

# EFFECTS OF MIGRATION AND REMITTANCE INCOME ON NEPAL'S AGRICULTURE YIELD

*Raju Tuladhar, Chandan Sapkota, and Naveen Adhikari*

**NO. 27**

July 2014

**ADB SOUTH ASIA  
WORKING PAPER SERIES**



ADB South Asia Working Paper Series

## Effects of Migration and Remittance Income on Nepal's Agriculture Yield

Raju Tuladhar, Chandan Sapkota,  
and Naveen Adhikari

No. 27 | July 2014

Raju Tuladhar is Senior Country Specialist, Nepal Resident Mission. Chandan Sapkota is Associate Economics Officer, Nepal Resident Mission. Naveen Adhikari is Assistant Professor at Tribhuvan University, Kathmandu. We would like to thank Kenichi Yokoyama, Country Director, Nepal Resident Mission; Sarah J. Carrington, Economist, SARC; and Bradley Cunningham, Research Fellow, Center for International Development, Harvard University for reviewing the draft and providing valuable feedbacks. All errors are authors'.

Asian Development Bank  
6 ADB Avenue, Mandaluyong City  
1550 Metro Manila, Philippines  
www.adb.org

© 2014 by Asian Development Bank  
July 2014  
ISSN 2313-5867 (Print), 2313-5875 (e-ISSN)  
Publication Stock No. WPS146820-2

The views expressed in this publication are those of the author and do not necessarily reflect the views and policies of the Asian Development Bank (ADB) or its Board of Governors or the governments they represent.

ADB does not guarantee the accuracy of the data included in this publication and accepts no responsibility for any consequence of their use.

By making any designation of or reference to a particular territory or geographic area, or by using the term “country” in this document, ADB does not intend to make any judgments as to the legal or other status of any territory or area.

ADB encourages printing or copying information exclusively for personal and noncommercial use with proper acknowledgment of ADB. Users are restricted from reselling, redistributing, or creating derivative works for commercial purposes without the express, written consent of ADB.

Unless otherwise noted, “\$” refers to US dollars.

# CONTENTS

TABLES, FIGURES, AND BOXES .....	iv
ABSTRACT .....	v
1. INTRODUCTION.....	1
2. BRIEF OVERVIEW OF THE EFFECTS OF MIGRATION AND REMITTANCES ON AGRICULTURE.....	2
3. SIGNIFICANCE OF MIGRATION AND REMITTANCES IN NEPAL .....	4
4. EFFECTS OF MIGRATION AND REMITTANCES ON AGRICULTURAL YIELD .....	7
4.1 Model and Data .....	7
4.2 Empirical Findings.....	12
5. CONCLUSIONS.....	15
REFERENCES.....	17

## TABLES, FIGURES, AND BOXES

### TABLES

1	Summary Statistics .....	10
2	3SLS Estimates of the Effects of Migration and Remittances on Agricultural Yield in Nepal .....	14

### FIGURES

1	Growth of Nepalese Migrant Workers and Their Destinations .....	5
2	Migration and Remittances in Nepal .....	6
3	Use of Remittances by Households in Nepal .....	7
4	Paddy Output (kg) Per Hectare .....	11
5	Use of Chemical Fertilizers and Ownership of Farming Assets Among Migrant and Nonmigrant Households .....	11
6	Migration and Paddy Yield.....	12
7	Remittances and Paddy Yield.....	13

### BOXES

1	New Economics of Labor Migration (NELM) .....	2
2	Theoretical Foundation of the Model .....	8

## ABSTRACT

Nepal is one of the highest remittance receiving countries in the world, in percentage of gross domestic product (GDP). Remittances are not only defining household consumption and investment patterns, but are also transforming the structure and dynamics of the country's overall economy. However, very little is known about its impact on the agriculture sector, which accounts for one-third of the country's GDP. Using the most recent cross-section national level household data, this paper analyzes the effects of migration and remittances on agriculture yield. It shows two important results: (i) migration negatively affects agriculture yield, and (ii) remittance-receiving agricultural households have not demonstrated improvements in agriculture productivity, despite increased household incomes. It points to two important trends: (i) migration adversely affects agriculture yield by inducing a labor shortage in the sector, and (ii) the remittance-receiving households are not investing such incomes on productivity-enhancing agricultural capital goods and inputs. Therefore, a key development challenge for a highly remittance-dependent agrarian economy like Nepal is to incentivize remittance receiving agriculture households to invest in capital goods and inputs to improve agriculture productivity so that it more than compensates for the yield losses arising from labor migration.

Raju Tuladhar, Chandan Sapkota, and Naveen Adhikari<sup>1</sup>

---

<sup>1</sup> Raju Tuladhar is Senior Country Specialist, Nepal Resident Mission. Chandan Sapkota is Associate Economics Officer, Nepal Resident Mission. Naveen Adhikari is Assistant Professor at Tribhuvan University, Kathmandu. We would like to thank Kenichi Yokoyama, Country Director, Nepal Resident Mission; Sarah J. Carrington, Economist, SARC; and Bradley Cunningham, Research Fellow, Center for International Development, Harvard University for reviewing the draft and providing valuable feedbacks. All errors are authors'.



## 1. INTRODUCTION

1. Migrant workers' remittance income has emerged as one of the most important components in the Nepalese economy, influencing not only household consumption and investment patterns, but also the overall economic structure and dynamics. Over the years, remittance inflows—received by 55.8% of households in 2011 (CBS, 2011)—have grown to an estimated 25.5% of GDP in 2013, up from just 1.7% of GDP in 1996 and 10.7% of GDP in 2001. As a share of GDP, in 2012, Nepal was the sixth highest remittance recipient in the world. According to official statistics, on an average 1,243 workers left the country each day in 2013. A World Bank (2006) study showed that remittance inflows to poor households accounted for one-third to one-half of the overall reduction in absolute poverty between 1996 and 2004.<sup>1</sup> Additionally, the latest Multidimensional Poverty Index (MPI), published by Oxford Poverty and Human Development Initiative (OPHI) and used by the United Nations Development Programme (UNDP) in its annual Human Development Report publication, shows that the decrease in multidimensional poverty from 64.7% in 2006 to 44.4% in 2011 can be attributed mostly to the contribution of remittances in improving asset ownership, access to electricity and better nutrition (OPHI, 2013). Migration and remittances are having profound impact on structural transformation in Nepal (ADB 2013a).<sup>2</sup>

2. Many studies have highlighted the far-reaching impact and role of migration and remittances on Nepal's economy and on its ongoing structural transformation, which is characterized by the expansion of low multiplier import-dependent services sector activities, and consistent deindustrialization (ADB, 2013a). But very little is known about their impact on the agriculture sector, which comprises one-third of the country's GDP and where nearly 76% of the country's labor force is engaged for livelihoods. While migration creates a shortage of workers and may adversely affect agricultural yield, the inflow of remittances to agricultural households could boost their capacities to acquire productivity-enhancing capital, resulting in higher yield (Stark, 1980). Hence, remittances have the potential to ease liquidity constraints, smoothen household consumption (Amuedo-Dorantes and Pozo, 2011), and boost household capacities to spend more on productivity-enhancing human and physical assets (Chodi, Jaimovich and Montes-Rojas, 2012). Consequently, human capital (for which education is usually a proxy) and physical capital (fertilizer use and farm equipment as proxies) contribute to reducing technical inefficiency in the agricultural sector. On the other hand, migration results in a shortage of labor in the absence of substituting surplus labor in the market. This may not only lower agriculture yield, but also compel households to engage in more intensive cropping techniques. There is a dearth of studies exploring these dynamics, including the impact of migration and remittances on the agricultural sector.

3. By analyzing the most recent cross-sectional national level household survey data, this study attempts to fill the gap by specifically analyzing the effects of migration and remittances on agriculture

---

<sup>1</sup> Furthermore, Sapkota (2013) argued that remittances have contributed to inducing the 'Dutch disease' effect and policy complacency, undermining the country's investment and growth prospects. Moreover, World Bank (2011) also indicated the emergence of Dutch disease effects in the economy as a result of high inflow of remittances. The exact empirical estimation of its impact on the economy remains to be explored.

<sup>2</sup> ADB (2013a) shows that high inflow of remittances and their use, mostly for consumption, impact overall structural transformation as well. In particular, remittances have supported higher levels of consumption of imported goods in the absence of domestic supply of substitutes or near-substitutes. Furthermore, they also fueled service sector activities such as real estate and housing, retail and wholesale trade, and financial intermediation. This has meant that low value added, low productivity services sector activities are overshadowing and to some extent inhibiting the growth of industrial sector.

yield (particularly of paddy production per hectare<sup>3</sup>). This study shows that not only migration adversely affects yield, but also remittance inflows are not contributing to improve the yield. It partially supports the main hypothesis of New Economics of Labor Migration (NELM) that labor migration affects household farm output (through reduction in labor input), but remittances could compensate for this by relaxing credit and insurance constraints (Stark, 1991). Given the fact that the agriculture sector constitutes around 35% of GDP, is an important contributor to GDP growth (ADB, 2013a), and provides livelihood options to 76% of total population (CBS, 2011), the findings of this study will have important policy implications for sectoral intervention strategies of the government and development agencies, including the recently formulated Agriculture Development Strategy 2014–2034.<sup>4</sup> Furthermore, it will also have implications for the formulation of policies and strategies to effectively manage high remittance inflows, particularly channeling them to more productive use, including commercial agriculture.

#### Box 1: New Economics of Labor Migration (NELM)

The NELM asserts that wage differential alone does not determine an individual's decision to migrate. It is a collective or household decision in order to maximize economic gains and to cope with the risks associated with income volatility, including agricultural shocks (Taylor 1987; Stark, 1991). One of the main reasons for migration is to provide an alternative source of income as insurance, especially among agriculture households, against risks of crop failure (Kochar, 1999). Similarly, remittance-receiving migrant households tend to experience a relaxation of credit constraint, as they are now able to purchase new agriculture technology, which helps boost agriculture productivity. Hence, migration and remittances are endogenous to household income and agriculture yield (Rozelle et al., 1999; Taylor et al., 2003; Quinn, 2009).

4. This next section provides a brief global overview of the impact of remittances and migration on agriculture sector, followed by a discussion on the significance of remittances in the Nepalese economy. It then presents the estimates of the effects of migration and remittances on agricultural yield in Nepal. The final section concludes with some important policy recommendations. This study uses data from national sources, particularly the latest household survey (National Living Standards Survey 2010/11).

## 2. BRIEF OVERVIEW OF THE EFFECTS OF MIGRATION AND REMITTANCES ON AGRICULTURE

5. The findings of the available studies on the impact of migration and remittances on agriculture in other countries are mixed.<sup>5</sup> Stark (1980) argued that remittance inflows to migrant agricultural households could provide a means to overcome credit market constraints, boosting the capacity of households to invest in productive activities and commercialization of production. Taylor and Wyatt (1996) found that remittances enabled rural households to accumulate liquid assets and helped them

<sup>3</sup> Due to data limitation, we could not use productivity as yield per workers. Instead, we define productivity as yield per hectare of land as in Rozelle et al. (1999).

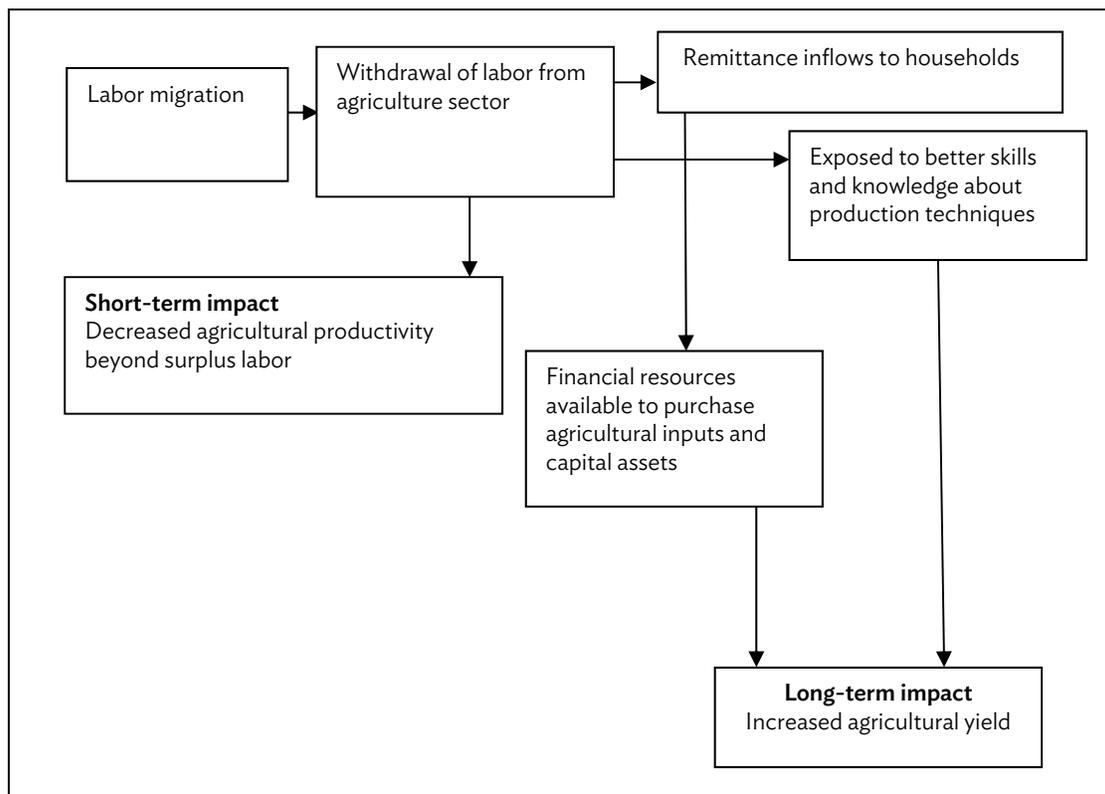
<sup>4</sup> The Government of Nepal is yet to formally adopt and launch the ADS. It has four strategic components, namely governance, productivity, profitable commercialization, and competitiveness. It is supposed to promote inclusive, sustainable, multi-sector, and connectivity-based growth, ultimately resulting in increased food and nutrition security, poverty reduction, agriculture trade competitiveness, and higher and equitable income among rural households (ADB, 2013b).

<sup>5</sup> Ratha (2011) presents a good summary of the impact of remittances at the macroeconomic and household levels.

overcome credit and risk constraints. In rural the People's Republic of China (PRC), remittances helped loosen constraints on crop production and boosted productivity (Rozelle et al, 1999). Similarly, Mochebelele and Winter-Nelson (2000) found that households of migrant workers benefited from remittances in the form of increased capacity to acquire capital goods required for enhancing farm management and production. De Hass (2006) showed that households in Southern Morocco invested more in housing and agriculture following a rise in remittance income. Singh, Singh and Jha (2012) found that in Bihar, India remittance-receiving households were using modern agricultural technologies such as improved varieties of rice and improved transplanting techniques. Furthermore, Atamanov and van den Berg (2012) showed that remittances led to an increase in crop income for most farmers in the Kyrgyz Republic.

6. However, Jokisch (2002) argued that migration did not significantly alter household cultivation patterns and remittances were also not used for agricultural improvements in Canar Province of Ecuador. Hyden et al (1993) found that the lack of male labor, arising from migration, led to a decline in agriculture production and inadequate land improvements. Additionally, Harden (1996) also showed that international migration negatively affected agriculture production. Migration significantly and negatively affected farm efficiency among migrant households, and the effect was larger for better educated and older migrants in Kosovo (Sauer, Gorton and Dayidova, 2013).

### Conceptual framework for the impact of labor migration and remittances on agricultural yield



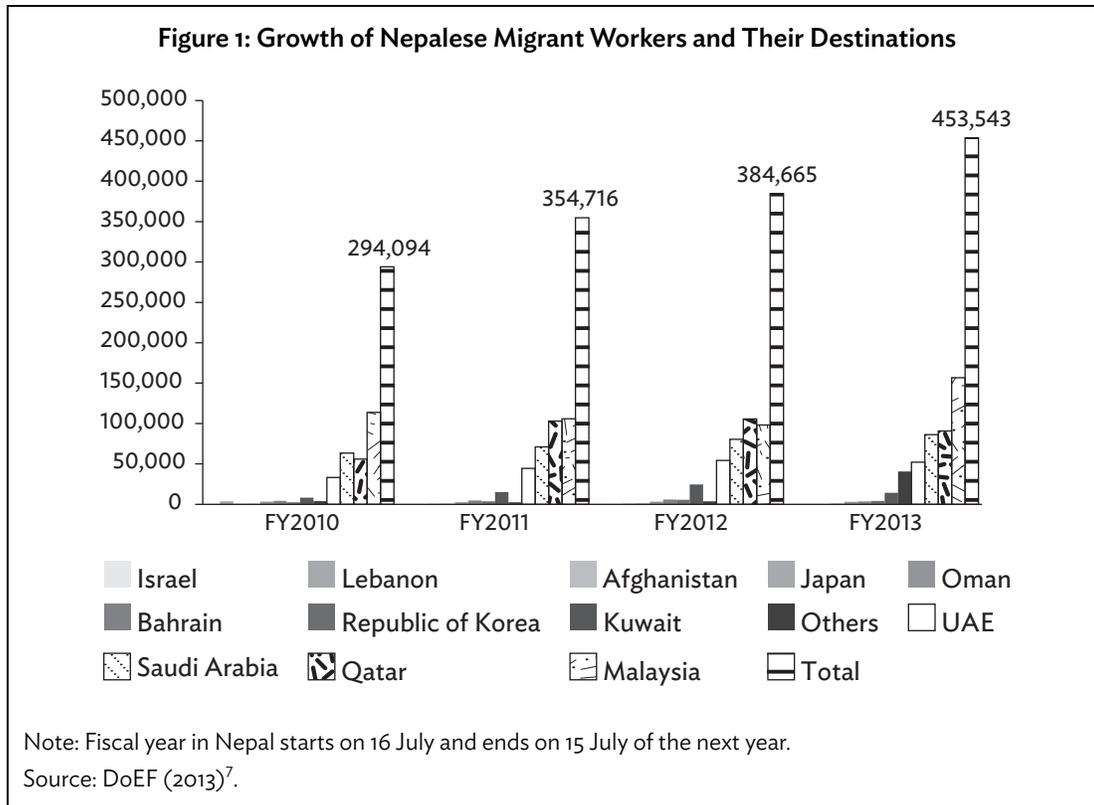
7. De Hass (2001) argues that migration induced the adoption of intensive cultivation patterns among oasis agriculture households in the Maghreb, and remittance-receiving households invested relatively higher amounts in agriculture. Quinn (2009) showed that migration and remittances increased the use of high-yield variety seeds mainly by lowering household risk and credit constraints in Mexico. Overall, the agricultural efficiency and productivity losses from migration are at least partially offset by gains from the boost in overall income as a result of remittance inflows. In fact, Rozelle et al (1999) found a net negative impact on income as the gains from remittance inflows was more than offset by the losses from migration among maize growing migrant households. But, Lucas (1987) showed that in the short run migration reduces subsistence agriculture production, but remittances enable households to improve agricultural productivity and capital accumulation in the long run.

### **3. SIGNIFICANCE OF MIGRATION AND REMITTANCES IN NEPAL**

8. Nepalese people have been emigrating to other countries for employment since as early as May 1815, when the agreement with the colonial British government in India opened up avenues for Nepalese nationals to seek employment abroad. Initially, work in the coal mining and agriculture sectors in Northeast India was the popular choice.<sup>6</sup> But, the rapid growth of natural resource and construction sectors in the Middle East, where the wage rate (“pull factor”) is better than in India, attracted Nepalese workers, mostly for low- and medium-skilled jobs. In the meantime, the intensification of the Maoist insurgency around 2000 displaced a large number of youths from villages and semi-urban areas, forcing them to seek employment overseas as domestic job market stagnated amidst the contraction of the industrial sector (“push factor”). Overseas migration for employment has been growing at around 20% annually, since 2005 (except for 2009 and 2012, when the global financial crisis and the Euro zone sovereign debt crisis affected the demand for labor in the Middle East). In 2013, 1,243 workers legally left the country each day (453,543 annually) for work overseas, up from 150 workers daily in 2000. Malaysia, Qatar, Saudi Arabia and UAE together have absorbed about 85% of the total Nepalese migrant workers seeking jobs overseas (see Figure 1).

---

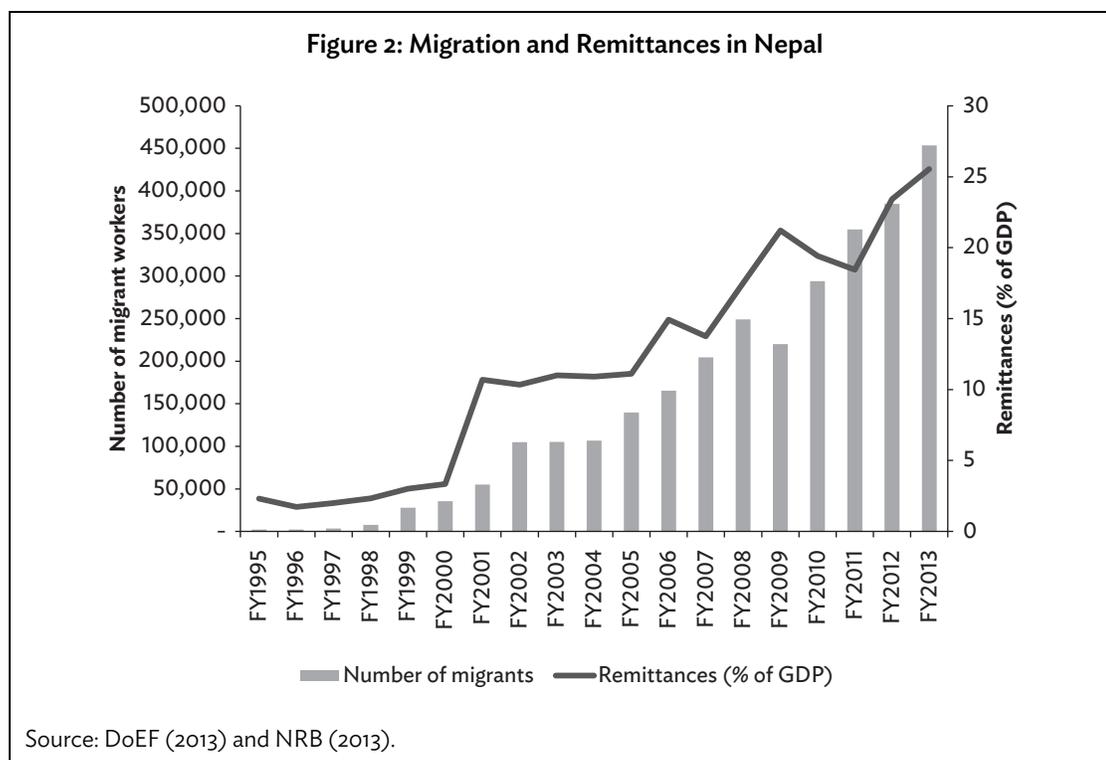
<sup>6</sup> The recruitment in British and Indian armed forces has also been an attractive source of foreign employment and remittance income.



9 The growing remittance income is now larger than official development assistance (ODA) and foreign direct investment (FDI) combined. In 1996, as a share of GDP, ODA, FDI and remittances amounted to 4.6%, 0.2% and 1.7%, respectively. By 2013, remittances reached 25.5% of GDP (see Figure 2), but ODA and FDI were just 4.2% and 0.5%, respectively. Furthermore, an increasing number of households are receiving remittances, reaching 56% in 2011, up from 32% in 2004. Consequently, per capita remittance inflows has also jumped manifold, reaching NRs9,234 per annum in 2011, up from NRs2,100 in 2004.<sup>8</sup>

<sup>7</sup> Note that the figures do not reflect the migrants who go to India for work as they do not require any permits from the government to live and work in India. A 2009 migration survey estimated the total number of migrants at 2.1 million, with 41 percent of them in India (World Bank, 2011).

<sup>8</sup> In US dollar it is equivalent to US\$28.4 in FY2004 and US\$128.1 in FY2011.

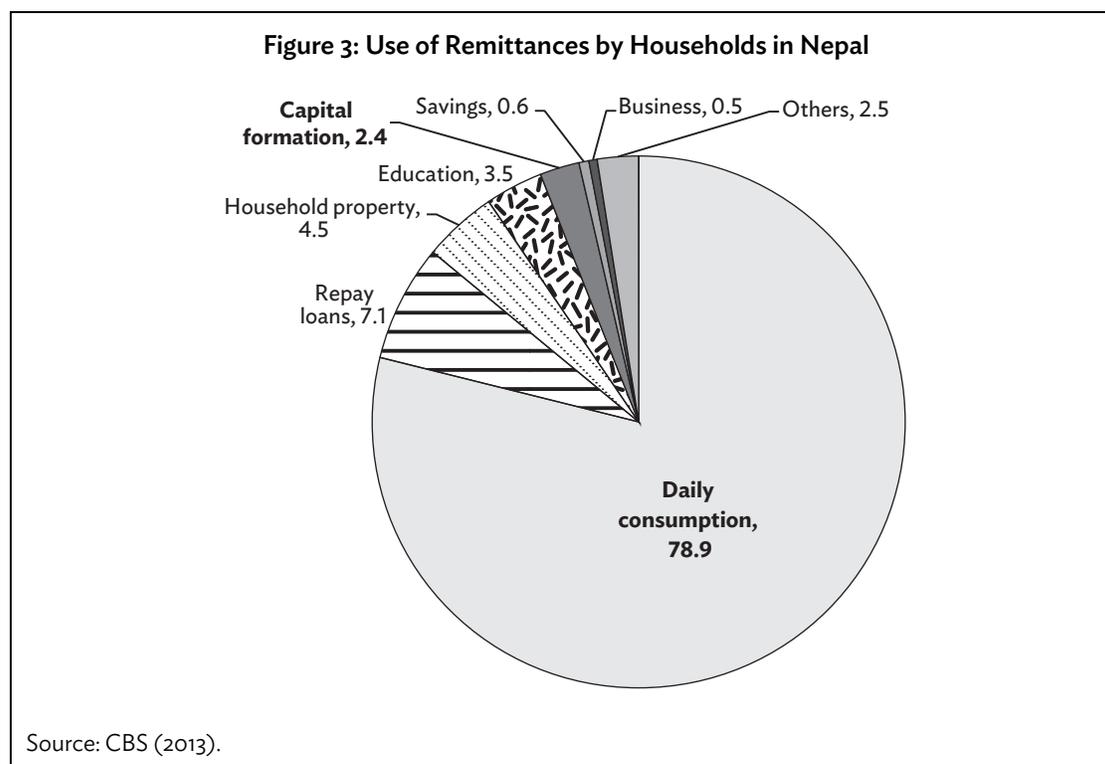


10. Remittances have helped reduce poverty, contributing between one-third and one-half of overall poverty reduction between 1996 and 2004 (World Bank, 2006). Similarly, remittance inflows have been instrumental in driving up services sector activities, which in turn have helped to consistently maintain an average GDP growth of about 4% over the past decade, despite the uneven performance of agriculture and fledgling industrial sector (ADB, 2013a). Remittances have also been the largest source of foreign exchange income, accounting for over 65% of total foreign exchange earnings in 2013. They have been crucial in ensuring external sector stability (maintaining a positive current account balance and balance of payments), by offsetting the widening trade deficit (27.1% of GDP in 2013). On the fiscal front, remittances have been indirectly contributing to the steady growth of tax revenues (which reached 15% of GDP in 2013, up from 8.6% in 2000). This is because the country's imports are being largely financed by the remittance income, and the consumption tax, mostly value added tax, and customs duties on imported goods account for about 72% of the total tax revenue.

11. Sapkota (2013) also points out that high remittance inflows has induced Dutch disease effects, i.e., the appreciation of the real effective exchange rate and shrinking of the tradable sector with respect to the non-tradable sector. Remittances have also fostered policy laxity among the policymaking institutions by creating a 'vicious policy cycle'. In the face of high remittance inflows, there is little pressure and incentive to undertake reform measures to address policy weaknesses and improve the macroeconomic environment, leading to poor investment climate and low investments. This eventually translates into low job creation and hence, increased migration for employment and remittance inflows.

12. On the use of remittances, the latest household survey shows that nearly 80% of remittances received by households is spent on consumption, followed by 7.1% to repay loans, 4.5% to purchase

household property, 3.5% on education, and a mere 2.4% on capital formation, among others (see Figure 3).



## 4. EFFECTS OF MIGRATION AND REMITTANCES ON AGRICULTURAL YIELD

### 4.1 Model and Data<sup>9</sup>

13. While migration affects agriculture production primarily through the induced shortage of labor, remittances tend to relax household's credit and risk constraints, which affect agricultural productivity in the long run (Lucas, 1987). Following the approach used by Rozelle et al. (1999) in the PRC and subsequently by Quinn (2009) in Mexico and Zahonogo (2011) in Burkina Faso, this paper assesses the impact of migration and remittances on agriculture productivity in Nepal.<sup>10</sup>

14. The NELM asserts that wage differential alone does not determine an individual's decision to migrate. It is a collective or household decision in order to maximize economic gains and to cope with the risks associated with income volatility, including agricultural shocks (Taylor 1987; Stark, 1991). One of the main reasons for migration is to provide an alternative source of income as insurance, especially

<sup>9</sup> To avoid repetition, we recommend readers to refer to Rozelle et al. (1999) for detailed theoretical underpinnings behind this study. For a short description, see Box 2.

<sup>10</sup> Due to the lack of panel data, it is not possible to show the changes in prices of inputs and production during the last three living standards survey.

among agriculture households, against risks of crop failure (Kochar, 1999). Similarly, remittance-receiving migrant households tend to experience a relaxation of credit constraint, as they are now able to purchase new agriculture technology, which helps to boost agriculture productivity. Hence, migration and remittances are endogenous to household income and yield (Rozelle et al., 1999; Taylor et al., 2003; Quinn, 2009).

### Box 2: Theoretical Foundation of the Model

The model is based on the new economics of labor migration framework developed by Stark (1991) and as applied by Rozelle et al. (1999). It considers a neoclassical farmer whose goal is to maximize output ( $Q$ ) under given resource constraints ( $T$ ). Households are credit constrained, an upshot of the imperfect markets in rural areas, to boost productivity by adopting a high yield technology.

Suppose that a household invests in a fixed resource  $T$  (which could be land or family labor), either in a low productivity or high productivity technology,  $f_i$  for  $i=0, 1$ , respectively. A number of household characteristics  $Z_y$  shape productivity in each of these activities. Consider a production possibility frontier (PPF) under the given resource constraints. Assume that at relative price  $(\frac{p_1}{p_0})$ , the household will specialize in the high productivity technology, resulting in an output function  $Q^* = f_1(T, Z_y)$ .

The household faces a market constraint on investing in the high productivity technology such that  $c(T_1) \leq K$ ,  $c'(T_1) > 0$  in the case of credit or cash constraints. In the case of liquidity constraint,  $c(T_1)$  denotes the cost of adopting the high productivity technology and  $K$  denotes the household's available credit to invest in the technology. In the case of a risk constraint,  $c(T_1)$  would be a measure of risk associated with the high productivity technology and  $K$  would be the maximum level of risk the household is willing to take by adopting this technology. By sending remittances ( $R$ ), migrants ( $M$ ) contribute to boosting productivity by relaxing credit constraints (or assuaging the risk constraint) faced by the household.

The NELM theory assumes  $K = g(R, M)$ . The constrained resource allocation to the high productivity technology is  $T^c = \phi(K)$ , where  $\phi(K) > 0$ . Constrained output under high productivity technology is  $Q_1^c = f_1(T^c, Z_y)$  and under low productivity technology  $Q_0^c = f_0(T - T^c, Z_y)$ . Constrained output per unit of  $T$ ,  $Y^c$  is given by

$$Y^c = (Q^c + Q^c)/T$$

Where capital, risk or human capital constraints are binding, the impact of migration on productivity is not likely to be zero ( $\theta_R$  and  $\theta_M$  are not indeterminate). The NELM tests the statistical importance of these coefficients.

Source: Adapted from Rozelle et al. (1999)

15. We assume that a rural household is typically financially constrained to invest in high-yield technology in order to maximize yield. Let  $Q^c$  be the constrained output that a household produces under a given credit or liquidity constraint. Following NELM—that migration is a coping strategy to mitigate agriculture income risks—migration ( $M$ ) can influence  $Q^c$  by 'relaxing the credit constraint through remittance ( $R$ ) or by allaying the risk constraint through remittances or a willingness to remit in the event the household suffers an income loss' (Rozelle et al. 1999). Therefore, the fundamental equation of our analysis is given by (1) where migration ( $M$ ) and remittances ( $R$ ) along with socioeconomic and farm characteristics ( $Z_Q$ ) are taken as important variables affecting constrained agriculture productivity  $Q^c$  (yield in terms of production per hectare).

$$(1) \quad Q^c = \alpha + \beta_1 M + \beta_2 R + \lambda_3 Z_Q + \varepsilon_Q$$

16. Here, the null hypothesis associated with NELM is that  $\beta_1$  and  $\beta_2$  are equal to zero, i.e., neither migration nor remittance affects agricultural productivity. In other words, if we get non-zero coefficients for migration and remittance inflows, then we can infer that these two variables affect agriculture yield.

17. Remittances are a function of the allocation of family members for labor migration, and household demographic, human and capital variables ( $Z_R$ ) affecting the successes and motivations to remit money back to households:

$$(2) R = \theta_0 + \theta_1 M + \theta_2 Z_R + \varepsilon_R$$

18. Meanwhile, migration is a function of networks at migrant destinations and household human and capital variables ( $Z_M$ )<sup>11</sup>:

$$(3) M = \gamma_0 + \gamma_1 Z_M + \varepsilon_M$$

19. Equation (1) and (3) constitute a recursive system. Furthermore, migration and remittance are endogenous and as per NELM hypothesis, migration, remittance and agricultural activities are simultaneously decided by households. Therefore, there is a need to address and eliminate endogeneity and simultaneity biases, if any. We use iterative three-stage least square (3SLS) in order to eliminate such biases. The simultaneity in decision making makes the disturbance terms (error terms) across the equations correlated, and hence, 3SLS is desirable over 2SLS. Quinn (2009) also argues that since migration, remittances and agriculture productivity are interrelated, they should be modeled together in a 3SLS instead of a 2SLS.<sup>12</sup>

20. Several variables in  $Z_R$  and  $Z_M$  are included as instruments to eliminate issues associated with simultaneity and endogeneity biases related to  $M$  and  $R$  in equation (1). In particular, the proportion of migrants' population in the PSU and the highest education completed by a family member are used to identify equation (3). Meanwhile, the average remittance received in PSU is used to identify equation (2). Note that in studies of similar kind, Rozelle et al. (1999) and Mendola (2008) have also used the same instruments. Ideally, a good instrument should be strongly correlated with the endogenous variable without affecting the dependent variable. We assume that the proportion of migrant population in the PSU (village or group of villages) has a strong correlation with the number of migrant workers at household level. Likewise, with missing formal financial markets, the amount remitted to households depends on the number of returnee migrant in a village, and accordingly the average remittance received in a PSU.

<sup>11</sup> The components of  $Z_R$  and  $Z_M$  include human and capital measures such as education level of head of household, age of head of household, number of children, total land, geographic location, annual consumption expenditure, use of chemical fertilizer, number of livestock, household size and irrigated land.

<sup>12</sup> One suggestion was to use interaction variables (between remittances and region) to see if people in marginal farming areas in mid-hills are using remittances for non-agriculture purposes and if farmers in Terai, where land is more productive and abundant, are using remittances to increase yield. This exercise remains out of the existing scope of the work as we follow the methodology developed by Rozelle et al. (1999).

**Table 1: Summary Statistics**

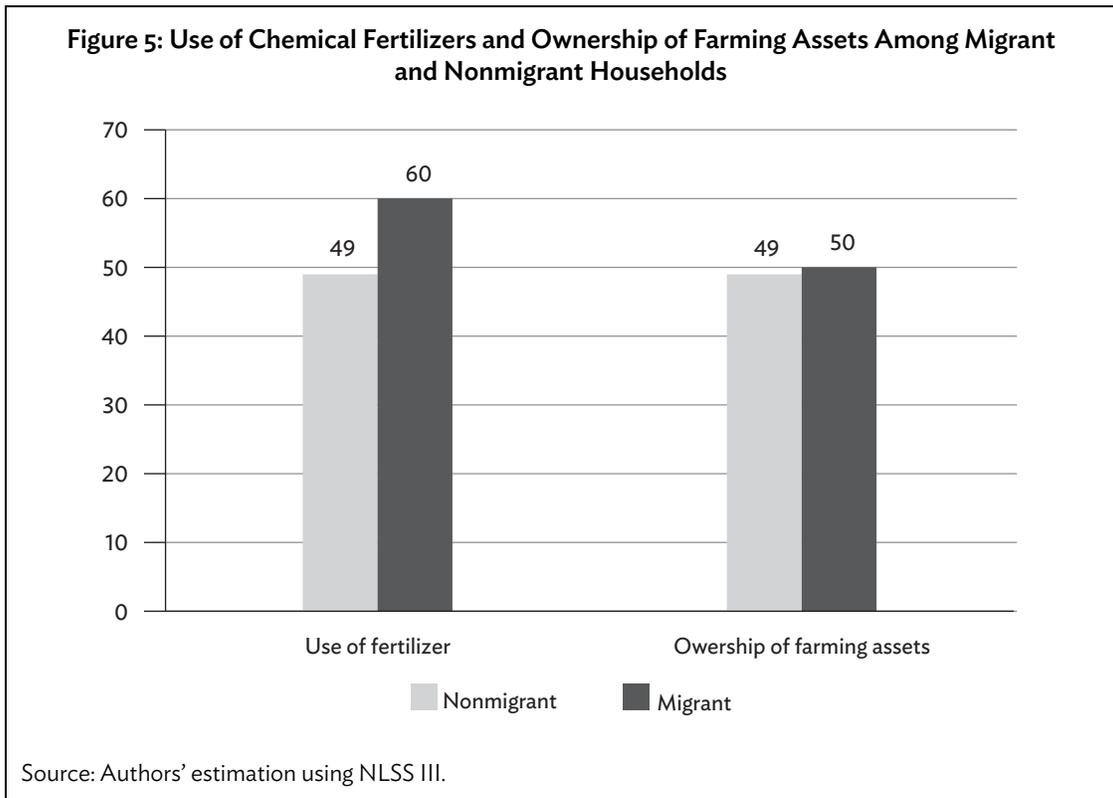
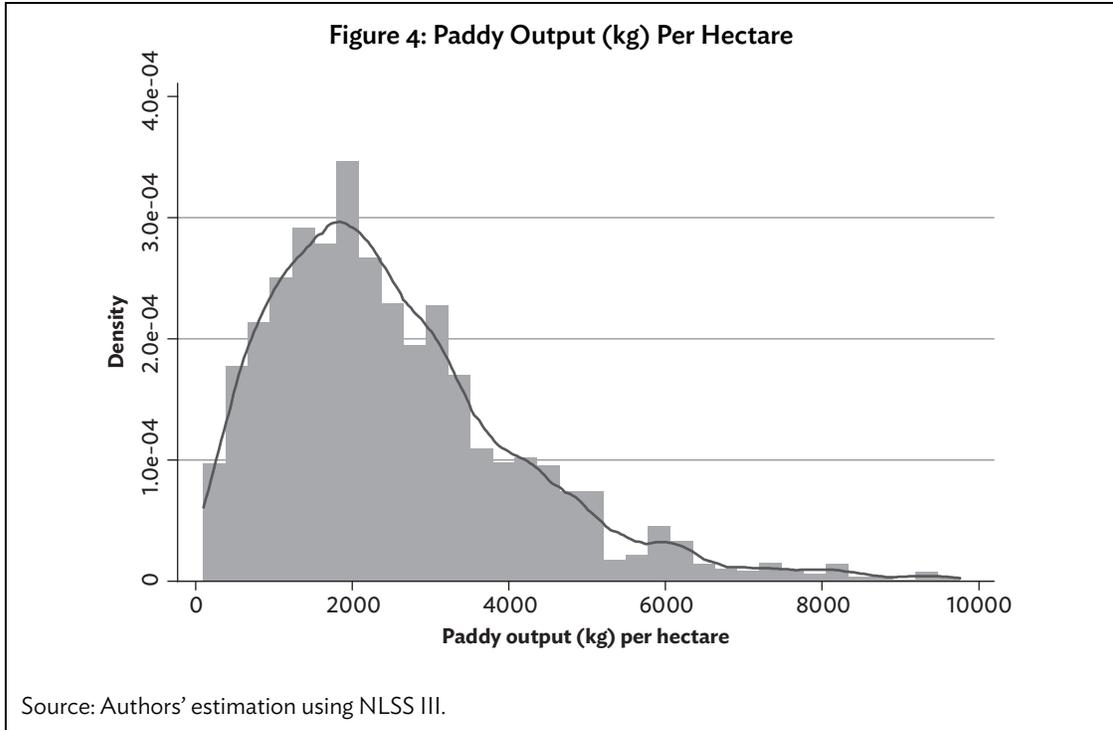
Variables	Obs	Mean	Std. Dev.	Min	Max
Paddy per hectare (kg)	2918	2842.78	1596.44	101.83	9435.45
Temporary migrants	5988	1.01	1.59	0.00	15.00
Remittance inflows (NRs per year)	5988	31841.41	88749.65	0.00	1000000.00
Household size	5988	4.76	2.31	1.00	20.00
Irrigation of paddy	5988	0.17	0.37	0.00	1.00
Livestock	5988	1.84	2.33	0.00	20.00
Fertilizer dummy	5988	0.47	0.50	0.00	1.00
Age	5988	46.00	14.13	11.00	95.00
Education	5988	4.49	4.99	0.00	15.00
Total Annual Consumption	5988	45738.46	42471.25	4541.01	510733.10
Total land	4217	0.67	1.06	0.01	24.40
Sex(1 if male)	5988	0.73	0.44	0.00	1.00
Number of Members >60 years age	5988	0.42	0.68	0.00	4.00
Number of Family Members <15 years of age	5988	1.68	1.52	0.00	11.00
Average Remittance Received in PSU	5988	64570.64	64732.70	0.00	400000.00
Proportion of Migrants worker in PSU	5988	0.02	0.03	0.00	0.32
Highest Education Completed in HH	5988	6.44	5.04	0.00	15.00

Source: Authors' estimation using NLSS III.

21. This paper uses the latest Nepal Living Standards Survey (NLSS) III 2010/11 dataset for empirical analysis. It includes nationwide cross-section data from five development regions (Eastern, Central, Western, Midwestern and Farwestern) and three ecological belts (mountains, hills and Terai). The cross-section consists of 5,988 sample households from 499 PSUs. For the purpose of this study, the analysis is limited to paddy production (i.e., dependent variable in equation [1]). This in turn generates a sample of 2,918 migrant households growing paddy and receiving remittances.

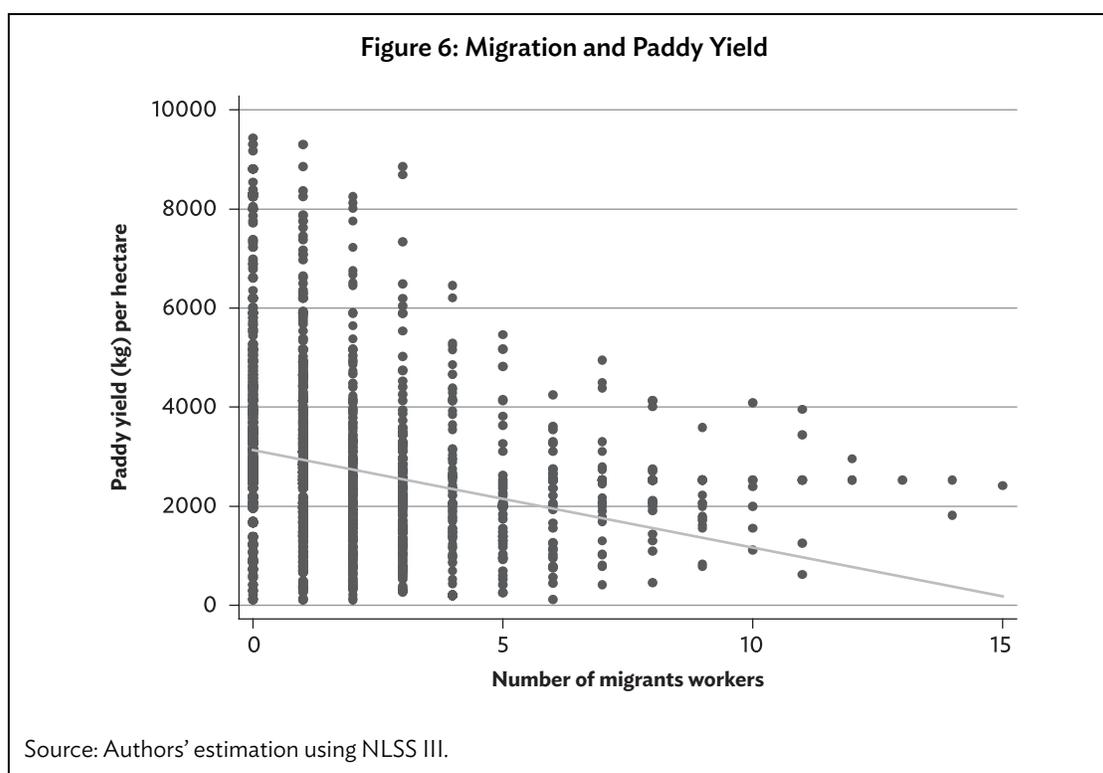
22. The rationale for choosing paddy yield (computed as kilograms of paddy produced per hectare of land) is that it is the most widely and predominantly cultivated cereal (and commercial) crop in Nepal. It is the most important part of the daily consumption basket. Note that paddy yield per hectare of land is relatively low in Nepal as, for a majority of the households, the average yield is just 2,842 kg per hectare and median yield of 2,700 kg per hectare (see Figure 4). The NLSS III dataset also provides sufficient statistical observations. The variables of primary interest are the number of temporary migrants and remittance received by the agricultural households. The other factors—used as control variables—affecting production and productivity include the use of chemical fertilizers, number of livestock, and irrigation facility. The initial descriptive results indicate that although the use of chemical fertilizers is relatively higher among migrant households than nonmigrant households, there isn't much difference in terms of ownership of farming assets (see Figure 5).<sup>13</sup> Additionally, household characteristics such as age, sex, and education of household head are used as explanatory variables. To control for the variation over the development regions and ecological belts, regional and belt dummies are used.

<sup>13</sup> It could also be that agricultural households might have used remittances to purchase chemical fertilizers more than farming assets as the former requires small amount while the latter requires substantially larger initial investment.



## 4.2 Empirical Findings

23. Table 2 shows the econometric results. The direct impact of migration on paddy yield is negative and significant (see Figure 6). Specifically, one additional migrant labor in the agriculture household is associated with a loss of about 163 kg per hectare of paddy (see Table 2).<sup>14</sup> This is consistent with other studies that found the decline in agriculture production and the increase in agricultural wages due to the shortage of labor emanating from emigration. Rozelle et al (1999) found that the migration of an additional family member led to a maize yield loss of 461.63 jin per mu<sup>15</sup> in rural PRC. In Nepal, CBS (2011) shows that agriculture wages increased from NRs75 in 2004 to NRs170 in 2011, a substantial 127% increase, possibly due to labor shortage caused by migration. Furthermore, it also shows that the share of the agriculture sector in wage employment declined from 37% to 35% over the same period, suggesting a shift in the source of occupational income away from the agriculture sector.

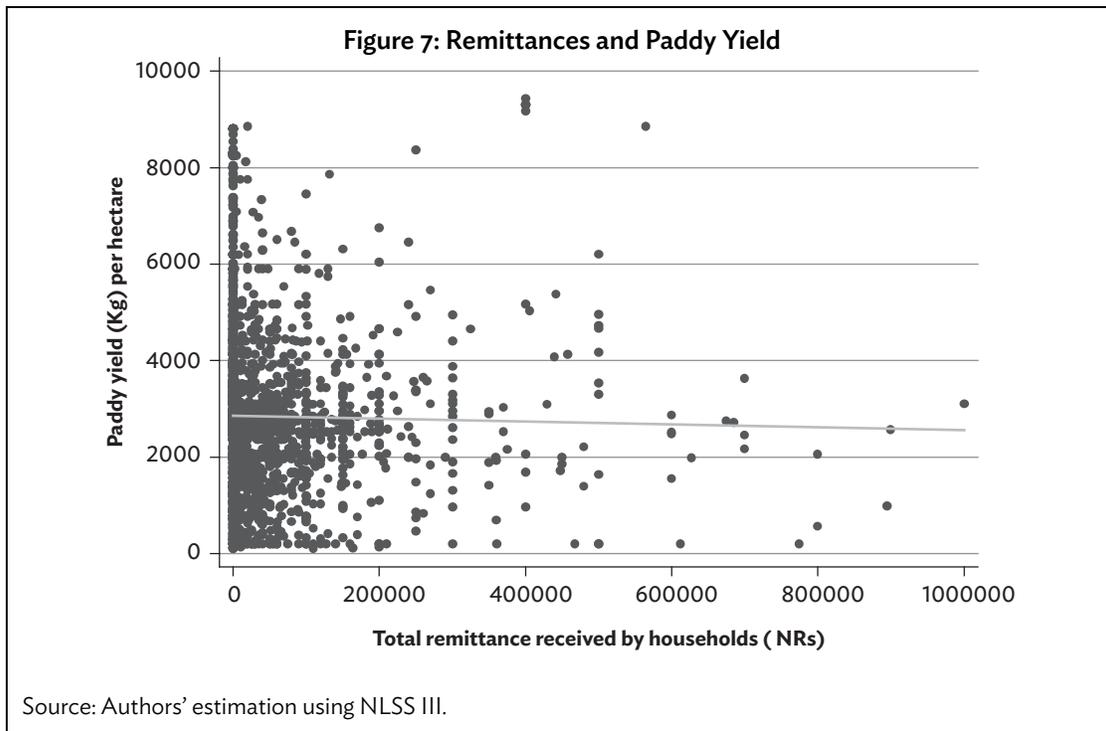


24. However, the study results also indicate that remittances received by households may not have been used to acquire capital goods (or agriculture technology) to boost yield (see Figure 7). The coefficient of remittances is negative (and statistically insignificant) (see Table 2). Hence, in Nepal, the negative effect of migration on agriculture yield may not have been compensated by remittances, as was seen in the PRC by Rozelle et al. (1999). This is not surprising in Nepal's case because almost 80% of remittance income is used for daily consumption purpose and a mere 2.4% for capital formation

<sup>14</sup> It also suggests that the loss of household labor due to large scale out migration may not be substituted with hired labor due to the absence of surplus labor even in a largely agrarian economy like Nepal. For similar lost-labor effect, see De Brauw (2010).

<sup>15</sup> 1,000 jin per mu is equivalent to about 500 kilograms of grain per 0.067 hectares of land.

(see Figure 3). Maharjan, Bauer and Knerr (2012) found that remittance receiving rural households did not use productivity-enhancing agricultural inputs such as chemical fertilizers even though remittances enhanced their income. Jokisch (2002) and Semyonov and Gorodzeisky (2008) found similar results in Canar province of Ecuador and the Philippines, respectively. That said, the results of this study do show that migration is positively and significantly correlated to remittances, i.e., a person increase in migration is associated with NRs11,644 increase in remittance inflows to agriculture households. This is slightly higher than the NRs9,245 per capita remittances in 2011 (CBS, 2011).



25. The proportion of year-round irrigated land and the use of chemical fertilizers positively and significantly affect paddy yield. The results of this study show that a unit increase in year-round irrigated land is associated with paddy production increase of 234 kg per hectare. Similarly, the use of chemical fertilizer by a household is associated with an increase in paddy yield by 465 kg per hectare. The results also show that while having more number of children below 15 years of age in a household significantly reduces paddy yield, having more number of working age household members is associated with significant increases in paddy yield. This is intuitive because more working members in a household mean more deployment of labor to cultivate paddy. However, more children in a household would involve trade-offs in terms of attending to care for the children versus the use of labor for cultivating paddy

26. To capture variations across the country and to address the unobservable effects, development region and ecological belt dummies were used. Results show that these are significant in some cases. The central development region has significantly high paddy yield compared to the Farwestern Development Region (the reference region). Surprisingly, the Eastern Development Region, controlling for other factors affecting paddy yield, is found to have lower paddy yield compared to the Farwestern Development Region. It may be noted that the Farwestern Development Region is

the most backward region in terms of economic and human development indicators. In the case of ecological belts, paddy yield in both Mountain and Hill regions is lower than in Terai, which is expected as Terai is considered the breadbasket of Nepal.

27. Though the determinants of remittances and labor migration are not of primary interest of this paper, these are used as instruments in equations (2) and (3) to avoid possible endogeneity biases. The instruments average remittance received in PSU and the proportion of migrant population in PSU are found to be significant for equation (2) and equation (3), respectively.

**Table 2: 3SLS Estimates of the Effects of Migration and Remittances on Agricultural Yield in Nepal**

VARIABLES	(1) Paddy yield (kg per hectare)	(2) Remittances	(3) Temporary migration
Temporary migrants	-163.3*** (16.90)	11,644*** (1,240)	
Remittance received (in NRs per year)	-3.60e-06 (0.000939)		
Household size	52.97*** (20.30)		0.0377*** (0.00726)
Proportion of year round irrigated land (for paddy)	234.5*** (57.11)		
Number of livestock	-8.319 (12.94)		0.0106** (0.00436)
Use of chemical fertilizer (1 if yes)	465.8*** (68.43)		
Sex of household head	-91.81 (79.55)	23,152*** (3,840)	0.0281 (0.0248)
Age of household head	-27.24** (12.17)		-7.92e-05 (0.000903)
Square of age of household head	0.222* (0.125)		
Education of household head	12.14* (6.830)		0.00252 (0.00299)
Annual consumption expenditure	0.00255** (0.00102)		
Number of children (<15yrs) in family	-69.08** (30.12)	4,820*** (990.8)	-0.00862 (0.0105)
Number of old people (>60 yrs) in family	-16.70 (49.25)	-202.7 (2,189)	0.0256* (0.0148)
Eastern Dev. Region (1 if Eastern)	-201.6** (98.89)	9,203* (5,507)	-0.112*** (0.0319)
Central Dev. Region(1 if Central)	429.7*** (99.99)	-5,479 (6,289)	0.0472 (0.0392)
Western Dev. Region(1 if Western)	96.61 (104.5)	3,126 (5,807)	-0.0785** (0.0337)
Midwestern Dev. Region(1 if Midwestern)	323.9*** (108.0)	3,180 (6,329)	0.0517 (0.0381)
Mountain(1 if Mountain)	-413.7*** (109.5)	4,575 (6,779)	-0.311*** (0.0400)
Hill (1 if Hill)	-190.9*** (62.62)	3,131 (3,752)	-0.175*** (0.0227)

VARIABLES	(1) Paddy yield (kg per hectare)	(2) Remittances	(3) Temporary migration
Paddy per hectare		17.11*** (5.326)	-0.000147*** (3.64e-05)
Total land		1,395 (1,634)	0.0183* (0.0101)
<b>Instruments</b>			
Average remittance received in PSU		0.567*** (0.0314)	
Proportion of migrants population in PSU			49.89*** (0.394)
Highest education completed by a family member			-0.000851 (0.00273)
Constant	3,207*** (333.3)	-103,419*** (19,140)	0.407*** (0.137)
Observations	2,918	2,937	2,937
R-squared	0.132	0.104	0.940
Chi-2 (p-value)	438.1 (0.00)	558.07 (0.00)	47819.1 (0.00)

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: Authors' estimation based on NLSS III dataset.

## 5. CONCLUSIONS

28. Remittances, equal to about a quarter of GDP, are having a significant impact on Nepal's economy both at the micro and macro levels. In particular, they have been instrumental in achieving some of the Millennium Development Goals such as reducing poverty. However, they have also been contributing to real effective exchange rate appreciation, which erodes competitiveness of Nepalese goods and services, and policy complacency (Sapkota, 2013). Migration and remittances are having a far-reaching impact on the agriculture sector, which contributes about 35% to GDP and provides livelihood options to 76% of the population.

29. Using a nationally representative cross-sectional household survey data, this study looked at the effects of migration and remittances on agriculture yield, particularly paddy production per hectare. The results show that migration negatively affects agriculture yield. Further, remittance-receiving agricultural households are also not seeing an uptake in agriculture output. These findings imply that large-scale migration is creating a shortage of agriculture labor, adversely affecting agriculture yield. However, remittances—which have been found in other countries to be contributing to increasing agriculture yield by boosting capacities to buy agricultural assets and inputs such as hybrid seeds and chemical fertilizers (Lucas, 1987; Rozelle et al., 1999; Quinn, 2009)—are also not contributing to boosting agriculture yield in Nepal. These findings partially support one of the main points of NELM, particularly that labor migration adversely affects household farm output (through reduction in labor input). However, the other point that remittances could compensate for this by relaxing credit and insurance constraints (Start, 1991) is not explicitly supported in the case of Nepal. That being said, the findings of this study are consistent with the general findings of a recent household survey, which showed that almost 80% of remittance incomes are used for daily consumption purpose and a mere 2.4% for capital formation (CBS, 2011). The high remittance inflows to households, and

subsequently, the higher income buffer, might have increased the opportunity cost of engaging in agriculture, resulting in reliance on remittance income more than the income from the agriculture sector. For instance, Amuedo-Dorantes and Pozo (2006) have shown that remittances increase lost-labor effect, primarily by reducing the incentives of remaining household members to work by increasing reservation wage and decreasing the opportunity cost of leisure.

30. These effects of migration and remittances on agriculture yield will have an important bearing on not only the recently formulated 20-year ADS, but also the overall direction and nature of structural transformation, and the country's overarching national goal to graduate from the Least Developed Country (LDC) category to a developing country by 2022. The two main goals of the ADS are to make the agriculture sector the main engine of economic growth and poverty reduction, and to enhance total factor productivity by channeling remittances, among others, for investment in agriculture sector and by addressing the negative impact of migration during ADS implementation (ADB, 2013b). The findings of this study reveal that achieving these goals may be tougher than envisaged as large-scale outmigration is already having an adverse impact on agriculture yield, undermining the sector's potential to further promote overall GDP growth rate and contribute to poverty reduction. Similarly, since remittance-receiving agriculture households are not seeing a positive impact on agriculture yield, there exist substantial knowledge gaps and policy deficiencies to facilitate the adequate channeling of remittances for investment in the agriculture sector. Policy measures aimed at channeling remittances to investments in productivity-enhancing agricultural capital and inputs might help increase agriculture yield.<sup>16</sup>

31. The government could implement policies to enhance skills of both outgoing and returning migrants so that migrants earn more abroad and remit more income to households, ultimately enabling them to acquire more productivity-enhancing capital assets even after discounting for the high share of consumption expenditure. Furthermore, skills enhancement of returning migrants would help them engage more productively in the agriculture sector, potentially helping to increase agriculture yield.<sup>17</sup> Taylor (1999) argues that migrants are unable to convert remittance savings into productive investments in the absence of skills gap, economic diversity, and a financial system that is able to mop up small amounts of savings from multiple sources and channel them into productive business purposes. Other measures that could work, given country socioeconomic and political contexts,<sup>18</sup> are reducing the cost of remitting money, financial literacy, lowering barriers to entrepreneurship, and maintaining overall macroeconomic stability (De Hass, 2005).

---

<sup>16</sup> However, it may be noted that simply channeling remittance income to agriculture sector may not be adequate to make a notable and sustained difference in the face of the erratic and undersupply of agricultural inputs (chemical fertilizers, improved seeds, irrigation, agriculture machinery, and extension services).

<sup>17</sup> Alternatively, the increase in income could also be used to acquire capital enhancing assets by households owning small and medium enterprises, especially in the manufacturing sector.

<sup>18</sup> In the case of Nepal, other measures to boost yield could be the adequate availability of chemical fertilizers, improved seeds and irrigation facilities.

## REFERENCES<sup>1</sup>

- ADB. (2013a). *Macroeconomic Update Nepal*. Manila: Asian Development Bank.
- ADB. (2013b). *Final Report of Technical Assistance for the Preparation of the Agricultural Development Strategy*. Manila: Asian Development Bank.
- Amuedo-Dorantes, C., & Pozo, S. (2006). Migration, Remittances, and Male and Female Employment Patterns. *American Economic Review*, 96(2), 222-226.
- Amuedo-Dorantes, C., & Pozo, S. (2011). Remittances and Income Smoothing. *American Economic Review*, 101(3), 582-87.
- Atamanov, A., & van den Berg, M. (2012). Heterogeneous Effects of International Migration and Remittances on Crop Income: Evidence from the Kyrgyz Republic. *World Development*, 40(3), 620-630.
- CBS. (2011). *Nepal Living Standards Survey 2010/11, vol2*. Kathmandu: Central Bureau of Statistics.
- Chiodia, V., Jaimovichb, E., & Montes-Rojasc, G. (2012). Migration, Remittances and Capital Accumulation: Evidence from Rural Mexico. *Journal of Development Studies*, 48(8), 1139-1155.
- De Brauw, A. (2010). Seasonal migration and agricultural production in Vietnam. *The Journal of Development Studies*, 1, 114-139.
- de Haas, H. (2005). International migration, remittances and development: myths and facts. *Third World Quarterly*, 26(8), 1269-1284.
- de Hass, H. (2001). *Migration and Agricultural Transformations in the Oases of Morocco and Tunisia*. Utrecht: KNAG.
- de Hass, H. (2006). Migration, Remittances and Regional Development in Southern Morocco. *Geoforum*, 37(4), 565-580.
- DoFE. (2013). *Details About Foreign Employment Permit Issued*. Kathmandu: Department of Foreign Employment.
- Harden, C. (1996). Relationships Between Land Abandonment and Land Degradation: A Case from the Ecuadorian Andes. *Mountain Research and Development*, 16(3), 274-280.
- Hyden, G., Turner, B., & Kates, R. (1993). Beyond Intensification. In B. Turner, G. Hyden, & R. Kates, *Population Growth and Agricultural Change in Africa* (pp. 320-260). Gainesville: University of Florida Press.
- Jokisch, B. D. (2002). Migration and Agriculture Change: The Case of Smallholder Agriculture in Highland Ecuador. *Human Ecology*, 30(4).

---

<sup>1</sup> ADB recognizes "China" as the People's Republic of China.

- Kochar, A. (1999). Smoothing Consumption by Smoothing Income: Hours-of-Work Responses to Idiosyncratic Agricultural Shocks in Rural India. *Review of Economics and Statistics*, 81(1), 50-61.
- Lucas, R. E. (1987). Emigration to South Africa's Mines. *American Economic Review*, 77(3), 313-330.
- Maharjan, A., Bauer, S., & Knerr, B. (n.d.). International Migration, Remittances and Subsistence Farming: Evidence from Nepal. *International Migration*, 51, e249-e26.
- Mendola, M. (2008). Migration and Technological Change in Rural Households: Complements or Substitutes? *Journal of Development Economics*, 85(1-2), 150-175.
- Mochebelele, M., & Winter-Nelson, A. (2000). Migrant Labor and Farm Technical Efficiency in Lesotho. *World Development*, 28(1), 143-153.
- NRB. (2013). *Quarterly Economic Bulletin*. Kathmandu: Nepal Rastra Bank.
- OPHI. (2013). *Country Briefing: Nepal Multidimensional Poverty Index at a Glance*. Oxford: Oxford Poverty and Human Development Initiative.
- Quinn, M. A. (2009). Estimating the Impact of Migration and Remittances on Agricultural Technology. *Journal of Developing Areas*, 43(1), 199-216.
- Ratha, D., Mohapatra, S., & Scheja, E. (2011). Impact of Migration on Economic and Social Development: A Review of Evidence and Emerging Issues. *Policy Research Working Paper 5558*.
- Rozelle, S., Taylor, E. J., & deBrauw, A. (1999). Migration, Remittances and Agriculture Productivity in the [People's Republic of] China. *American Economic Review*, 127(8(S)), 287-291.
- Sapkota, C. (2013). Remittances in Nepal: Boon or Bane? *Journal of Development Studies*, 49(10), 1316-1331.
- Satrck, O. (1980). On the Role of Urban-to-Rural Remittances in Rural Development. *Journal of Development Studies*, 16, 369-364.
- Sauer, J., Gorton, M., & Davidova, S. (2013). Migration and Agriculture Efficiency- Empirical Evidence from Kosovo. *Wie viel Markt und wie viel Regulierung* (pp. 1-13). Berlin: Jahrestagung der GEWISOLA.
- Semyonov, M., & Gorodzeisky, A. (2008). Labor Migration, Remittances and Economic Well-being of Households in the Philippines. *Population Research and Policy Review*, 27(5), 619-637.
- Singh, R., Singh, K., & Jha, A. (2012). *Effect of Migration on Agriculture Productivity and Women Empowerment in Bihar*. Retrieved October 30, 2013, from SSRN: <http://dx.doi.org/10.2139/ssrn.2111155>
- Stark, O. (1991). *The Migration of Labor*. Cambridge, MA: Basil Blackwell.
- Taylor, E. J. (1987). Undocumented Mexico—U.S. migration and the returns to households in rural Mexico. *American Journal of Agricultural Economics*, 69(3), 619-638.

- Taylor, E. J. (1999). The New Economics of Labour Migration and the Role of Remittances in the Migration Process. *International Migration*, 37(1), 63–88.
- Taylor, E. J., & Wyatt, T. (1996). The Shadow Value of Migrant Remittances, Income and Inequality in a Household-farm Economy. *Journal of Development Studies*, 32(6), 899–912.
- Taylor, E. J., Rozelle, S., & deBrauw, A. (2003). Migration and Incomes in Source Communities: A New Economics of Migration Perspective from the [People's Republic of] China. *Economic Development and Cultural Change*, 52, 75–101.
- World Bank. (2006). *Resilience Amidst Conflict: An Assessment of Poverty in Nepal, 1995-96 and 2003-04*. Washington, DC: World Bank.
- World Bank. (2011). *Large-scale Migration and Remittance in Nepal: Issues, Challenges and Opportunities*. Washington, DC: World Bank.
- Zahonogo, P. (2011). Migration and Agricultural Production in Burkina Faso. *African Journal of Agricultural Research*, 6(7), 1844–1852.

## Effects of Migration and Remittance Income on Nepal's Agriculture Yield

This working paper uses the most recent cross-section national-level household data to analyze the effects of migration and remittances on agriculture yield. It demonstrates two important results: (i) migration negatively affects agriculture yield and (ii) remittance-receiving agriculture households have not demonstrated improvements in agriculture productivity despite increased household incomes. This paper recommends the need for measures to incentivize remittance-receiving agriculture households to invest in capital goods and inputs to improve agriculture productivity so that it more than compensates for the yield losses arising from labor migration.

### About the Asian Development Bank

ADB's vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries reduce poverty and improve the quality of life of their people. Despite the region's many successes, it remains home to approximately two-thirds of the world's poor: 1.6 billion people who live on less than \$2 a day, with 733 million struggling on less than \$1.25 a day. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

Based in Manila, ADB is owned by 67 members, including 48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

