Migration and Remittance and Their Impacts on Food Security in Nepal

Madhav Regmi, Graduate Student
Krishna P. Paudel, Associate Professor
Deborah Williams, Graduate Student

Corresponding Author
Madhav Regmi
Graduate Student
Department of Agricultural Economics and Agribusiness
LSU AgCenter and Louisiana State University
Baton Rouge, LA 70803-5604
Email: mregmi1@lsu.edu

Selected Paper prepared for presentation at the Southern Agricultural Economics Association (SAEA) Annual Meeting, Dallas, Texas, February 1-4, 2014.

Migration and Remittance and Their Impacts on Food Security in Nepal

Abstract

We collected survey data to identify the impact of several explanatory variables on children, adult, and household food security in East Chitwan, Nepal. The polychoric correlation coefficient indicated a high correlation among children, adult, and household food securities. When ordered probit regression model was estimated to identify the magnitude and direction of these pertinent variables, we found that a higher education level, higher proportion of agricultural income and adoption of hybrid rice/maize have a positive effect on food security while age of household head and number of conservation technologies adopted have a negative impact on food security. Results also indicated that remittance-receiving households were more likely to be food secure in the study area.

Keywords: children, adult, household food security, ordered probit, remittance

JEL classifications: O13, O19

Migration and Remittance and Their Impacts on Food Security in Nepal

Food insecurity is a major concern in Nepal; a substantial number of children suffer from malnutrition, stunting, and wasting in many parts of the country. "Food security exist when all people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO, 1996). Poverty is a leading contributor to food insecurity in developing countries, but it is not the sole indicator.

Recent evidence suggests that remittances, the portion of a migrant's income sent back to the family members left behind, are helping to improve the livelihoods of households in many low-income countries (FAO, 2013; Tinajero, 2009; Kiawa & Jones, 2013; Banga, R., & Sahu, 2010, Willams et.al. 2013). Nepal provides a unique environment to study all of the facets of migration, remittance and their subsequent impact on food security. The average economic growth rate of Nepal was 4% from 1976-96, GDP was increased only by 0.8% in 2001 and remittances became the only option to check some extent of poverty and food insecurity (Pyakuryal et.al. 2005). However, there is very little information available on the level of its impact on the adult, children and household level food security status. Nepal ranks 60 in Global Hunger Index[1] with score of 20.3 where the highest rank is 79 for Burundi (IFPRI, 2012) and the prevalence of overall undernourished among residents of Nepal is 18% of the total population (FAO, 2012).

This study is based on the information collected from respondents in Chitwan, Nepal, where agriculture is the main source of income for the majority of households. Agricultural production

[1] Global Hunger Index (GHI) is calculated each year by International Food Policy and Research Institute (IFPRI). GHI combines three equally weighted indicators undernourishment, child underweight and children mortality in on scale and ranks countries on a 100-point scale where zero is the best (no hunger) and 100 is the worst.

is characterized by mostly subsistence farming on fragmented land, using traditional agricultural practices, resulting in a disequilibrium in food imports. A quarter of Nepal's population lives on less than U.S. $1 a day, and many Nepalese lack the appropriate education and social capital to access good local jobs (Wagle 2010). Additionally, political instability and high unemployment rates force migrants to leave rural Nepal for incomes that can help to cover the household daily expenses. The Government of Nepal (GON) encourages migration as a means to reduce poverty; during 2010/11, 55.8% of households in Nepal received remittances, making up an average of 30.9% of household income, of which 79% is used for daily consumption (NPC, 2011). Remittance already amounts to 23 percent of GDP, and this figure is expected to grow (Thieme at el. 2005, Yang 2011). Studies have found that remittance income provides rural households with an opportunity to secure daily food requirements and escape poverty (Yang 2011, Frost et al. 2007, Carletto et al. 2011). However, a mass exodus from rural to urban areas resulting in the outflow of resources from the farm sector may exacerbate the growing demand for food (Rozelle et al. 1999).

Most would agree that remittance has the potential to alleviate poverty, increase food security and eventually promote development, especially for the rural poor who are isolated, under-educated and lack the means to gain greater access to local resources (Yang 2011, Frost et al. 2007, Adams et al. 2005, Thieme et al. 2005). But, it is difficult to measure the access to sufficient dietary needs (Barrett, 2010) because the determinants of household's subjective experiences on food access are context specific (Coattes et al. 2007). In order to estimate the impact on food security status we develop food security indexes at three levels (household, adult and children). We then identify the role of pertinent variables on the food security status of households (HFS), adults (AFS) and children (CFS), separately using an ordered probit model.

Method

We use an ordered probit model to estimate the impact of different socioeconomic variables on food security because the label of food security status[2] are discrete but ordinal in nature (USDA, 2012). Household Food Security (HFS) is coded 1 for very low household food security, 2 for low household food security, 3 for marginal household food security, and 4 for high household food security.

$$HFS_i^* = \beta_h X_i + \varepsilon_i$$

Where, X_i represents the observable household characteristics, β_h is a vector of regression parameters to be estimated, and ε_i is the stochastic disturbance term. HFS_i is an observed ordered categorical variable for the food security status of households with one or more children, which is assumed to be related, with a latent variable HFS_i^* as follows:

$$\mathrm{HFS}_i = \begin{cases} 1 & \text{if } \mu_2 \leq \mathrm{HFS}_i^* \leq \mu_1 \\ 2 & \text{if } \mu_4 \leq \mathrm{HFS}_i^* \leq \mu_3 \\ 3 & \text{if } \mu_6 \leq \mathrm{HFS}_i^* \leq \mu_5 \\ 4 & \text{if } \mathrm{HFS}_i^* = \mu_7 \end{cases}$$

(Here,$\mu_1 = 18, \mu_2 = 8, \mu_3 = 7, \mu_4 = 3, \mu_5 = 2, \mu_6 = 1=, \mu_7=0$)

[2] Four ranges of food security status can be characterized as:

1. High food security*:* Households had no problems, or anxiety about, consistently accessing adequate food.
2. Marginal food security**:** Households had problems at times, or anxiety about, accessing adequate food, but the quality, variety, and quantity of their food intake were not substantially reduced.
3. Low food security**:** Households reduced the quality, variety, and desirability of their diets, but the quantity of food intake and normal eating patterns were not substantially disrupted.
4. Very low food security**:** At times during the year, eating patterns of one or more household members were disrupted and food intake reduced because the household lacked money and other resources for food.

Similarly, Adult Food Security (AFS) is coded 1 when a household has very low food security among adults, 2 when a household has low food security among adults, 3 when a household has marginal food security among adults, and 4 when a household has high food security among adults.

$$AFS_i^* = \beta_a X \ + \varepsilon_i$$

Where, X_i represents the observable household characteristics, β_a is a vector of regression parameters to be estimated, and ε_i is the error term. AFS_i is an observed ordered categorical variable of adult food security, for a household that is assumed to be related, with a latent variable AFS_i^* as follows:

$$\mathrm{AFS}_i = \begin{cases} 1 & \text{if } \mu_2 \leq \mathrm{HFS}_i^* \leq \mu_1 \\ 2 & \text{if } \mu_4 \leq \mathrm{HFS}_i^* \leq \mu_3 \\ 3 & \text{if } \mu_6 \leq \mathrm{HFS}_i^* \leq \mu_5 \\ 4 & \text{if } \mathrm{HFS}_i^* = \mu_7 \end{cases}$$

(Here, μ_1=10, μ_2=6, μ_3=5, μ_4=3, μ_5=2, μ_6=1, μ_7=0)

Likewise, Children Food Security (CFS)[3] is coded 1 when a household has very low food security among children, 2 when a household has low food security among children, 3 when a household has marginal or high food security among children.

$$CFS_i^* = \beta_a X \ + \varepsilon_i$$

Where, X_i represents observable household characteristics, β_c is a vector of regression parameters to be estimated, and ε_i is the error term. CFS_i is an observed ordered categorical

[3] Children Food Security has only three categories as defined in the measurement section of U.S. household food security survey module: three-stage design, with screeners (USDA, 2012).

variable of children's food security, for a household that is assumed to be related, with a latent variable CFS_i^* as follows:

$$\mathrm{CFS}_i = \begin{cases} 1 & \text{if } \mu_2 \leq \mathrm{CFS}_i^* \leq \mu_1 \\ 2 & \text{if } \mu_4 \leq \mathrm{CFS}_i^* \leq \mu_3 \\ 3 & \text{if } \mu_6 \leq \mathrm{CFS}_i^* \leq \mu_5 \end{cases}$$

(Here, μ_1=8, μ_2=5, μ_3=4, μ_4=2, μ_5=1, μ_6=0)

In order to interpret the coefficients of an ordered probit regression, we compute the partial changes in the marginal probabilities of an outcome for a given change in each of the dependent variables by taking first derivative of the log likelihood functions (Logn, 1997). These marginal effects will show the probability of having very low food security, low food security, marginal food security, and high food security.

Data

Survey respondents are farming households randomly selected from several village development committees (VDC) in East Chitwan. The researchers digitized name, address and the landholding size, and farmers were selected using a stratified random sample of small, medium and large landholdings. The survey was initially tested using Focus groups with farmers from Kumroj and Pithuwa VDC. Based on their responses, the final survey questionnaire was developed. Two maps are presented in Figure 1 to show the study area; one is map of Nepal showing Chitwan district and another is map of Chitwan showing the study VDC's.

Survey assistants with bachelor and master degrees in Agriculture were hired to conduct face-to-face interviews of farmers over a period of two months. Survey respondents were cooperative; there were no incidence of survey assistants being turned down for the interview. The

questionnaire was 22 pages long, and a total of 396 farmers were interviewed . The researchers captured information on the socio-demographic makeup of the household, household production decisions, migration history, remittances and the food security status before and after migration.

Measurement of Food Security Status

We asked a series of 18 questions (see Table 1) based on the U.S. household survey format developed by the Economic Research Service, United States Department of Agriculture (USDA, 2012). The food security measurement developed in this survey module is appropriate to capture the food security scenario of rural households in any part of the world. These 18 questions are designed in such a way that the responses of "yes", "often", "sometimes", "almost every month" and "some but not every month" are coded as affirmative for food insecurity. Based on the sum of affirmative responses, the food security status are identified for each group. In case of food security for the entire household (we used the category for households with one or more children), the raw score (sum of affirmative responses for food insecurity) of 8 to 18 represents "very low food security", 3 to 7 represents "low food security", 1 to 2 represents "marginal food security", and 0 (zero) represents "high food security". Similarly, the food security among adults, the raw score of 6 to 10 represents "very low food security", 3 to 5 represents "low food security",1 to 2 represents "marginal food security", and 0 (zero) represents "high food security". Unlike the household and adult food security measures, the food security among children has only three categories. Both the high or marginal food security among children are considered as one scale because there is no certainty that all the households that have a raw score of zero have high food security among children (USDA, 2012). In this case, a raw score of 5 to 8 represents "very low food security" among children, 2 to 4 represents "low food security" among children, and 0 to 1 represents "high or marginal food security" among children.

We have used household, adult and children food security indexes as dependent variables in three separate regression models. Summary statistics are presented in Table 2. We found that 86.84%, 3.04%, 8.61%, and 1.52% of households experienced high food security, marginal food security, low food security, and very low food security, respectively. Among adults, 87.095%, 3.29%, 8.86%, and 0.76% experienced the same respective food security categories. Among children, 90.38%, 9.11%, and 0.51% experienced high or marginal food security, low food security, and very low food security, respectively. The polychoric correlation matrix (see Table 3) indicates that adult and children food security are highly correlated, and homogenously represent an overall scenario of household food security.

Description of Explanatory Variables

Several socio-economic indicators affect household, adult and child level food security, and the pertinent explanatory variables in this analysis are presented in Table 4. These explanatory variables are developed based on some previous literatures on food security (Garret et.al. 1999, Babatunde et.al. 2007). Respondents were asked several questions related to the socio-economic makeup of their households, including gender of household head, which is a dummy variable (1= male and 0=female), age of household head (in years), the number of household members with secondary education or higher. We also included the number of conservation agricultural practices adopted by the households (e.g. no tillage, terracing reduced tillage, reduce surface runoff, water harvesting, mulching practices, terrace farming, crop rotation etc.), whether or not the household adopted hybrid rice/maize, which is a dummy variable (1= yes and 0= no), and the dependency ratio, calculated using the following formula:

$$\text{Total Dependency Ratio} = \frac{\text{Number of people aged 0 to 14 and those aged 65 and over}}{\text{Number of people aged 15 to 64}}$$

As the variable of interest is remittances, we have included total annual remittances received by the household from foreign countries as an explanatory variable. We also included the annual income from wages outside the district, the annual income from agriculture/livestock production, landholding size (in katha; where 30 katha=1 hector), and the total animal unit equivalents owned by the household. Animal unit equivalents were calculated based on the calculation provided by the Minnesota Department of Agriculture. Some animals did not have an equivalent animal unit, so we used the value of the most appropriate equivalent. Based on the Minnesota calculations, the animal unit is 1.0 for a cow, horse, or ox (an ox is worth the same as a mature cow under 1000 pounds with an animal unite of 1.0), 0.7 for a buffalo, 0.1 for a goat (a goat is worth the same as a sheep or a lamb with an animal of 0.1), 0.3 for pig (the animal unit for a swine between 55 and 300 pounds is 0.3), 0.033 for a chicken, 0.01 for a duck, and 0.003 for a pigeon (a pigeon is worth the same as a chicken under 5 pounds with an animal unit of 0.003). Among 396 households the mean annual remittance amount is NRs. 15485.4 with minimum value of NRs. 0 (no remittance receiving household) to maximum value of NRs. 300,000.

Results

The order probit model is used to estimate the impact of the explanatory variables on the household, adult and children's food security status. We suspected that the number of conservation technology adopted by the household and whether the adopted hybrid rice/maize variety would be endogenous variables. We used a variable indicating the presence of household perceived land degradation (household perceived land degradation is a dummy variable;1= yes and 0= no), and land productivity (household perceived the land is productive is a dummy variable;1= yes and 0= no) as instrumental variables for the number of conservation technology adopted and whether a hybrid rice/maize variety was adopted, respectively. We estimated two regression models for each

suspected endogenous variables. The first stage regression for the number of conservation technology adopted was a poisson, and the first stage regression for whether the household adopted a hybrid rice/maize variety was a probit. We used an ordered probit for both second stage regressions. The Durbin-Wu-Hausman endogeneity test found no endogeneity problem with the variables we suspected. So we run the final order probit regression in order to find the determinants of different types of food security and the effect of remittance on each food security status. Our results are consistent with previous literature, suggesting that remittances help households in low-income countries meet daily food requirements (Kiawa & Jones, 2013; Banga, R., & Sahu, 2010).

a) Household Food Security

The determinants of household food security status, their marginal effects and standard errors are reported in Table 5. The signs of estimated coefficients of an ordered probit model and marginal effects of high food security status are similar but the effects for marginal, low and very low food security status are opposite in most of the scenario. The RemitOutCoun shows the impact of country level remittance inflows on household level food security, after controlling for other explanatory variables, an increase in annual remittance in the amount of NRs. 10,000 (approximately $100 @ of NRs.1=$0.01003 on Jan. 7, 2013) will significantly increase the likelihood that households are highly food secure by 22%. With an additional number of household members having secondary education or higher will significantly increase the likelihood that a household is highly food secure by 2.9%. There is a 12.2% increase in the likelihood of a household being high food secure, if the income from agriculture and livestock production increases by an additional NRs. 1,000 (approximately $10 @ of NRs.1=$0.01003 on Jan. 7, 2013). The age of the household head negatively impacts the household food security status, for an additional 10 years of age, the household is 3% less likely to be high food secure. Interestingly, we found that an

additional number of soil or water conservation technology that was adopted, the household was 1.9% less likely to be high food secure. The reason may be that farmers with small landholdings were forced to adopt more conservation practices or subsistent economy which is detrimental to food security if land is taken away or reduce in size by adopting conservation practices. It may be also that farmers do not have other required inputs (herbicides, pesticides, fertilizers) to make conservation practices effective. The adoption of hybrid rice/maize variety, wage from outside the district, landholding size, gender of household head, household dependency ratio, and animal unit did not explain the household food security status in a significant level.

b) Adult Food Security

The determinants of adult food security status, their marginal effects and standard errors are reported in Table 6. Like the household level food security estimation, the signs of the estimated coefficients in the ordered probit model and marginal effects of high food security status among adults, are similar but the effects for marginal, low and very low food security status are opposite. The RemitOutCoun shows the impact of national remittance inflows on adult food security at the household level. After controlling for other relevant explanatory variables, an increase in the annual remittance amount of NRs. 10,000 (approximately $100 @ of NRs.1=$0.01003 on Jan. 7, 2013) will significantly increase the likelihood of the adults in the household to be highly food secure by 21 %. The likelihood of high food security for the adults in the household significantly increases by 2.7% with an additional household member having secondary education or more. There is a 10.8% increase in the likelihood of a the adults in the household being high food secure with an additional NRs. 1,000 (approximately $10 @ of NRs.1=$0.01003 on Jan. 7, 2013) increase in the income from agriculture and livestock production. The age of the household head negatively impacts the household food security status,

for an additional 10 years of age, the household is 3% less likely to be high food secure. Similarly, an additional number of soil/water conservation technology adopted, the adults in the household was 1.8% less likely to be high food secure. However, the adoption of improved variety, wage from the outside of district, landholding size, gender of household head, household dependency ratio, and animal units did not significantly explain the adult's food security status, even though all these variables have expected signs.

c) Children Food Security

Unlike the previous food security groups, children's food security has only three categories. The determinants of children's food security status, their marginal effects and standard errors are reported in Table 7. Results for most of the variables are consistent with our expectations. The signs of estimated coefficients of the ordered probit model and marginal effects of marginal/high food security status are similar but opposite for low and very low food security status. After controlling for other explanatory variables, we found that an increase in the national remittance inflows in the amount of NRs. 10,000 (approximately $100 @ of NRs.1=$0.01003 on Jan. 7, 2013) significantly increases the likelihood that a child is marginally/highly food secure by 15%.

The likelihood of being marginally/highly food secure significantly increases by 2% with an additional household member having secondary education or higher. There is a 12.4% increase in the likelihood of being highly food secure if a child is from a household that receives an additional income from agriculture and livestock production in the amount of NRs. 1,000 (approximately $10 @ of NRs.1=$0.01003 on Jan. 7, 2013). In contrast to the household and adult food security estimations, we found a very significant effect of adopting a hybrid rice/ maize variety on the

children. If the household cultivated a hybrid rice/maize variety in the previous year, the children were 53.6% more likely to be food secure than the children from other households.

We found that the age of household head is significantly related with children's food security, an additional 10 years of age of the household head makes the children 3% less likely to be marginally/highly food secure. Similarly, we found that an additional soil/water conservation technology adopted results in the children being 1.4% less likely to be marginally/highly food secure. However, gender of household head, wage from the outside of district, landholding size, household dependency ratio, and animal units did not explain the household food security status at a significant level.

Conclusions

We estimated the impact of remittances on the food security of different groups in Chitwan, Nepal: household, adult, and children food security. Our findings indicated the likelihood of improvement in food security status due to remittance is substantial in the study region. We found that income from agriculture and livestock production is limited among most survey respondents because of small landholding sizes, conventional farming practices and lack of sufficient improved input supplies. Households with higher incomes from agriculture and livestock production are more likely to have food security among household members. Surprisingly, the adoption of conservation practices have a negative impact on food security because productive land is diverted for these practices and less land is available for food production. This is consistent with the findings in developed countries where farmers do not adopt best management practices because of the concerns they have to divert the land from productive to environmental use (Gillespie et al. 2007). In addition, this it may be due to the fact that farmers are not aware about the appropriateness of these technology in their own farm situation, and they are adopting them as a

farming tradition. On the other hand, our findings suggest that the promotion of hybrid rice/corn varieties can play a crucial role in the food security of children in Nepal. Based on our study result, we strongly recommend that the Government of Nepal and other related stakeholders implement their activities with major focus on household member's education to overcome the ongoing hunger situation. Education provides employment opportunities and steady income thereby reducing the pressure of food shortage. Remittance as an important source of household income in migrant families is helping to get higher education for family members, making possible to adopt improved agricultural technology and ultimately supporting the better access of household for more diverse quality and quantity of dietary foods. Hence, programs related to effective utilization of remittances income at household level can make a positive change in food security in developing economies. In the long run, remittance income can be used for investments in education and adoption of improved agriculture technology, which will simultaneously help alleviate food insecurity problem.

References

Adams Jr, Richard H., and John Banga, R. and Sahu, P.K. “Impact of remittances on poverty in developing countries”.

Babatunde, R. O., O. A. Omotesho, and O. S. Sholotan. "Socio-economic characteristics and food security status of farming households in Kwara State, North-Central Nigeria." *Pakistan Journal of Nutrition* 6.1 (2007): 49-58.

Barrett, Christopher B. "Measuring food insecurity." *Science* 327, 5967 (2010): 825-828Page. "Do international migration and remittances reduce poverty in developing countries?" *World Developme1nt* 33, 10 (2005): 1645-1669.

Coates, Jennifer, Anne Swindale, and Paula Bilinsky. "Household Food Insecurity Access Scale (HFIAS) for measurement of food access: indicator guide." Washington, DC: Food and Nutrition Technical Assistance Project, Academy for Educational Development, August 2007.

Economic Research Service, United States Department of Agriculture. U.S. household food security survey module: three-stage design, with screeners. Internet site: http://www.ers.usda.gov/datafiles/Food_Security_in_the_United_States/Food_Security_Survey_Modules/hh2012.pdf (Accessed January 14, 2013).

Food and Agriculture Organization. FAO: Rome Declaration on Food Security and World Food Summit Plan of Action. Internet site: http://www.fao.org/docrep/003/w3613e/w3613e00.HTM(Accessed 26 October 2013).

Food and Agriculture Organization. FAO: The State of Food Insecurity in the World 2012.Economic growth is necessary but not sufficient to accelerate reduction of hunger and malnutrition. Internet site: http://www.fao.org/docrep/016/i3027e/i3027e.pdf (Accessed May 2, 2013).

Food and Agriculture Organization. FAO: The State of Food Insecurity in the World 2013. The multiple dimensions of food security. Internet site: http://www.fao.org/docrep/018/i3434e/i3434e.pdf (Accessed December 30, 2013).

Frost, Peter, Bruce Campbell, Manyewu Mutamba, Alois Mandondo, and Witness Kozanayi. "In search of improved rural livelihoods in semi-arid regions through local management of natural resources: lessons from case studies in Zimbabwe." *World Development* 35, 11 (2007): 1961-1974.

Garrett, James L., and Marie T. Ruel. "Are determinants of rural and urban food security and nutritional status different? Some insights from Mozambique."*World Development* 27.11 (1999): 1955-1975.

International Food Policy Research Institute (IFPRI).2012. Global Hunger Index. The Challenge of hunger: Ensuring Sustainable Food Security under Land, Water and Energy Stresses. Internet site: http://www.ifpri.org/sites/default/files/publications/ghi12.pdf (Accessed May 3, 2013).

Kiawu, James AF, and Keithly G. Jones. "Implications of food aid and remittances for West African food import demand." *African Journal of Agricultural and Resource Economics Volume* 8, 1 (2013): 30-44.

Long, J. Scott. *Regression models for categorical and limited dependent variables*. Sage Publications, Inc. 1997.

Maluccio, John A., Katia Covarrubias, and Calogero Carletto. "Migration and Child Growth in Rural Guatemala." *Food Policy* 36(2011):16-27.

Maphosa, France. "Remittances and development: the impact of migration to South Africa on rural livelihoods in southern Zimbabwe." *Development Southern Africa* 24, 1 (2007): 123-136.

Minnesota Department of Agriculture (MDA).Animal unit calculation worksheet. Internet site: http://www.mda.state.mn.us/animals/feedlots/feedlot-dmt/feedlot-dmt-animal-units.aspx (Accessed 18 December, 2013).

National Planning Commission Central Bureau of Statistics. *Nepal Living Standard Survey 2010/2011*. Statistical Report 2, 2011.

Pyakuryal, Bishwambher, Y. B. Thapa, and Devesh Roy. "Trade liberalization and food security in Nepal": Discussion Paper 88, Washington DC: International Food Policy Research Institute (IFPRI), October 2005.

Rozelle, Scott, J. Edward Taylor, and Alan DeBrauw. "Migration, remittances, and agricultural productivity in China." *The American Economic Review* 89, 2 (1999): 287-291.

Thieme, Susan, and Simone Wyss. "Migration patterns and remittance transfer in Nepal: A case study of Sainik Basti in western Nepal." *International Migration*43, 5(2005): 59-98.

Tinajero, Sandra Paola Alvarez. "Setting the Stage for Enhanced Development Impacts of Remittances in Angola." *IAECAE/MIREX, IOM Lisbon, IOM Luanda, IOM Pretoria and Development Workshop*. 2009.

Wagle, Udaya R. "Economic inequality in Nepal: Patterns and changes during the late 1990s and early 2000s." *Journal of International Development* 22, 5 (2010): 573-590.

Williams, Deborah, Krishna Paudel, and Mahesh Pandit. "Remittance And Conservation Technology Adoption." Paper presented at the annual meeting of Agricultural and Applied Economics Association, Washington, DC, August 4-6, 2013.

Working Paper, Dept. of Humanities and Social Sciences. Indian Institute of Technology Bombay, 2010.

Yang, Dean. "Migrant remittances." *The Journal of Economic Perspectives* 25, 3 (2011): 129-151.

Table 1. Questions Included in the Food Security Scale

1. "We worried whether our food would run out before we got money to buy more."
2. "The food that we bought just didn't last and we didn't have money to get more." 1- Often 2-Sometimes 3-Never 4-N/A
3. "We couldn't afford to eat balanced meals." 1- Often 2-Sometimes 3-Never 4-N/A
4. "We relied on only a few kinds of low-cost food to feed our children because we were running out of money to buy food."
   1- Often 2-Sometimes 3-Never 4-N/A
5. "We couldn't feed our children a balanced meal, because we couldn't afford that." 1- Often 2-Sometimes 3-Never 4-N/A
6. "The children were not eating enough because we just couldn't afford enough food." 1- Often 2-Sometimes 3-Never 4-N/A
7. Did you or other adults in the household ever cut the size of your meals or skip meals because there wasn't enough money for food?
   1- Yes 2-No 3-N/A
8. (If yes to question 7) What month in which it occurred?
   (All that apply) a: 1-Baishakh, 2-Jeth, 3-Asar,4-Saun ,5-Bhadau, 6-Asoj, 7-Kattik,8- Mangsir,9- Pus,10- Magh,11- Fagun,12- Chait
9. Did you or other adults ever eat less than you or they ought because there wasn't enough money for food? 1- Yes 2-No 3-N/A
10. Were you or other adults ever hungry, but didn't eat, because there wasn't enough money for food? 1- Yes 2-No 3-N/A
11. Did you or other adults lose weight because there wasn't enough money for food? 1- Yes 2-No 3-N/A
12. Did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food?
    1- Yes 2-No 3-N/A
13. (If yes to question 12) What month in which it occurred?
    (All that apply) a: 1-Baishakh, 2-Jeth, 3-Asar,4-Saun ,5-Bhadau, 6-Asoj, 7-Kattik,8- Mangsir,9- Pus,10- Magh,11- Fagun,12- Chait
14. Did you ever cut the size of any of the children's meals because there wasn't enough money for food? 1- Yes 2-No 3-N/A
15. Were the children ever hungry but you just couldn't afford more food? 1- Yes 2-No 3-N/A
16. Did any of the children ever skip a meal because there wasn't enough money for food? 1- Yes 2-No 3-N/A
17. (If yes to question 16) What month in which it occurred?
    (All that apply) a: 1-Baishakh, 2-Jeth, 3-Asar,4-Saun ,5-Bhadau, 6-Asoj, 7-Kattik,8- Mangsir,9- Pus,10- Magh,11- Fagun,12- Chait
18. Did any of the children ever not eat for a whole day because there wasn't enough money for food? 1- Yes 2-No 3-N/A

Table 2. Description of Food Security Types

	Freq.	Percent	Cum.
a) Household Food Security Status			
Very Low Food Security	6.00	1.52	1.52
Low Food Security	34.00	8.61	10.13
Marginal Food Security	12.00	3.04	13.16
High Food Security	343.00	86.84	100.00
Total	395.00	100.00	
b) Adult Food Security Status			
Very Low Food Security	3.00	0.76	0.76
Low Food Security	35.00	8.86	9.62
Marginal Food Security	13.00	3.29	12.91
High Food Security	344.00	`87.09	100.00
Total	395.00	100.00	
c) Children Food Security Status			
Very Low Food Security	2.00	0.51	0.51
Low Food Security	36.00	9.11	9.62
High or Marginal Food Security	357.00	90.38	100.00
Total	395.00	100.00	

Table 3. Polychoric correlation matrix

	Household Food Security	Adult Food Security	Child Food Security
Household Food Security	1.00		
Adult Food Security	0.998	1.00	
Child Food Security	0.999	0.993	1.00

Table 4. Description of Dependent and Independent Variables

		Obs	Mean	Std. Dev.	Min	Max
Dependent Variables						
HouseFS	Household Food Security Status(1=very low food security; 2=low food security;3=marginal food security; 3=high food security)	395.00	3.75	0.67	1.00	4.00
AdultFS	Adult Food Security Status(1=very low food security; 2=low food security;3=marginal food security; 3=high food security)	395.00	3.77	0.63	1.00	4.00
ChildFS	Children Food Security Status(1=very low food security; 2=low food security;3=marginal or high food security)	395.00	2.90	0.32	1.00	3.00
Independent Variables						
GenderHh	Gender of household head (1= male, 0= female)	393.00	0.95	0.21	0.00	1.00
AgeHh	Age of household head (years)	384.00	52.78	13.75	22.00	92.00
ConsTech	Soil and water conservation technology (number)	362.00	6.22	2.93	1.00	20.00
EduSec	Number of household members with education of secondary level or more	394.00	2.87	2.11	0.00	12.00
DepenRatio	Dependency ratio of household	394.00	25.60	19.52	0.00	100.00
AnimUnit	Animal unit	350.00	5.13	13.01	0.00	111.70
HybRiceMaize	Adoption of any hybrid varieties of rice or maize last year (1=yes; 0= no)	396.00	0.05	0.21	0.00	1.00
WageOutDist	Amount of wage from outside the district (NRs.1000)	396.00	1.84	6.50	0.00	60.00
RemitOutCoun	Amount of annual remittance from outside the country (NRs.1000)	396.00	15.49	29.97	0.00	300.00
AgLivInc	Annual cash income from agriculture and livestock (NRs. 1000)	396.00	8.57	45.30	0.00	887.00
LandArea	Total land area (Katha)	382.00	11.63	15.24	0.10	112.00

Table 5. Coefficients and Marginal Effects of Ordered Probit Estimation of the Household Food Security Status

			Marginal Effects							
			High Food Security		Marginal Food Security		Low Food Security		Very Low Food Security	
Variables	Coeff	SE	dy/dx	SE	dy/dx	SE	dy/dx	SE	dy/dx	SE
GenderHh	0.559	(0.486)	0.097	0.085	-0.021	0.019	-0.059	0.051	-0.017	0.018
AgeHh	-0.018**	(0.007)	-0.003	0.001	0.001	0.000	0.002	0.001	0.001	0.000
ConsTech	-0.109***	(0.027)	-0.019	0.004	0.004	0.002	0.012	0.003	0.003	0.001
EduSec	0.165***	(0.047)	0.029	0.008	-0.006	0.002	-0.017	0.005	-0.005	0.002
DepenRatio	0.002	(0.006)	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000
AnimUnit	-0.001	(0.006)	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000
HybRiceMaize	0.352	(0.532)	0.061	0.092	-0.013	0.020	-0.037	0.056	-0.011	0.017
WageOutDist	0.250	(0.217)	0.043	0.038	-0.009	0.009	-0.026	0.023	-0.008	0.007
RemitOutCoun	0.124**	(0.063)	0.022	0.011	-0.005	0.003	-0.013	0.007	-0.004	0.002
AgLivInc	0.700***	(0.202)	0.122	0.034	-0.026	0.009	-0.074	0.022	-0.022	0.011
LandArea	0.007	(0.009)	0.001	0.002	0.000	0.000	-0.001	0.001	0.000	0.000
_cut1	-2.604***	(0.803)								
_cut2	-1.503**	(0.718)								
_cut3	-1.244*	(0.721)								
								Number of obs =		306
								Wald chi2(11) =		47.26
								Prob > chi2 =		0.0000
								Log pseudolikelihood =		-132.01013
								Pseudo R2 =		0.1802

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6. Coefficients and Marginal Effects of Ordered Probit Estimation of the Adult Food Security Status

			Marginal Effects							
			High Food Security		Marginal Food Security		Low Food Security		Very Low Food Security	
Variables	Coeff	SE	dy/dx	SE	dy/dx	SE	dy/dx	SE	dy/dx	SE
GenderHh	0.515	(0.444)	0.090	0.077	-0.022	0.019	-0.060	0.053	-0.007	0.008
AgeHh	-0.015**	(0.007)	-0.003	0.001	0.001	0.000	0.002	0.001	0.000	0.000
ConsTech	-0.105***	(0.029)	-0.018	0.004	0.004	0.002	0.012	0.003	0.002	0.001
EduSec	0.158***	(0.048)	0.027	0.008	-0.007	0.003	-0.019	0.006	-0.002	0.001
DepenRatio	0.002	(0.006)	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000
AnimUnit	-0.001	(0.006)	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000
HybRiceMaize	0.353	(0.516)	0.061	0.090	-0.015	0.021	-0.041	0.061	-0.005	0.008
WageOutDist	0.280	(0.230)	0.049	0.040	-0.012	0.010	-0.033	0.027	-0.004	0.004
RemitOutCoun	0.123**	(0.063)	0.021	0.011	-0.005	0.003	-0.014	0.007	-0.002	0.001
AgLivInc	0.622***	(0.184)	0.108	0.031	-0.026	0.009	-0.073	0.022	-0.009	0.006
LandArea	0.009	(0.009)	0.002	0.002	0.000	0.000	-0.001	0.001	0.000	0.000
_cut1	-2.854***	(0.792)								
_cut2	-1.402**	(0.667)								
_cut3	-1.118*	(0.669)								

Number of obs = 306

Wald chi2(11) = 45.51

Prob > chi2 = 0.0000

Log pseudolikelihood = -127.16093

Pseudo R2 = 0.1708

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7. Coefficients and Marginal Effects of Ordered Probit Estimation of the Children Food Security Status

			Marginal Effects					
			High/Marginal Food Security		Low Food Security		Very Low Food Security	
Variables	Coeff	SE	dy/dx	SE	dy/dx	SE	dy/dx	SE
GenderHh	0.723	(0.478)	0.087	0.057	-0.0824	0.05394	-0.005	0.005
AgeHh	-0.025***	(0.008)	-0.003	0.001	0.00279	0.00104	0.000	0.000
ConsTech	-0.119***	(0.033)	-0.014	0.004	0.01353	0.00329	0.001	0.001
EduSec	0.166***	(0.059)	0.020	0.007	-0.0189	0.00708	-0.001	0.001
DepenRatio	0.006	(0.007)	0.001	0.001	-0.0007	0.00076	0.000	0.000
AnimUnit	-0.005	(0.006)	-0.001	0.001	0.00056	0.00072	0.000	0.000
HybRiceMaize	7.509***	(0.553)	0.536	0.100	-0.5067	0.09933	-0.029	0.022
WageOutDist	0.156	(0.231)	0.019	0.028	-0.0178	0.02655	-0.001	0.002
RemitOutCoun	0.126*	(0.065)	0.015	0.008	-0.0143	0.00742	-0.001	0.001
AgLivInc	1.029***	(0.347)	0.124	0.040	-0.1172	0.03735	-0.007	0.006
LandArea	0.012	(0.012)	0.001	0.002	-0.0014	0.00143	0.000	0.000
_cut1	-3.547***	(0.841)						
_cut2	-1.577**	(0.782)						
						Number of obs =		306
						Wald chi2(11) =		1870.13
						Prob > chi2 =		0.0000
						Log pseudolikelihood =		-71.228215
						Pseudo R2 =		0.2728

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8. Mean Predicted Probabilities of Different Types of Food Security

	Food Security Status			
Food Security Type	Very Low Food Security	Low Food Security	Marginal Food Security	High Food Security
Household Food Security	0.016	0.082	0.040	0.862
Adult Food Security	0.007	0.087	0.045	0.861
			Marginal/High Food Security	
Children Food Security	0.0028	0.093	0.905	

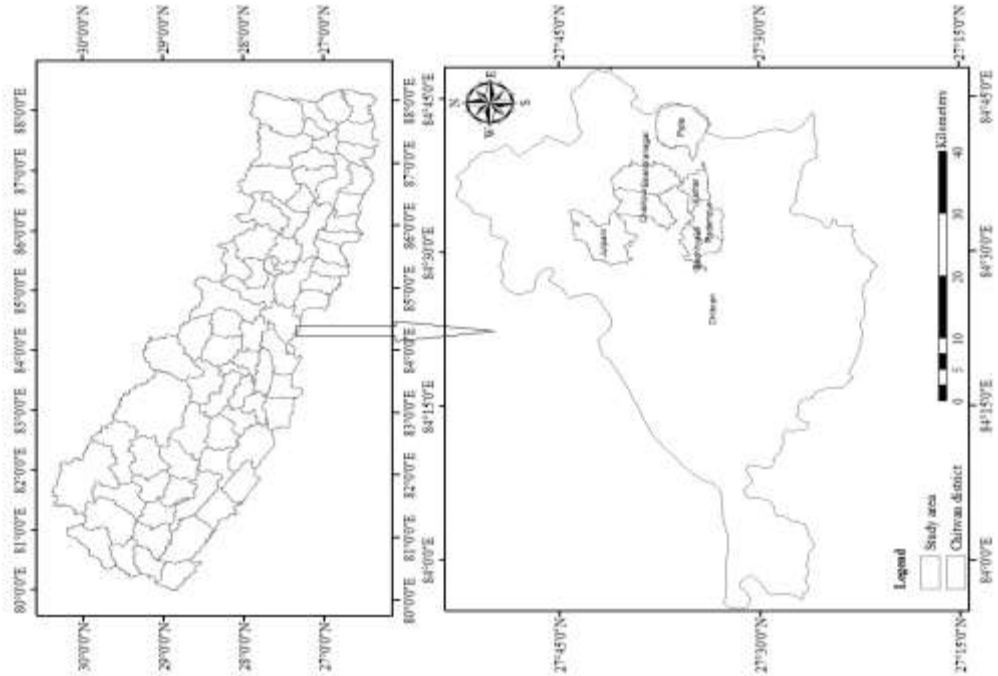

Figure1. Showing Chitwan district in Map of Nepal and study area in eastern Chitwan (Bottom)