論説 Article

Determinants of Income and Consumption Poverty in Far-Western Rural Hills of Nepal
― A Binary Logistic Regression Analysis ―

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Abstract: Poverty in Nepal remains forefront in Nepalese development agenda since 1970s. However, there has not been significant improvement in poverty situation and poverty still remains the key research issue in Nepal. This study aims to analyze income and consumption measure of poverty applying an econometric tool taking a case of Baitadi district from far-western rural hills of Nepal. Data obtained from household survey is used for the analysis. A binary logistic regression model is applied for identifying the variables having a significant impact on income and consumption poverty. Both measures of poverty show that it is quite high in the study areas. Most of the factors that determine income and consumption poverty are more or less similar. However, there are still few factors that affect income and consumption poverty in different way. For instance, a chance of household to suffer food insecurity is significantly higher in Melauli, a relatively remote VDC. Subsistence nature of agriculture and absence of well-developed market structure that leads to higher price of food commdities is the main reason for such difference. Similarly, family size, operational landholding and livestock holding are important determinants of food insecurity, whereas, dependency ratio and occupation are important determinants of income poverty. Education of household head and landholding are important determinants for both income and consumption poverty.

Key words: Income poverty, food insecurity, Baitadi, a binary logistic regression

Ⅰ．Introduction

Concept of poverty has evolved overtime moving from its initial treatment as an economic phenomenon (Rowntree, 1901) to take on a number of social phenomena (Human Development Index, United Nations Development Programme, 1990). Most widely adopted concept of poverty is "deprivation of basic capabilities" together with "lowness of income", both of which are interrelated with each other in way one may be a cause of the other (United Nations Development Programme, 1990; Sen, 1999). Thus, poverty has two broad dimensions namely monetary and non-monetary. Nepal remains one of the poorest countries in the world in terms of both dimensions. The per capita income of the country has reached US$388 per annum in 2008, but the country still remains one of the poorest countries in the world with wide income disparities, and poor access to basic social services by a large section of the population (Asian Development Bank, 2008). Moreover, though agriculture is a mainstay for 66 percent of its population, the sector still largely remains subsistence and lags behind in modernization with efficient production practices due to low literacy rate, poor extension services, lack of credit and capital, and inadequate infrastructure such as transportation, communication, and markets (Kebede, 2001). Hence, 61 percent of these farmers are food self-insufficient (Central Bureau of Statistics, 2003). At present 17 percent of the population is suffering from malnourishment. The figure is much worse in case of children under weight for age - underweight (percent under age 5) and children under height for age - stunting (percent under age 5). Around 48 percent and 57 percent of under-five children are suffering from underweight and stunting, respectively. Both figures are increasing continuously since 1990 and 1995 when the UNDP started calculating children underweight and stunting, respectively (United Nations Development Programme, 1998; United Nations Development Programme, 2007).

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Poverty in Nepal exists in a wide variation depending on the rural-urban, geographical, gender, and caste/ethnic division. The problem is more rampant, deeper, and severe in rural areas of Mid-western and Far-western Hills/Mountains of Nepal (United Nations Development Programme, 2005). The rural poverty especially in the Mid-western and Far-western Hills/Mountains remains a core issue of poverty in Nepal. Despite persistence of poverty in the country plethora of literature are merely based on the descriptive analysis that lacks quantitative assessment of the effects each predictor has on poverty. Most of the large scale studies, including Nepal Living Standard Surveys, consider the regional poverty line to assess income poverty, which fail to capture the underlying spatial differences within the region. Similarly, food insecurity is assessed in terms of aggregate supply and requirement of total population (Sheddon and Adhikari, 2003) and misses the accessibility and distribution aspects related with regional and socio-economic differentiation at household level. In addition, selection of poverty measures, either consumption or income, itself remains crucial question while making poverty analysis (Deaton and Grosh, 1998). Many of poverty literatures are based on only one measure either income or consumption overlooking the importance of the other (World Food Programme, 2001; Subedi, 2003; Baidya, 2004; Central Bureau of Statistics, 2005). This shows the necessity of the detail study on poverty at household (HH) level based on the empirical analysis considering both income as well as consumption measures of poverty. Understanding the issue from micro perspective could be crucial in dealing with the problem of poverty more effectively. Therefore, this study aims to assess income as well as consumption poverty and analyze their determinants at a household level in far-western rural hills of Nepal applying the econometric tools, i.e., a binary logistic regression analysis.

Ⅱ. Methodology
1. Study area and sample selection

Baitadi district that falls under the category of the lowest HDI is purposively selected for this study. Household survey was conducted in 2001 among 116 households using pre-tested semi-structured interview schedule. Sample households were selected through proportional stratified random sampling in two Village Development Committees (VDCs). Melauli represents a relatively remote VDC that can be accessed through 12 hours walk from nearest motorable roads and have less developed market structure. Patan, on the other hand, represents relatively accessible VDC connected with all season motorable roads. Firstly, the general survey in both VDCs was conducted in order to categorize entire households of the VDCs into different categories based on caste and landholding size of the household. Samples are then selected from each category based on the proportion of household in the category. This is crucial in getting the representative samples for both VDCs. Total sample includes 56 HHs from Melauli and 60 HHs from Patan. The questionnaire incorporated information on demography of households including education, occupation, resource holding, community participation, income and consumption.

2. Poverty measurement

Monetary dimension of poverty is widely used in poverty literatures (Gradin et al., 2008). Income and consumption measures of poverty are two important measures to capture monetary dimension of poverty (Joshi et al., 2010). Selection of one among these two measures is the crucial question that arises while making monetary poverty analysis. However, given their own pros and cons, there is growing evidences of supplementing the income measure with consumption measure (Deaton and Grosh, 1998; Bryan, 2002; Bavier, 2008; Gradin et al., 2008). Supplementation is lacking in case of literatures on Nepalese poverty. Hence, to the best of our knowledge this paper is the first of its type to consider income as well as consumption measure of poverty while making empirical analysis of poverty.

Income poverty is the most widely used measure of poverty. Here, poverty line is established based on the estimated amount of money that is necessary to meet the basic necessities for a given period in given location. Households are categorized as poor if they are not able to meet the poverty line from their income. Income poverty in this paper is based on the poverty line established by Nepal Living Standards Survey (NLSS) I and II for Rural Western Hills. These two surveys are the authentic poverty surveys in Nepal. These surveys are conducted following the guidelines of World Bank's Living Standards Measurement Survey (LSMS). They consider

the temporal and spatial (at regional level) dimensions. There is also NLSS III in 2010/11, which established the national poverty line of Rs. 19,261, compared to Rs. 7,695.7 and 5,088.7 in 2003/04 and 1995/96 respectively. Change in the food basket in 2010/2011 compared to earlier two NLSS is one of the reasons for high increase in poverty line in 2010/11 (Central Bureau of Statistics, 2011). Similarly, high rate of inflation during the period has resulted in substantial increase in poverty line (Ministry of Finance, 2010). The timing of earlier two surveys is close to our field survey; therefore based on earlier two surveys, a poverty line of Rs. 7,857 per person per year at the current price of 2001 is set considering the poverty line of the Rural Western Hills (Central Bureau of Statistics, 2005; Joshi, 2008). Hence, households with per capita income less than Rs. 7,857 are categorized as poor.

In contrast to income poverty, there lacks consensus on the measure of consumption poverty (Bryan, 2002; Johnson et al., 2005; Bavier, 2008). Food insecurity is sub-set of consumption poverty in case of developing countries where food is the first and the most important priority of any household (Rhoe et al., 2008). Food insecurity can be measured through an assessment of food consumption and requirement of the sample households in terms of calorie unit (Maxwell and Frankenberger, 1992). Calorie consumption of a household is calculated through the calorie conversion of major food items consumed by the sampled households (Prennushi, 1999). For a calculation of calorie require-ment, standard calorie requirement of 2,344 kcal per person per day for Mountain/Hills of Nepal set by Nepal Planning Commission based on the WHO guidelines is considered, which is equivalent to Rs. 4395.8 at the price of 2001/02 (Subedi, 2003). Total calorie requirement of the household is calculated based on the adjusted family size (adult equivalent[1]) and if per capita consumption of any household is less than 2,344 kcal per day they are categorized as poor (food insecure).

3. Empirical model

A binary logistic regression model is considered to be the most appropriate model for the econometric analysis when dependent variable is dichotomous variable (Garson, 2011) such as incidence of poverty in our case. It fits well for both continuous as well as categorical independent variables. The functional form of binary logistic regression model can be given as equation 1.

$$Z_i = \ln\left[\frac{P_i}{1-P_i}\right] = \alpha + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + ... + \beta_n X_{ni} + \varepsilon_i \quad ... 1$$

Where, Z_i is a log odds of the ith household, α is constant, β_1, β_2, β_3, and β_n are coefficients of independent variables X_{1i}, X_{2i}, X_{3i}, and X_{ni}, and ε_i is an error term for the ith household. Independent variables include wide range of household characteristics that determine poverty of the household. It includes household composition and human capital (age and gender of household head, family size, economically active population-dependency ratio, education, occupation, and caste), physical assets (landholding, irrigation coverage, and livestock holding-livestock standard unit), geographical control (VDC), and social capital (participation in number of community based organizations, and level of participation). In equation 1, coefficient gives changes in log odds of the dependent variable, not the changes in the dependent variable itself. Therefore, to make the interpretation straightforward, a logit can be converted to the odds ratio using the exponential function (Garson, 2011). The functional form of odds ratio can be given as equation 2.

$$\text{Odds ratio} = \left[\frac{P_i}{1-P_i}\right] = e^{\alpha + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + ... + \beta_n X_{ni} + \varepsilon_i}$$
$$... 2$$

Here, odds ratio is simply the ratio of the probability that the household will be poor to the probability that the household will be non-poor. In case of binary independent variables, exponential of the respective coefficient gives the proportion of change in odds for shift in the given independent variable. However, if the independent variable is continuous, exponential of coefficients is associated with the effect of per unit change in the given independent variable to odds ratio. In both types of variables sign of coefficient reveals the direction of change.

Incidence of poverty in Nepal varies based on wide range of socio-economic variables including geographi-cal division. Huge proportion (93.5 percent) of poor in Nepal resides in rural areas (Joshi et al., 2010). Moreover, the problem of poverty is more severe in far-western and mid-western rural hills of Nepal. Within rural areas

incidence of poverty is high in relatively remote areas (Joshi, 2008; Maharjan and Joshi, 2009). Therefore, considering the remoteness of Melauli VDC, probability of household in Melauli to fall into poverty is expected to be higher. Nepalese society, being largely influenced by Hinduism, is vertically divided into four caste groups based on Hindu caste hierarchy. Priestly Bahun Brahmin is placed at the top, followed by Chettri (Kshatriya - kings and warriors), Vaishya (merchants) and Sudra (peasants and laborers) respectively. Beneath everyone are Occupational Castes (OC). They are also known as the *dalit* (oppressed) or lower caste and are the artisan such as caste involved in smithery (blacksmith - *kami* and goldsmith - *sunar*), shoemaking (*sarki*), and tailoring (*damai*) *inter alia*. These castes are socially discriminated as polluters and treated as untouchable, though illegal by law. Due to such discrimination since the historic time they lag far behind in all important socio-economic indicators like asset holding and education. Consequently, they have limited access to state mechanism in order to receive benefit from any government policy and programs (Department for International Development and the World Bank, 2006). Due to this, OC households are supposed to have higher chance to fall under poverty (Joshi and Maharjan, 2007; Maharjan and Joshi, 2007; Joshi and Maharjan, 2008; Joshi et al., 2010; Maharjan and Joshi, 2011). In addition, being patriarchal society, females have little access or control over household assets as well as communal resources in rural areas of Nepal. Characterized by lack of labor as well as limited access to resources such as land and human capital, female headed household has higher probability to fall into poverty (Baidya, 2004; Joshi and Maharjan, 2007; Joshi et al., 2010; Maharjan and Joshi, 2011).

Age of household head (HHH) is another important determinant of poverty. Household head with higher age is supposed to have more experience in agriculture production practices particularly in the rural areas where agriculture is the mainstay. This increases the probability of household with aged heads to be non-poor (Hofferth, 2003; Obamiro et al., 2003). This increases the possibility of household to fall under poverty with decrease in the age of the HHH. However, Babatunde et al. (2007) show positive association between age of HHH and poverty, i.e. increase in age of household will increase the possibility of household to fall into poverty. It is because

the older HHH have low tendency of adopting improved technology, thereby depends on subsistent agriculture despite increase in population pressure. Education is crucial in imparting knowledge and skill in modern agricultural practices and its adoption resulting into higher productivity thereby higher agricultural production (Thapa, 2008; Joshi et al, 2010). In addition, higher education opens up job opportunities in the off-farm as well non-farm sectors that offer relatively higher income. This justifies the expected negative relationship between higher level of education of HHH and poverty.

Family size could determine poverty in either positive or negative way. For instance, larger family requires more food that increases the chance of being poor (Kidane et al., 2005; Babatunde et al., 2007). In the context of rural Nepal where agriculture is subsistence and off-farm/non-farm income opportunities are limited, positive association of family size with poverty can be expected (Joshi et al., 2010; Maharjan and Joshi, 2011). Dependency ratio is another important demographic factor that affects poverty. It is a ratio of dependent household members and economically active household members. Dependency ratio is expected to be positively associated with poverty i.e., higher the number of dependent member(s) (higher dependency ratio) higher will be the chances of being poor (World Food Programme, 2001; Maharjan and Joshi, 2011).

Agriculture is the mainstay of life in rural Nepal. However, agriculture still remains subsistence and is practiced in small plots of land with low productivity. Therefore, due to seasonality in agriculture, households in rural area are also engaged in casual laboring with nominal cash income. There are very limited numbers of households in rural areas who are highly educated and involved in service sector that guarantee continuous flow of relatively higher income. Therefore, rural households who are self-employed in agriculture or casual laboring are expected to have positive association with poverty (Baidya, 2004; Joshi et al., 2010; Maharjan and Joshi, 2011).

Resource possession is another important determinant of poverty. Land is the most important factor of production in rural Nepalese context where agriculture remains a main source of livelihood. It represents the principal form of wealth thereby the principal symbol of social status. This can be translated into the principal

source of economic and political power (Regmi, 1999). Thus, ownership of bigger land means higher control over a vital factor of production and therefore a position of prestige, affluence and power in the society. This provides an opportunity to expand the area of cultivation thereby food production for such households and helps to reduce the probability of the household to be poor (World Food Programme, 2001; Kidane et al., 2005; Joshi et al., 2010; Maharjan and Joshi, 2011). Similarly irrigation, which is crucial in agriculture in order to improve the agricultural productivity, decreases the probability of household to be poor. Livestock is another important asset that determines poverty in rural Nepalese context (World Food Programme, 2001). Increase in number of livestock decrease the probability for household to be poor.

Community Based Organizations (CBOs) are non-profit organizations that operate in local community essentially on voluntary basis in order to meet the common interest of all its members. Therefore, participation in CBOs on the basis of mutual aid will strengthen social capital. It helps to increase the access to resources that are available in the community through their social behavior and collective actions. For instance, saving and credit groups facilitate access to credit among the members. Similarly, household can improve their access to forest resources through Community Forestry User Groups (CFUGs). Women groups help to empower women in the community through awareness as well as improved access to the resources (Maharjan et al., 2008). Therefore, participation in CBOs is expected to have negative association with poverty i.e., with the increased participation of households in CBOs, chances to suffer poverty will decline.

Ⅲ. Results and discussion

1. Socio-economic characteristics of the sampled households

The proportion of female headed household is higher in Melauli with 19.6 percent households headed by female compared to 11.7 percent in Patan (Table 1). Chettri is the most dominating caste group followed by

Table 1　Social characteristics of sample households

Variables	Patan	Melauli	Total
Gender of HHH *P-value = 0.23*			
Male	53 (88.3)	45 (80.4)	98 (84.5)
Female	7 (11.7)	11 (19.6)	18 (15.5)
Caste *P-value = 0.00****			
Bahun	25 (41.7)	8 (14.3)	33 (28.4)
Chettri	30 (50.0)	40 (71.4)	70 (60.4)
Occupational Caste (OC)	5 (8.3)	8 (14.3)	13 (11.2)
Education of HHH[2] *P-value = 0.00****			
Illiterate	8 (13.3)	23 (41.1)	31 (26.7)
Literate	13 (21.7)	17 (30.4)	30 (25.9)
School education	28 (46.7)	11 (19.6)	39 (33.6)
College education	11 (18.3)	5 (8.9)	16 (13.8)
Average year of schooling (P-value = 0.00***)	*7.0*	*3.8*	*5.5*
Occupation of HHH *P-value = 0.02***			
Agriculture	37 (61.7)	32 (57.1)	69 (59.5)
Salaried jobs	18 (30.0)	8 (14.3)	26 (22.4)
Business	2 (3.3)	5 (8.9)	7 (6.0)
Laboring	3 (5.0)	11 (19.7)	14 (12.1)
Family size category – AE *P-value =0.62*			
Small (1-5 Members)	20 (33.3)	23 (41.1)	43 (37.1)
Medium (>5-10 Members)	31 (51.7)	27 (48.2)	58 (50.0)
Large (>10 Members)	9 (15.0)	6 (10.7)	15 (12.9)
Average family size (AE) (P-value =0.33)	*6.3*	*5.7*	*6.0*
Landholding category *P-value =0.11*			
Small (Less than 0.5ha)	12 (20.0)	21 (37.5)	33 (28.5)
Medium (0.5-2ha)	47 (78.3)	34 (60.7)	81 (69.8)
Large (>2ha)	1 (1.7)	1 (1.8)	2 (1.7)
Average land holding (ha.) (P-value =0.05**)	*0.87*	*0.73*	*0.8*
Overall	**60 (100)**	**56 (100)**	**116 (100)**

Note: Figures in parentheses indicate percentage, and *** significant at 1 percent and ** significant at 5 percent based on chi-square test for distribution of categorical variables and mean difference test of continuous variables in two VDCs.
Source: Field Survey, 2001.

Bahun and OC in both VDCs. Education attainments differs significantly in two study areas. Illiteracy of HHHs is quite prevalent in Melauli. More than 41 percent of the HHHs are illiterate compared to 13.3 percent in Patan, whereas, in case of attainment of college education and school education by the HHHs Patan has significantly higher proportions. Agriculture constitutes the most important occupation in the study areas with significantly higher proportion of HHHs depending on it in both VDCs. Distribution of households by occupation of HHHs in two VDCs is significantly different. The higher concentration of small landholding households (37.5 percent) with insufficient food production in Melauli results into higher proportion (19.7 percent) of HHHs involved in daily wage laboring. This is also a reason for relatively lower proportion of HHHs engaged in agriculture in Melauli. Involvement of individuals in salaried jobs is related with the attainment of secondary and college education. Therefore, higher proportion of HHHs in Patan (30 percent) is involved in salaried jobs compared to Melauli (14.3 percent).

Average family size of the sample households is 6.0, which is slightly higher compared to national average of 5.45 (Central Bureau of Statistics, 2005). Fifty percent of households come under the medium family sized households having more than 5 to 10 members followed by small (less than 5 members) and large (more than 10 members) family sized households respectively. The distribution of households by family size does not differ significantly in two VDCs (Table 1). In case of landholding, households with medium holding (0.5-2.0 ha.) constitute the highest proportion of households i.e., 70 percent. A proportion of small holding (less than 0.5 ha.) households in Melauli are significantly higher compared to that of Patan. Due to significantly higher concentration of small-landholding and relatively lower concentration of medium-landholding households, landholding size is significantly smaller in Melauli. It is 0.73 ha. in Melauli compared to 0.87 ha. in Patan. Moreover, there exists unequal distribution of resources in two VDCs as well as among different caste groups (Maharjan, 2003; Joshi, 2008).

2. Descriptive analysis

Incidence of income poverty (51.7 percent) is higher compared to consumption poverty (42.2 percent).

This could be due to the nature of consumption itself, which is continuous. Moreover, consumption poverty has the wider coverage. The consumption poverty includes not only the consumption from their regular income but also includes consumption through borrowing, bartering and using earlier savings. The income poverty includes food as well non-food expenses while constructing income poverty line, whereas consumption poverty considers only the food needs. Incidence of poverty with its relation to various socio-economic variables is presented in Table 2. Incidence of both measures of poverty is significantly higher in relatively remote Melauli VDC. As the VDC has no connection with motorable road and can be assessed only through foot trails, market structure is less developed in Melauli. This leads to higher price of transported goods in Melauli. Moreover, there is very limited market even for little surplus from subsistent agriculture. Similarly, incidence of poverty is significantly higher among OC households. Higher incidence of poverty among OC households is mainly due to their low level resource possession in the study areas (Maharjan, 2003; Joshi, 2008).

Incidence of income poverty among the female headed household is significantly higher. The difference is low in case of consumption poverty. Such high incidence of poverty among female headed household is mainly due to the low level of resource possession and relatively higher family size. Age of HHH does not differ significantly among the poor and non-poor households. However, poor households have relatively higher family size. The difference is slightly higher for consumption poverty. Education, measured in terms of schooling years, is also significantly different among poor and non-poor household. Non-poor households have significantly higher schooling year. Occupation is closely related with the level of income (Maharjan and Joshi, 2007; Joshi, 2008). Therefore, incidence of poverty is significantly higher among the household with its head engaged in laboring and self-employed in agriculture.

Operational landholding, which indicates areas of land under cultivation by the sampled household, does not differ among poor and non-poor household. However, total landholding differs significantly between poor and non-poor households. Non-poor households have significantly higher landholding, which they rent-out to

Table 2　Poverty incidence by different socio-economic variables

Variables	Income poverty		Consumption poverty	
	Poor	Non-poor	Poor	Non-poor
Village development committee				
Patan (percent)	45.0	55.0	31.7	68.3
Melauli (percent)	58.9	41.1	53.6	46.4
Caste				
Bahun (percent)	45.5	54.5	36.4	63.6
Chettri (percent)	50.0	50.0	38.6	61.4
Occupational Caste (percent)	76.9	23.1	76.9	23.1
Gender of HHH				
Male (percent)	47.9	52.1	39.8	60.2
Female (percent)	72.2	27.8	55.6	44.4
Age of HHH (years)	50.2	50.4	50.9	49.7
Family size (AE)	6.3	5.6	7.2	5.1
Education of HHH (schooling years)	3.9	7.1	3.6	6.8
Occupation of HHH				
Agriculture (percent)	63.8	36.2	50.7	49.3
Salaried job (percent)	11.5	88.5	7.7	92.3
Business (percent)	42.9	57.1	42.9	57.1
Laboring (percent)	71.4	28.6	64.3	35.7
Operational landholding (ha)	0.9	1.0	0.8	1.0
Landholding (ha)	0.7	1.7	1.0	1.3
Irrigation coverage *(percent)*	33.2	37.7	31.7	38.0
Livestock holding (LSU)	4.5	3.7	4.2	4.0
Dependency ratio	1.6	0.8	1.4	1.0
Number of CBO	0.6	0.5	0.5	0.6
Participation in CBO				
Yes (percent)	51.6	48.4	38.9	61.1
No (percent)	51.9	48.1	45.2	54.8
Level of participation	1.8	1.9	1.7	1.9
Overall (percent)	51.7	48.3	42.2	57.8

Source: Field Survey, 2001

poor household on the share-cropping basis. Thus, though poor households have larger operational land compared to their actual land, they have to share their produce with landowners. Irrigation coverage is relatively higher among the non-poor households. In contrast to the earlier findings that non-poor households have higher livestock holding, our study found that it is the poor households who have larger livestock holding. It could be due to some target programs that distribute small livestock like goat (on rotational basis) as well as big livestock like buffalo (on low interest credit without collateral) among household identified as poor by such program.

　Dependency ratio, which reflects the proportion of dependent member in a sampled household, shows that it is relatively higher among the poor households. This indicates that the poor household has less number of their members involved in economic activities. In case

of participation in CBOs[3], the poor household has equal participation in the CBOs. It is mainly due to the intervention made by government as well as non-government programs, which targets poor household in their group activities. In addition, there are some non-targeted group activities such as community forestry that involve interested participants who could also be non-poor households.

3. Empirical analysis

　Two independent models were run for income and consumption poverty. In both cases fifteen variables listed in Table 2 were introduced. However, following the step-wise analysis based on likelihood ratio we identified the best fitted model for income poverty as well as consumption poverty. Selection of best fitted model was done on the basis of Hosmer-Lemeshow and omnibus test. The insignificant value of Hosmer-

Lemeshow test guides us to accept the null hypothesis that there is no significant difference between observed value and the model-predicted value, thereby making it the best fitted model. Moreover, the omnibus test suggests that dropping of the variables other than those ten variables in each model make no difference in the prediction. Both tests justify our final model to be the best-fitted model. Thus, the best-fit model includes ten independent variables, which have significance as important determinants of poverty (Table 3). Out of these ten variables, eight were common variables in both independent models.

The results of the binary logistic regression model presented in Table 3 suggest that except for livestock holding, all the independent variables have effect on both poverty measures in the same direction. Difference in only the food insecurity is significant in two VDCs. A probability of household to become food insecure is significantly higher in Melauli. It is mainly due to limited access to market as well as high transportation cost involved in supply of basic needs in the area. However, dummy for VDC does not have any influence in income poverty i.e., incidence of income poverty is not significantly different in two VDCs. This is mainly due to common poverty line set for both VDCs. Thus, though the household in Melauli could achieve income poverty line, they could not meet the calorie requirement. It is

because of insufficient food produced in own farm and significantly higher price of imported foods in the local market due to higher transportation cost involved. Transportation is either done manually or using draft animal like mule and involves relatively higher cost. This shows lack of relevance of the common regional poverty line in properly understanding the nature of income poverty that depends on underlying spatial differences such as accessibility and development of market mechanism.

Though the probability of OC household to fall into income as well as consumption poverty is positive, the relation however is statistically non-significant. Similarly, age of household also does not have any significance on probability to fall into poverty. In case of gender of HHH, the coefficient is negative but non-significant. This signifies that probability of male-headed household to fall into poverty is relatively less compared to female-headed household. Family size shows positive association with both measures of poverty. The association is stronger in case of consumption poverty. This suggests that household with bigger family size has higher chance to become food insecure.

Education and landholding are two important variables that have significant negative relations with both measures of poverty. This signifies that with the increase in education level and/or landholding the

Table 3   Outcome of binary logistic regression model of income and consumption poverty

Variables	Income poverty			Food insecurity		
	Coefficient	Sig.	Exp(B)	Coefficient	Sig.	Exp(B)
Constant	0.10	0.95	1.11	-3.41	0.01***	0.03
Dummy for VDC (1 if Melauli, 0 otherwise)	-	-	-	1.07	0.06*	2.93
Dummy for caste (1 if OC, 0 otherwise)	0.34	0.74	1.40	1.61	0.13	5.01
Age of HHH	-0.01	0.64	0.99	-	-	-
Dummy for gender (1 if male, 0 otherwise)	-1.09	0.14	0.34	-0.77	0.26	0.46
Family size	0.12	0.33	1.13	0.82	0.00***	2.28
Education of HHH	-0.16	0.04**	0.85	-0.12	0.09*	0.88
Dummy for occupation (1 if agri. and laboring, 0 otherwise)	1.69	0.03**	5.40	1.07	0.14	2.92
Operational landholding	-	-	-	-0.95	0.05**	0.39
Landholding	-1.56	0.03**	0.21	-0.08	0.05**	0.92
Irrigation coverage	-0.01	0.63	0.99	-	-	-
Livestock holding	0.11	0.41	1.11	-0.29	0.05**	0.75
Dependency ratio (economically active members)	1.38	0.00***	3.99	0.20	0.50	1.22
Hosmer-Lemeshow's test	χ^2-value 6.60 (Sig. 0.58)			χ^2-value 2.28 (Sig. 0.97)		
Nagelkerke R-square	0.58			0.57		

Note: Figures in parentheses indicate percentage, *** significant at 1 percent, ** significant at 5 percent, and * significant at 10 percent.

probability of households to fall into income as well as consumption poverty can be significantly reduced. Education helps to introduce efficient technology in agriculture thereby increase the yield. Similarly, education increases awareness on several social and administrative issues that helps a household to explore different opportunities provided by government as well as non-government agencies. Moreover, educated members have higher chance of involving themselves in high income generating opportunities like salaried job and business. Since agriculture and laboring are the occupation that derives the least income (Maharjan and Joshi, 2007; Joshi, 2008), involvement of household in agriculture and laboring increases the probability of household to fall in poverty.

It is basically the subsistence households, who are renting-in land and is increasing the land under cultivation. Therefore, expansion of land under cultivation through renting-in helps those households to decrease the probability to fall into consumption poverty. However, such land tenure system in rural Nepal is not significant in increasing cash income. Irrigation is one of the most important factors of production in agriculture based livelihoods. It is crucial in enhancing yield of agricultural crops. Hence, it helps to lower the probability to fall in income poverty. The relationship, however, is not statistically significant. Livestock holding has shown interesting result. It has shown positive, though non-significant, relation with poverty. The livelihood intervention program that distributes livestock species is targeted towards poor household. This might has resulted in positive relation of livestock with poverty. Here causal relationship is other way around, i.e. poor households have relatively higher livestock holding due to the intervention programs. Such programs distribute either small livestock species specially goat (for meat, milk, and live animal) on rotational basis or big livestock species like buffalo (for milk, dung, etc.) on low interest credit without collateral. Such livestock is found to be crucial in meeting food demand of those poor households.

Dependency ratio has shown positive relation with poverty. However, the relation is statistically significant only in case of income poverty. This implies that higher the dependency ratio higher will be probability of the household to suffer income poverty. In case of consump-

tion poverty, however, the relation is statistically non-significant. This is due to dependent member's contribution in household chores including agricultural activities. Though CBOs were expected to have positive impact on reducing the probability to fall into poverty, it was not significant in the study areas. It was mainly due to non-functioning of those CBOs. The threats posed by the Maoist insurgency at the time of field survey has resulted in non-functioning of the CBOs in the study areas. Also given the limited function of such CBOs, participation of poor and non-poor household were not significantly different as shown in Table 2.

Ⅳ. Conclusion

Poverty incidence measured both in terms of income as well as consumption is high in the study areas. Most of the factors that determine income and consumption poverty are more or less similar. However, there are still few factors that affect income and consumption poverty in different way. For instance, though a probability of suffering income poverty is not significantly different in two VDCs; the probability for consumption poverty is significantly different. Specially, a chance of household to suffer food insecurity is significantly higher in remote Melauli VDC. Agriculture is subsistent in Melauli and the absence of well-developed market mechanism due to devoid of road network, results into higher price of food and non-food commodity. Hence, though a household could achieve the income to meet the poverty line set for the region, it would not be sufficient to acquire the food and non-food requirement from the less developed market in the area. Family size, operational landholding, and livestock holding are important determinants of food insecurity, whereas, dependency ratio and occupation are important determinants of income poverty. Education of HHH and landholding are important determinants for both monetary and non-monetary dimensions of poverty.

Thus, the evidences suggest that consideration of common poverty line could not capture the underlying differences within remote areas while making the spatial analysis of poverty. Therefore, consumption poverty would be preferable while making comparative analysis of poverty between the locations. In both cases of poverty, education is found to be very crucial in dealing with the problem of poverty in rural Nepal. Education could be helpful in raising awareness on controlling

family size, which is significantly high in case of poor household. Education, therefore, will be effective tools to reduce poverty not only through reduction in family size but also through increase in income through adoption of efficient agricultural practices as well as involvement in relatively high income generating opportunities. Similarly, improvement in landholding will help to reduce poverty significantly. Since distribution of land to poor involves huge cost in short run, even the regulation of land tenure in rural areas that increase the operational landholding among the poor will be quite effective in dealing with poverty more efficiently. Besides the direct services provided by livestock such as milk, dung, and mean, livestock also serves as liquid assets to the poor. It can be exchange with food items at the time of need to meet the food demand and remain food secure.

【Endnotes】

1) Adult equivalent is an aggregate measure of family size that standardize consumption unit within the household taking age and sex of its members into account.

2) Education of HHH is categorized into four categories on following basis: Illiterate - cannot read and write; literate - attained informal education or formal education up to 5th grade, and can read and write; school education - attained formal education from 6th to 10th grade; and College education - attained formal education above 10th grade.

3) There are basically four categories of CBOs existing in the study areas. They are as follows; community forestry users groups, saving and credit groups, community support organizations, and farmers groups. Maharjan et al. (2008) have described nature, functionalities, and effectiveness of these CBOs in detail. Baitadi district being one among the 16 most affected district by Maoist Insurgency during the study period and mostly controlled by the Maoist insurgent (U.S. Department of State, 2003; Shimkhada and Oliva, 2006), many of the donor funded CBOs were not functioning well mainly due to disruption by the Maoist.

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