

much smaller compared to international migrants and the bulk of earnings are spent on consumption. Over time, and if current trends in urban development continue, migration could provide an important source of capital for subsistence farmers struggling to manage in unpredictable environmental conditions. Analysis of more than 40 years of rainfall and temperature data for the state has revealed an increase in occurrence of extreme weather events with a continuous rise in temperatures (Wadood and Kumari 2009). However, the implications of this for ecological resilience are less clear, as increased use of agrochemicals can lead to pollution of soil and water systems.

Recent research on indigenous SWC practices shows that a range of techniques have been practised traditionally, including stone-cum-earth bunding and brushwood weirs, but many have now become less prevalent due to migration and the shortage of labour (Dey and Sarkar 2011). It is not clear whether there are government programmes that can effectively include households with migrant labour and this is an area for policy consideration.

Improvements in farm productivity could in theory reduce the area farmed and this could reduce pressure on forests. In fact, Jharkhand is one of the few states in India that has registered an increase in its forest area (Food Survey of India 2009). Many of the districts showing increased forest cover such as Palamu, Purbi Singhbhum, Dumka, Hazaribagh and Gumla are also high migration areas where people have long combined agriculture, forest produce collection and migration to diversify income sources. But as discussed above, migration can lead to an intensification of agriculture through capital investment on larger farms, but also have adverse impacts on soil and water conservation.

## 5. Discussion

The three regions covered show that there is diversity in migration patterns and impacts even within a region. Broad categories such as international migrants are not homogeneous but are in fact composed of individuals with diverse characteristics and households with diverse endowments, which have implications for the way in which migration impacts on agriculture and resilience to environmental shocks and stresses.

The evidence from Mexico indicates that households with certain characteristics and endowments such as ejido land, receiving substantial remittances, possessing business acumen and belonging to a household that has already met its consumption needs, all improve the chances of intensification of agriculture. In Burkina Faso, migration was positively associated with soil and water conservation in only one study. It is possible that this may have occurred due to their ability to access external support under SWC programmes. Other studies show a positive correlation between high return migration to Europe and capital investment in agriculture, whereas migration within the region did not generate earnings that were sufficient to enable rural households to move out of low return and labour intensive agriculture. Finally, in the case of Jharkhand, only those farmers with larger plots of

land were able to invest remittances in agriculture. Soil and water conservation appear to have been negatively impacted by migration.

These case studies provide insights into factors at the household level, and even the level of the individual, as well as the broader context in shaping decisions to invest labour and capital in agriculture. They also indicate agricultural intensification through capital investments may improve the resilience of poor households to economic and environmental shocks but this does not necessarily mean an improvement in ecological resilience of the system.

Given these processes, what are the implications for a future world with increased climate variability and possibly higher levels of migration? What would increased migration mean for improving resilience through investment in agriculture?

A great deal of uncertainty remains in predictions of rainfall, storms and other processes based on GCM models, for example in the Sahel (Caminade *et al* 2009) and South Asia (Wang *et al* 2010). In the face of such uncertainty, migration can lead to a number of outcomes including intensification and disintensification. Experience from other parts of the world has shown that remittances are not invested in agriculture if policy conditions are not conducive, as is seen in the case of Albania (Miluka *et al* 2010). Early introduction of policies to introduce appropriate technologies and backup will improve the chances of remittances being invested in agriculture and natural resources. For poorer households where migration is a coping strategy, more stresses coming from slow onset climate impacts could mean a greater reliance on migration to cope with and adapt to change. Ultimately, policymakers need to heed the advice given by the recent Foresight report on migration and environmental change which is to view migration as a form of adaptation to environmental change, and an effective way to build long-term resilience (Foresight 2011).

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