AN EMPIRICAL ANALYSIS OF HOUSEHOLD INCOME IN RURAL PAKISTAN
Evidences from Tehsil Samundri

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Abstract. The study analyzed rural income inequality and the relationship of farm and non-farm sources with household income. The primary data of 104 rural households were collected by applying stratified sampling technique in the district Faisalabad, Punjab. Lorenz curve, Gini coefficient and coefficient of variation were calculated. It was found that distribution of land was skewed as compared to income and livestock. Rural income was derived mainly from farm and non-farm sources. Non-farm activities were prevalent. It was found that among farm source of income, land and livestock were positively related whereas dependence on only farm occupation was negatively related with household income. Among non-farm source, rental income was positively related and dependence on only non-farm source was negatively related with household income. Education played a significant positive role in decreasing income inequality whereas income from assets like land, livestock and other non-farm assets showed an inequality increasing impact. In short, education as human capital filled the deficiency of physical capital to a significant extent.

I. INTRODUCTION

Rural income of Pakistan is derived mainly from farm and non-farm sources. Agriculture is the primary source of rural income as 60 percent of the rural labor force is engaged in agriculture sector (GOP, 2008). The main features of agriculture sector in Pakistan are unequal distribution of landholdings, disguised unemployment, traditional methods of production and resulting

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low productivity. Land is the main asset of agriculture sector but its distribution is highly skewed in Pakistan. It was found that in rural areas of Pakistan, 67 percent households were landless and just 0.1 percent households possessed 1 hectare and above landholdings (Anwar *et al.*, 2004). There existed a positive relationship between landholdings and income of the households (Malik, 1996; Chaudhry, 2003).

Agriculture sector of Pakistan is based on traditional methods of production. The application of high yielding methods of production is not often because of low purchasing power of farmers and lack of knowledge about modern inputs. It was found that the use of modern techniques of production helped to increase income of the farmers through increased productivity as well as indirectly to others by decreasing the prices of commodities (de Janvry and Sadoulet, 2002).

Livestock had a complementary relationship with agriculture. There existed significant positive relationship between farm size and livestock rearing (Kumar *et al.*, 2007). It also played a key role in rural agricultural economy of Pakistan. It contributed 11 percent to GDP. In rural areas, 30-35 million people were engaged in livestock activities. They derived 30-40 percent of their income from this sector (GOP, 2006). Earlier studies of Chaudhry (2003) and Jan *et al.* (2008) showed that livestock holdings were positively related with income and consumption of households. Livestock is a multidimensional source of income. It provides income not only in the form of milk and meet but also in the form of waste products of fuel and organic fertilizer.

Non-farm income referred to income that is not derived from agriculture sector. Non-farm activities are getting prevalence in rural Pakistan because of reduction in capacity of agriculture sector to absorb growing population. Non-farm sector absorbs the growing rural labor force. It does not depend on land distribution like farm source of income. De Janvry *et al.* (2005) found that land was negatively related with non-farm income and positively with farm income. Arif *et al.* (2000) divided rural non-farm sector in four sub-sectors: construction; services; manufacturing and commerce. The greater tendency was observed towards services employment as compared to commodity production in rural Pakistan. Educated individuals were more likely to adopt non-farm occupation as compared to illiterates.

Literacy rates in rural areas of Pakistan were lower as compared to urban areas. According to latest estimates, over all literacy rate of the country was 55 percent. Urban literacy rate was 72 percent whereas rural literacy rate was 45 percent. In rural areas, the male literacy rate (67 percent) was higher as

compared to that of female (45 percent). Two studies on micro determinants of income in Pakistan revealed a positive relationship between household's income and its education attainment (Malik, 1996; Chaudhry, 2003).

There are few studies in the literature which put attention on the sources of rural income and its inequality. The present study attempts to fill this gap and the aim of the study is to explore the relationship of farm and non-farm sources with rural income and put attention on the income inequality and its determining factors.

The rest of the paper is organized as follows. Section II discusses some theoretical considerations of income and its sources. Section III describes data and methodological issues involved in the present study. Section IV presents the derived results. Conclusion and policy implications are suggested in section V.

II. RURAL HOUSEHOLD INCOME AND ITS SOURCES: SOME THEORETICAL CONSIDERATION

Theoretical analysis of household income revealed that rural income is mainly derived from farm and non-farm sources. Farm and non-farm variables played a vital role in rural household economy. All variables had their inequality increasing or decreasing effect.

The wage income and livestock income were found to be helpful in reducing over all inequality whereas income from crops had contributed to growing inequality in rural Egypt (Croppenstedt, 2006). The findings of Berg and Kumbi (2006) also suggested that agriculture was the main source of rural inequality in Oromia, Ethiopia. Their results showed that 90 percent of total inequality was due to farm source of income. On the other hand, non-farm income was found to be inequality decreasing source of rural income. The results of de Janvry *et al.* (2005) also indicated that participation in non-farm employment had decreased income inequality significantly in case of China. The study of Arif *et al.* (2000) suggested that non-farm wage-workers had been better-off than many agriculture laborers in rural Pakistan.

Education was the chief determinant of non-farm employment. Findings of Araujo (2003) indicated that secondary education had a positive and significant effect on employment in services. In case of China, earnings in the non-farm sector depended primarily on the education and experience of individual worker whereas it was found that education did not influence earnings in farm sector (de Janvry *et al.*, 2005). In case of Pakistan, education also had a significant influence on the adoption of non-farm

occupation. Non-farm income increased with the increase in education (Arif *et al.*, 2000).

Adams and He (1995) analyzed inequality among different sources of rural income in Pakistan. They divided rural income of Pakistan in five main sources namely: farm; non-farm; livestock; transfer and rental sources of income. Non-farm and livestock were found to be inequality decreasing sources of income. However, among non-farm source, government employment was found to be inequality increasing and unskilled labor as inequality decreasing source of income. In case of agriculture, income from cash crops had an inequality increasing and from food crops (wheat and rice) an inequality decreasing impact. The external remittances played an inequality increasing and internal remittances played an inequality decreasing role. Income from high valued capital and land had an inequality increasing and from water pricing an inequality decreasing effect. Income from female buffalo and local cows had an inequality reducing and from male animals an inequality increasing effect (Adams and He, 1996).

The comprehensive study of Adams and He (1995) had divided rural income of Pakistan in five sources but in a broader sense transfer and rental income can also be regarded as non-farm income. The complimentary relationship of livestock with agriculture relates this to farm source of income. Farm source of income is based primarily on landholding, quality of land and irrigation facilities. The skewed distribution of land, difference in fertility of land and improper irrigation facilities resulted in vast inequality in farm income. Non-farm employment serves as an additional income generation source besides agriculture. Small landholders and landless class can improve their standard of living by adopting non-farm occupation. That was why it had an inequality decreasing effect.

III. DATA AND METHODOLOGY

Primary data source was used to fulfill the objectives of the study. A detailed household questionnaire was developed after the pre-testing. Data were collected from the Tehsil Samundri of District Faisalabad. The selected village comprised of 450 households from which a sample of 104 households was drawn by using stratified sampling techniques as it assured the representation of all groups in the sample. The population was divided mainly between landlords and landless households and then sub samples were drawn from each group randomly.

Measure of Inequality

In order to analyze inequality in income and asset holding, study used Gini coefficient and coefficient of variation measures. Besides these numerical indicators, distributions were also analyzed by Lorenz curve. The coefficient of variation was calculated by using the usual formula:

$$CV = \frac{\text{Standard Deviation}}{\text{Mean}}$$

The Gini coefficients were mostly proximate by applying Brown and Deaton's formula (Brown, 1994; Deaton, 1997). Brown's method seemed more appropriate because it fully utilized the collected information with the help of cumulative shares. Deaton's method was relatively easy and simple. It assigns weights to individuals or households depending on their income (or any other variable of interest) such as that lowest person received the highest weight. It put more weight to lowest groups.

Brown's Method

$$G_b = 1 - \sum_{k=1}^{n} (X_k - X_{k-1})(Y_k - Y_{k-1})$$

Where

X_k = Cumulated Percentage of Population Variable (in fractions)

Y_k = Cumulated Percentage of Income (or any other variable of interest) in Fractions.

Angus Deaton's Method

$$G_d = \frac{N+1}{N-1} - \frac{2}{N(N-1)\mu} \left(\sum_{i=1}^{n} X_i P_i \right)$$

Where

N = total sample size

μ = mean of the distribution

X_i = income of the ith person

P_i = ranks assigned in such a manner that poorest person received the highest rank

Source: Wikipedia, the Free Encyclopedia (2009)

Model Formulation

The semi log multiple regression model was formulated to analyze rural income in Pakistan. The average monthly income of the household was considered dependent variable. The distribution of income was not normal so it was transformed in logarithmic form. Various variables were used as proxy for farm and non-farm sources. Variables land, livestock and only-farm occupation were used as proxy for farm source. Variables only non-farm occupation, rental income and transfer income were used as proxy for non-farm source. The variable education was also included due to its significant impact on earnings in non-farm sector (Arif *et al.*, 2000). Therefore, variables land, farm, livestock, education, non-farm, rental income and transfer income were used as explanatory variables. Land variable was measured as total landholdings of the household in acres. Education variable was measured as the average educational years of the earners. Sampled households were divided into three categories based on their occupations:

1. households who adopted only-farm occupation;

2. households who adopted only non-farm occupation; and

3. households who adopted both occupations.

The impact of occupation on household income was analyzed by two dummy variables that were only-farm occupation and only non-farm occupation. Variable 'only-farm' assumed the value of 1 if household depended on only-farm occupation and 0 otherwise. Variable 'only non-farm' assumed the value of 1 if household depended on only non-farm occupation and 0 otherwise. The variable adoption of both occupations was the benchmark category. Variable livestock was measured as the total monetary value of livestock population owned by the household. Variable rental income was measured by the presence of productive assets in a household that gave income in the form of rent. Productive assets included urban property, agriculture inputs like tractor, tube well, thresher, reaper, etc. also other automobiles like van, car and weight carriers etc. that were used for commercial purposes. It was measured by a dummy variable that assumed the value of 1 if the households received rental income and 0 otherwise. Variable transfer was measured by a dummy variable that assumed the value of 1 for households receiving transfer income and 0 for non-receiving households. Concept of transfer income used in the study included income from transfer payments like pension, Zakat, Ushar, Baitul-mal, scholarships and external remittances. Income from internal remittances was not included in transfer income because of data problems. Model was estimated with SPSS by adopting the method of least squares. Firstly,

percentage analysis of total and lower income households was performed then inequality in assets holdings and income was analyzed and results of regression analyses are given at the end.

IV. RESULTS AND DISCUSSIONS

Table 1 revealed that majority of the households were landless and 85 percent of them belonged to lower income group. The proportion of the lower income households decreased significantly with the increase in landholdings. It vanished for the 19 acres and above landholdings. The same happened in case of education, highest incidence of lower income households was found among households with illiterate earners and very interestingly, it vanished for households with highly educated earners. It showed that land and education were positively related with household income. Highest proportion of lower income households was found among households depending on only non-farm income. It was also higher in case of dependence on only-farm income. The proportion of lower income households was sufficiently lower in the households that adopted both occupations as compared to households with dependence of only one occupation. Proportion of lower income households decreased significantly with the increase in the monetary value of livestock holdings. It means that monetary value of the livestock holdings was positively related with household income. There was no evidence of lower income households among the households receiving rental income whereas it was 61 percent in case of other non-receiving households. Transfer income was negatively related with household income. The proportion of lower income households was significantly higher in the households receiving transfer income as compared to other non-receiving households. This was due to the fact that mostly transfer payments were comprised of Ushar, Zakat and other benefits to the lower income households (the poor). Fewer households received external remittances.

It is concluded that majority of the households were landless, attained secondary education and owned livestock population. Non-farm occupation was prevalent. Few households received rental and transfer income. Rich households received rental income whereas transfer income was common among lowest group in the form of social benefits to the lowest income group (the poor) of the society. Rich households received transfer income in the form of external remittances and pension whereas lower income households received transfer income in the form of Zakat, Ushar and other benefits to the poor. Land, education, livestock and rental income were positively related with income whereas only-farm occupation (1 = only farm

TABLE 1

Percentage Distributions of Sampled Households

Variable	Percentage of Total Households	Proportion of Lower Income Households
Landholding (Acres)		
Landless	38	85
1-5	33	47
6-18	15	12
19 and above	13	0
Education Attainment (Years)		
Illiterate	15	100
Primary	29	60
Secondary	43	40
Higher	12	0
Occupation (Dummy Variable)		
Farm	14	78
Non-farm	39	85
Both	47	12
Livestock Holdings (Rupees, Lac)		
Null	25	50
Less than 1	34	74
1-2	15	44
2-3	12	38
3 and above	13	7
Rental (Dummy Variable)		
Yes	18	0
No	82	61
Transfer (Dummy Variable)		
Yes	19	40
No	81	14

Source: Calculated from Author's Household Survey 2008)

occupation), only non-farm occupation (1 = only non-farm occupation) and transfer income (1 = households receiving transfer income) were negatively related with income.

Inequality in Asset Holdings and Income

The available literature revealed that distribution of land and income was skewed in Pakistan (Malik, 1996; Chaudhry, 2003; Anwar *et al.*, 2004). Table 2 showed that the income was distributed unequally among sampled households with the Gini coefficient value of 0.49 and 0.57 calculated through Brown's method and Deaton's method respectively. The coefficient of variation was also high (1.66). The lowest 25 percent population owned just 5 percent of total income whereas highest 26 percent households owned 65 percent of total income. Figure 1 showed Lorenz curve for income distribution.

TABLE 2

Income Distributions among Sampled Households

Households (Numbers)	Population (Percentage)	Cumulated (Percentage)	Income (Percentage)	Cumulated (Percentage)
Lowest 10	6	6	1	1
Next 10	10	16	2	2
Next 10	9	25	2	5
Next 10	10	35	3	8
Next 10	9	44	4	12
Next 10	7	51	5	17
Next 10	11	62	7	24
Next 10	12	74	11	35
Next 10	9	83	15	50
Next 14	17	100	50	100
$G_b = 0.49$, $G_d = 0.57$, $CV = 1.66$				

Source: Calculated from Author's Household Survey (2008)

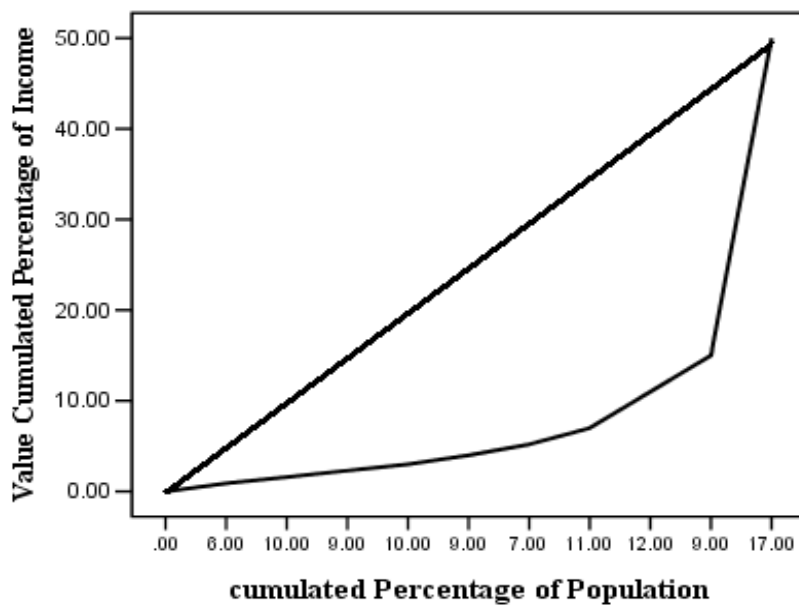FIGURE 1

Lorenz Curve for Income Distribution

TABLE 3

Land Distributions among Sampled Households

Households (Numbers)	Population (Percentage)	Cumulated Percentage	Land (Percentage)	Cumulated Percentage
Lowest 10	8	8	0	0
Next 10	10	18	0	0
Next 10	11	29	0	0
Next 10	9	38	0	0
Next 10	7	45	2	2
Next 10	9	54	3	5
Next 10	12	66	5	10
Next 10	9	75	8	18
Next 10	9	84	15	33
Next 14	16	100	67	100
$G_b = 0.69$, $G_d = 0.75$, $CV = 1.93$				

Source: Calculated from Author's Household Survey (2008)

Table 3 showed that land distribution was skewed as compared to income indicated by higher Gini coefficient values of 0.69 and 0.75 calculated through Brown's method and Deaton's method respectively. The coefficient of variation for land distribution (1.93) was also higher as compared to that of income distribution (1.66). The lowest 38 percent population was landless and highest 25 percent households owned 82 percent of total landholdings. Figure 2 showed Lorenz curve for land distribution.

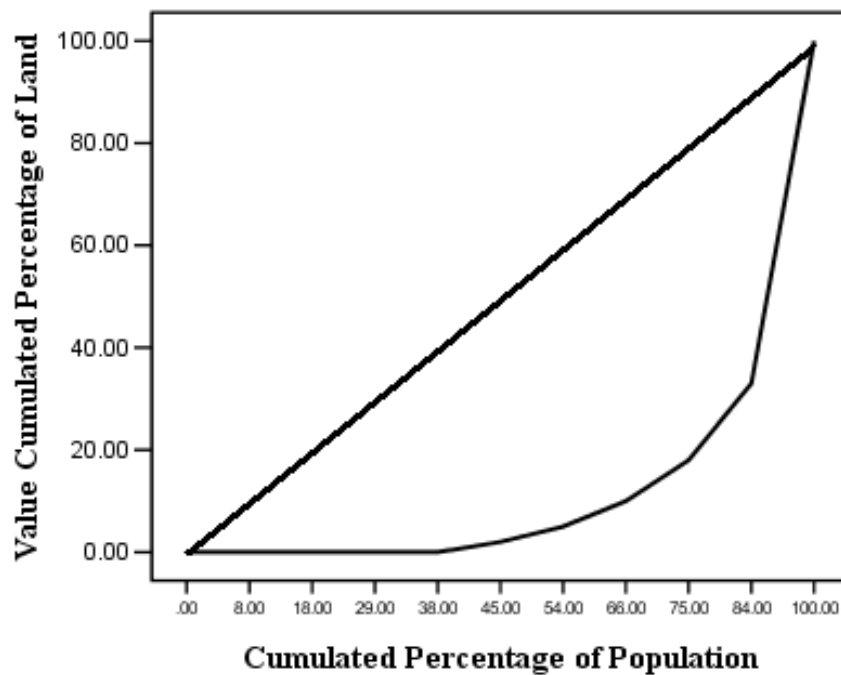FIGURE 2

Lorenz Curve for Land Distribution

Table 4 showed that distribution of livestock was also skewed with the Gini coefficient values of 0.53 and 0.63 calculated through Brown's method and Deaton's method respectively. Gini coefficient values were lower than that of land but higher than that of income. But coefficient of variation (1.42) was lower as compared to that of land (1.93) and income (1.66). The lowest 43 percent population owned just 7 percent of total livestock holdings and highest 26 percent households owned 66 percent of total livestock holdings. Figure 3 showed Lorenz curve for livestock distribution.

TABLE 4

Livestock Distribution among Sampled Households

Households (Numbers)	Population (Percentage)	Cumulated Percentage	Livestock (Percentage)	Cumulated Percentage
Lowest 10	8	8	0	0
Next 10	8	16	0	0
Next 10	7	23	1	1
Next 10	9	32	2	3
Next 10	11	43	4	7
Next 10	9	52	5	12
Next 10	12	62	9	21
Next 10	12	74	13	34
Next 10	9	83	18	52
Next 14	17	100	48	100
$G_b = 0.53$, $G_d = 0.63$, $CV = 1.42$				

Source: Calculated from Author's Household Survey (2008)

FIGURE 3

Lorenz Curve for Livestock Distribution
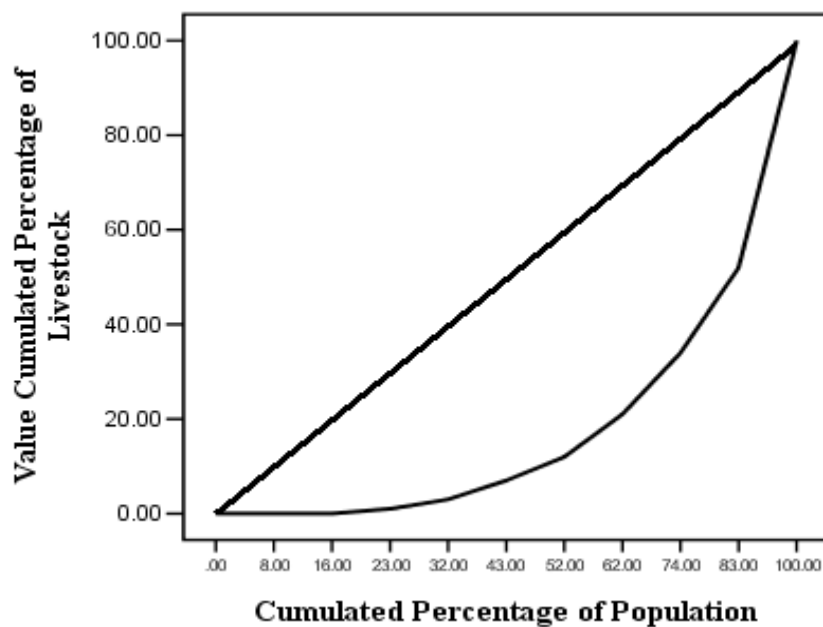
The results showed that income distribution was egalitarian as compared to that of livestock and land in terms of Gini coefficients but coefficient of variation showed that distribution of livestock was egalitarian as compared to land and income. The land distribution was skewed as compared to that of income and livestock. The values of Gini coefficients G_d (calculated by Deaton's method) were higher as compared to G_b (calculated by Brown's method) for the same variables.

Regression Analysis

In order to analyze relationship of farm and non-farm sources with household income three regression analyses were carried out. Firstly a regression was run on 52 lower income households, then on 52 higher income households and finally on the complete sample of 104 households. Table 5 presented the results of lower income households, Table 6 presented results of higher income households and results based on complete sample were given in Table 7.

TABLE 5

Results of Semi-log Multiple Regression Analysis
(Lower Income Households)

Variable	Coefficients	Std. Error	t-statistic
(Constant)	8.139***	0.403	20.207
Land (Acres)	0.033	0.077	0.422
Only farm (Dummy Variable)	–0.236	0.330	–0.715
Livestock (Rupees)	1.02E-006	0.000	0.979
Education (Years)	0.056**	0.023	2.463
Only non-farm (Dummy Variable)	–0.018	0.383	–0.046
Transfer (Dummy Variable)	–0.256	0.218	–1.176

Dependent Variable: log of household income, $R^2 = 0.29$, Observations = 52

***Indicates that the coefficients were significantly different from zero at 0.01 percent probability level.

**Indicates that the coefficients were significant different from zero at 0.05 percent probability level.

*Indicates that the coefficients were significant different from zero at 0.10 percent probability level.

A (–) referred to the situation where the particular variable was dropped.

Table 5 showed that education was only significant variable for lower income households. The education was positively related with income and was significant at 0.05 percent probability level. This was because labor was the only asset of lower income households. Inequality in income can be overcome by refining the capabilities and skills of labor through education. Education served as the primary tool to overcome hunger in lower income households.

Table 6 showed that land holdings, livestock, education and rental income were important for higher income households. The variable land and education were significant at 0.05 percent probability level whereas livestock and rental income were significant at 0.01 percent probability level and all were positively related with income.

TABLE 6

Results of Semi-log Multiple Regression Analysis
(Higher Income Households)

Variable	Coefficients	Std. Error	t-statistic
(Constant)	8.998***	0.267	33.690
Land (Acres)	0.012**	0.005	2.525
Only farm (Dummy Variable)	–0.283	0.231	–1.225
Livestock (Rupees)	1.11E-006***	0.000	3.377
Education (Years)	0.061**	0.024	2.532
Only non-farm (Dummy Variable)	0.113	0.180	0.630
Transfer (Dummy Variable)	0.001	0.143	0.004
Rental (Dummy Variable)	0.432***	0.142	3.039

Dependent Variable: log of household income, $R^2 = 0.77$, observations = 52

***Indicates that the coefficients were significantly different from zero at 0.01 percent probability level.

**Indicates that the coefficients were significant different from zero at 0.05 percent probability level.

*Indicates that the coefficients were significant different from zero at 0.10 percent probability level.

It is concluded that skewed distribution of assets was the root cause of income inequality. The higher income households were better off mainly due to asset holding. All the variables showing impact of assets like land, livestock and rental income were significant for higher income households and showed no significant impact on lower income households. The education was significant for both regressions. This showed that education or attainment of human capital was the only factor that can reduce income inequality.

Table 7 showed that land holdings, only-farm occupation, livestock, education, only non-farm occupation and rental income were significant variables. The variables land, livestock, education and rental were positively related whereas occupation variables only-farm occupation and only non-farm occupation were negatively related with income. Variables farm occupation, non-farm and education were significant at 0.01 percent probability level and variables livestock and rental income were significant at 0.05 percent probability level while land was significant at 0.10 percent probability level.

TABLE 7

Results of Semi-log Multiple Regression Analysis (Complete Sample)

Variable	Coefficients	Std. Error	t-statistic
(Constant)	8.533***	0.220	38.780
Land (Acres)	0.013*	0.007	1.894
Only farm (Dummy Variable)	–0.612***	0.206	–2.971
Livestock (Rupees)	1.09E-006**	0.000	2.385
Education (Years)	0.089***	0.017	5.069
Only non-farm (Dummy Variable)	–0.484***	0.169	–2.855
Transfer (Dummy Variable)	–0.071	0.150	–0.472
Rental (Dummy Variable)	0.532**	0.217	2.454

Dependent Variable = log of household income, R^2 = 0.75, Observations = 104

***Indicates that the coefficients were significantly different from zero at 0.01 percent probability level.

**Indicates that the coefficients were significant different from zero at 0.05 percent probability level.

*Indicates that the coefficients were significant different from zero at 0.10 percent probability level.

The distribution of assets was skewed (as indicated by previous studies of Malik (1996) and Chaudhry (2003) also confirmed by findings of present study) but assets played a key role in increasing income. The skewed distribution of assets increased income inequality. Education played its positive role to reduce income inequality. The households with lower asset endowments can increase their income through education attainment. The assets like land, livestock and other productive assets (measured by rental source) were important for higher income households. The livestock was considered the main asset of lower income or poor households (Adams, 1996) but in the present study, it was significant for higher income households and insignificant for lower income households. This was due to the complementary relationship of agriculture and livestock. Farmers with land and good agriculture productivity also owned livestock and supplemented their income.

The variable transfer income was negatively related in regression 1 (lower income households) and 3 (complete sample) but was positively related in regression 2 (higher income households). This was due to the dominating impact of external remittances in higher income households whereas transfers in lower income households were mostly in the form of Zakat, Ushar and pension. The variable non-farm was negatively related in regression 3 and 1 but positively related with income in regression 2 (higher income households). This was due to the engagement of higher income households in high yielding non-farm activities. The high yielding activities required higher education attainment.

V. CONCLUSIONS AND POLICY IMPLICATIONS

It was found that majority of the household heads attained secondary education. Non-farm activities were prevalent. The distribution of assets was skewed as compared to that of income. The results indicated that lower 83 percent households owned just 50 percent of total income. The higher income households depended primarily on assets whereas education was important for lower income households. This showed that inequality in income was mainly due to skewed distribution of assets. The households adopting both occupations were better off than households adopting single occupation. Among non-farm sources, rental income was positively related with income whereas only non-farm occupation was negatively related with income. Among farm source, land and livestock were positively related with income whereas only farm occupation was negatively related with income. The education remained significant in all the three regression analyses.

Government should take necessary steps to improve quality of education. Special steps should be taken to promote technical education. There is a dire need to create linkages between farm and non-farm sector in rural areas. Non-farm and farm diversifications activities (Tunnel Farming) must be introduced at village level for the employment of unskilled rural labor. Lack of irrigation water is a big constraint in agriculture production. Existing irrigation system should be improved. Better availability of water will enhance agriculture out put. The farmers should be made aware of the availability of better seeds, pesticides and other agri-inputs. This can be done easily by using the growing influence of media. Use of better seeds and other agriculture facilities will increase the production, productivity and income of the farmers and will exert an inequality reducing impact. Micro credits should be issued to empower small farmers. They will enable them to purchase modern inputs. Better infrastructure should be provided to create linkage not only between cities and villages as well as between farm and non-farm sectors. Provision of schools, hospitals and banking facilities will reduce the volume of urban migration.

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