DYNAMICS OF RURAL LIVELIHOODS IN BANGLADESH AND INDIA: INSIGHTS FROM VILLAGE DYNAMICS STUDIES VILLAGES[1]

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Abstract

This study focuses on the recent changes in rural livelihoods systems in Bangladesh and India. It has used household survey data collected under the Village Dynamics Studies in south Asia (VDSA) project from 1831 households located in 42 villages in Bangladesh and India for the period 2010/11 to 2012/13. The villages are comprised of 18 villages from six states (Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Maharashtraand and Telangana) of semi-arid tropics (SAT) in India, 12 villages from three states (Bihar, Jharkhand and Odisha) in eastern India and 12 villages from 11 districts in Bangladesh. The study villages and sample households come from a number of agro-ecological zones and represent varied infrastructure and socio-economic conditions in Bangladesh and India. The study has quantified household income by sources and their determinants. Role of various factors such as access to irrigation facilities, adoption of modern technology, better road connectivity and market linkages, access to education, diversity in economic activities and livelihood opportunities on per capita income are examined. Contribution of different sources (farm and nonfarm) to the total income of the households is analyzed. We have also analyzed the extent of income inequality among households in the three study reguins. The study observed substantial rise in per capita real income and increased importance of nonfarm income sources for livelihoods of rural households.

Keywords: livelihoods, income, inequality, drought, floods, Bangladesh, India

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1. INTRODUCTION

South Asian countries have relied mostly on agriculture sector for employment of rural workforce and their livelihoods for centuries. In recent decades, rural economies in Bangladesh and India have been changing rapidly in terms of production, employment structure and sources of livelihoods (Hossain and Bayes, 2009; Balagtas et al. 2012; Papola, 2013). Rural economies of these countries have been changing with availability and adoption of new agricultural technologies, better access to markets for their products and labor, implementation of development programs such as construction of new roads and infrastructure, employment generation schemes, social safety net programs, sanitation programs, etc. Spread of education and ease in information flow through the advent of mobile phones, radio and television channels; availability and ability of rural population to read daily newspapers have also created closer links between villages and outside areas. Sources of livelihood and dependence on traditional occupations have been changing with new opportunities. In addition to crop agriculture, rural economies in Bangladesh and India have been experiencing diverse opportunities in non-crop agriculture, animal and fish farming along with the development of non-farm employment opportunities in production and service oriented activities. Livelihood systems in the village are changing rapidly with the spread of new income generating assets such as power tiller, thresher, harvester, rice mills, pumpsets, brick fields, etc. and expansion of non-farm economies.

Policy makers and managers of agricultural research institutions constantly want information about importance of various farm and nonfarm activities to the rural livelihoods and its implications for agricultural research and development policies. They also want to know about impacts of technologies, marketing opportunities and policy changes on income of the rural population so that they can design research programs for development and delivery of new technologies, and formulate appropriate policies and strategies for public investment and development. However, there is lack of information and understanding about recent trends in employment, income and their determinants at the household level in both Bangladesh and India. There is wide variation in average income level across villages and regions in India and Bangladesh. However, no studies have yet measured average income at the village level and explained variations in average farm, nonfarm and overall income of the villages across India and Bangladesh.

This study focuses on the recent changes in rural livelihoods systems in Bangladesh and India. Specific objectives of the study are as follows:

- To understand and compare the occupational patterns and employment situation among rural households in Bangladesh and India.
- To analyse the recent trends in income and income inequality in the semi-arid and humid tropics of India and Bangladesh.
- To quantify the contribution of different sources (farm and nonfarm) to the total income of the households and determinants of household income.

- To articulate implications of the research findings for development strategies and policies.

This paper consists of five major sections. After this introductory section, section 2 discusses about the data sources and sample households. Section 3 describes the rural economy in India and Bangladesh. Section 4 describes the level and sources of rural livelihoods and their determinants. Conclusions and policy implications are put forward in the last section (Section 5).

2. DATA SOURCES AND SAMPLE HOUSEHOLDS

Data Sources: This study is based on household level panel data collected under the Village Dynamics Studies in south Asia (VDSA) project. Since 2009, the VDSA project has been implemented jointly by ICRISAT, IRRI and NCAP in collaboration with national institutes in India (ICAR institutes, namely, Directorate of Water Management, Bhubaneswar and ICAR Research Complex for Eastern Regions, Patna) and Bangladesh (Socioconsult Ltd.) with support from the Bill & Melinda Gates Foundation. The project has collected data from 42 villages located in humid and semi-arid tropics (SAT) regions in Bangladesh and India. Based on the location of the study villages, we can group them into three categories: SAT India, East India and Bangladesh. Out of the 42 study villages, 18 villages are located across six states in SAT India (Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra and Telangana), another 12 villages are located in three states in East India (Bihar, Jharkhand and Odisha) and 12 villages are located in 11 districts of Bangladesh. Location Map of the study villages is provided in Figure 1. The study villages and sample households come from different lemgth of growing periods and rainfall zones representing varied infrastructural and socio-economic conditions.

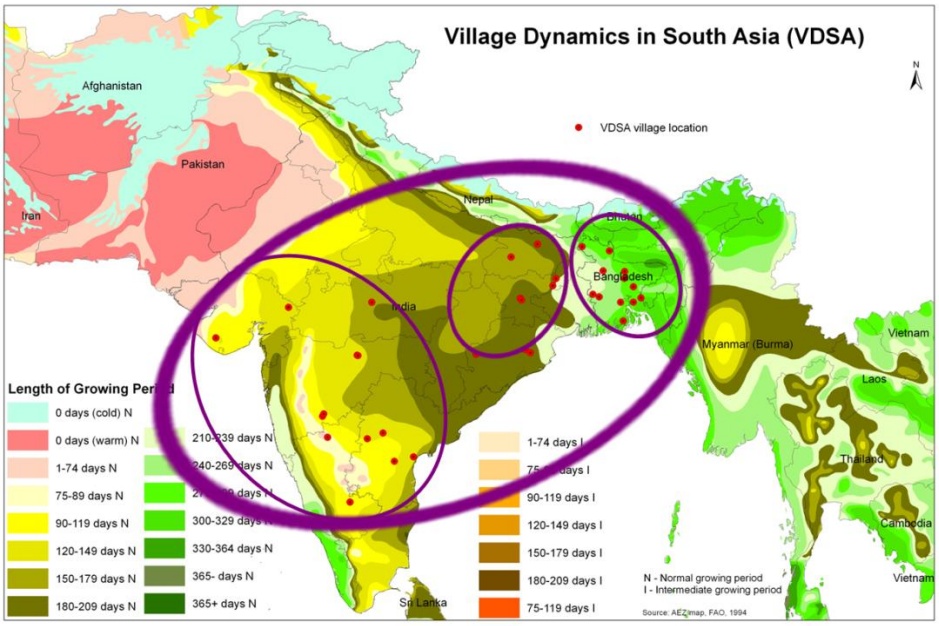
Sample Households: Data collected from 1831 households and their splits for three years (2010/11, 2011/12 and 2012/13) are studied. Total sample size increased from 1831 in 2010/11 to 1848 in 2012/13. Distribution of sample households across regions is provided in Table 1. About half of the total sample households are from SAT India region while one-fourth of the households come from East India and another one-fourth of the sample households come from Bangladesh.

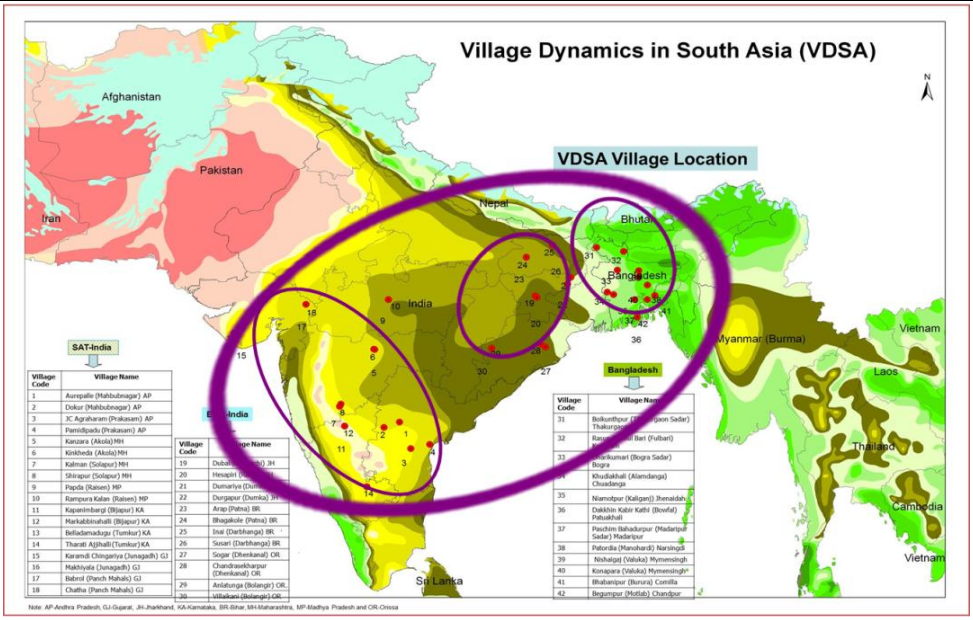
Table 1: Distribution of the sample households in India and Bangladesh: 2010-2012

Country and Regions	**2010**	**2011**	**2012**
SAT India (Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra and Telangana)	866 (47.3)	867 (47.1)	862 (46.6)
East India (Bihar, Jharkhand and Odisha)	480 (26.2)	483 (26.3)	486 (26.3)
Bangladesh	485 (26.5)	490 (26.6)	500 (27.1)
All	**1831 (100.0)**	**1840 (100.0)**	**1848 (100.0)**

Note: Figures in the parenthesis indicate percentages of the total sample.
Source: VDSA Panel Database.

Figure 1: Location of the VDSA study villages in India and Bangladesh





Source: VDSA Project

Occupational distribution of the sample households is provided in Table 2. Based on the major occuption (occuption which provided highest annual income to the household in the study year) of the household, sample households are grouped into two categories: Farm households and Nonfarm households. Farm households are then divided into four sub-categories: Crop farming households, Livestock farming households, Fish farming households and Agricultural labor households. Nonfarm households are divided into six sub-categories: Business, Service, Caste Occupation, Nonfarm Labor, Migrant Workers (remittance is the major source of income) and Other nonfarm households. In 2010, out of the 1831 sample households, 910 households were Farm households and 921 households were Nonfarm households. In other words, 49.7 percent of the households were farm households and 50.3 percent of the households were Nonfarm households. In case of Bangladesh, half of the sample households were Farm households and another half of the households were Nonfarm households. In east India, about one-fourth of the sample households were Farm households and three-fourth of the households were Nonfarm households. In case of SAT India, three-fifth of the sample households were Farm households and two-fifth of the sample households were Nonfarm households.

Table 2: Distribution of the sample households according to main occupation of the households (defined by the highest source of income) in Bangladesh and India, 2010-2012

Occupation of the Household	**Bangladesh**			**East India**			**SAT India**		
	2010	**2011**	**2012**	**2010**	**2011**	**2012**	**2010**	**2011**	**2012**
Farm	243	225	270	121	120	135	546	506	494
Crop farming	141	59	135	61	84	99	314	235	267
Livestock farming	63	123	120	42	15	10	94	141	118
Fish farming	5	10	5	None	None	None	None	None	None
Farm Labor	34	34	10	18	21	26	138	130	109
Nonfarm	242	265	230	359	357	351	320	361	368
Business	78	69	60	41	45	60	39	45	42
Service	38	39	45	72	73	75	69	96	99
Caste Occupation	10	5	5	24	27	23	43	47	39
Nonfarm Labor*	49	74	30	197	178	164	84	65	74
Migrant Workers (Remittances)	62	68	80	6	10	11	21	23	22
Others	5	10	10	19	24	18	64	85	92
Total	485	490	500	480	477	486	866	867	862

Note: * For Bangladesh and Eastern India, Nonfarm labor income also includes income from Rickshaw, van pooling, other transport, etc.

Source: Authors' calculation, based on VDSA Panel Data.

Basic characteristics of the sample households are reported in Table 3. Average household size was highest in eastern India (5.9) followed by Bangladesh (5.4) and SAT India (5.0). Less than one fourth of the total population in SAT India was children. In case of eastern India and Bangladesh, children comprised 30 percent and 27 percent, respectively of the total population. Average age of the household head was about 50 years in all the three study regions. On an average, the household head had five years of education. Female-Male ratio was about 0.9 in all the three regions for both children and adult. On a per capita basis, sample households in SAT India had ownership of 0.41 ha of land while it was 0.17 ha in Eastern India and only 0.09 ha in Bangladesh. In other words, Bangladesh and eastern India have very limited amount of land to support income generating activities. On the other hand, SAT India regions of higher amount of land resources but soil qualities are poor and farmers face frequent droughts. Per capita ownership of non-land assets was highest in SAT India followed by Eastern India and Bangladesh. Within a span of only three years (between 2010/11 and 2012/13), per capita ownership of non-land assets increased by 43 percent in SAT India (from USD 1638 to USD 2344), 125 percent in Eastern India (from USD 970 to USD 2187) and only 15 percent in Bangladesh (from USD 745 to USD 856).

Table 3: Basic characteristics of the sample households

Indicators	**Bangladesh**			**East India**			**SAT India**		
	2010	**2011**	**2012**	**2010**	**2011**	**2012**	**2010**	**2011**	**2012**
Number of Sample Households	485	490	500	480	483	486	866	867	862
Household Size	5.40	5.35	5.33	5.89	5.83	5.90	5.01	4.98	4.96
Children (%)	28.10	27.39	26.55	30.76	29.95	29.77	25.34	24.51	23.54
Female-male Ratio (Child)	0.93	0.87	0.91	0.90	0.91	0.90	0.97	0.94	0.91
Female-male Ratio (Adult)	0.91	0.92	0.91	0.90	0.91	0.89	0.91	0.91	0.92
Reproductive Women	0.49	0.49	0.50	0.52	0.53	0.53	0.55	0.54	0.55
Child-woman Ratio	0.59	0.58	0.56	0.94	0.90	0.88	0.76	0.68	0.65
Dependency Ratio (%)	0.79	0.76	0.65	0.64	0.58	0.57	0.44	0.43	0.40
Average Age of Head	50	51	51	48	49	49	49	49	50
Average Head Years of Education	4.49	4.54	4.62	5.46	5.49	5.46	4.90	4.93	4.96
Average Per Capita Own Total Area (Hectares)	0.087	0.089	0.088	0.17	0.18	0.16	0.41	0.42	0.45
Average Per Capita Value of Non-land Assets (USD)	745	790	856	970	1321	2187	1638	1895	2344

Source: Authors' calculation, based on VDSA Panel Data.

3. RURAL ECONOMY IN SOUTH ASIA

3.1 Structural Changes in Rural Economy

During the last three decades, rural economy of Bangladesh and India experienced remarkable structural changes. Traditionally, agriculture was the dominant sector of south Asian economy both in terms of GDP and employment of rural workforce. With continued expansion of other sectors, economy has diversified and agriculture has lost its prominence both in Bangladesh and India.

Trends in composition of Bangladesh economy during the last three decades is reported in Table 4. Between 1980/81 and 2012/13, total GDP of Bangladesh has gradually increased by more than nine times (from USD 14.23 billions to USD 130.19 billions). All sectors of the economy (Agriculture, Industry and Services) have experienced consistent growth with some year to year ups and downs. During this period, per capita GDP has increased from USD 163 to USD 750. With the expansion of the non-agriculture sector at a rapid pace, dominance and share of the agriculture sector has declined. Share of the agriculture sector has declined from 41 percent to 17 percent. On the other hand, contribution of the industry sector which is the main component of Nonfarm sector was quite remarkable. Contribution of the industry sector to the total GDP increased from 17 percent to 28 percent. Contribution of the services sector has increased from 42 percent to 55 percent.

Table 4: Trends in composition of the Gross Domestic Product (GDP) in Bangladesh, 1980-81 to 2012-13

(in Million USD)

Sectors	**1980-81**	**1990-91**	**2000-01**	**2005-06**	**2012-13**
Agriculture	5830 (41)	8425 (36)	10941 (23)	11708 (19)	21655 (17)
Industry	2395 (17)	3682 (16)	11778 (25)	16660 (27)	36322 (28)
Service	6008 (42)	11279 (48)	24269 (52)	33607 (54)	72210 (55)
Total	14233 (100)	23385 (100)	46988 (100)	61975 (100)	130188 (100)

Note: Values in the parenthesis indicating percentage
Source: Bangladesh Bureau of Statistics

At the macro-level, there is lack of information about growth of non-agriculture sector particularly in the rural areas. However, nationally representative household survey based studies (Hossain, 2004; Hossain and Byes, 2008 and Balagtas et.al, 2012) showed high growth in rural economy and faster growth in nonfarm sector than the agriculture sector in the rural areas. With in a span of only two deacdes (between 1988 and 2008), per capita income was more than doubled. Per capita income increased from USD 187 to USD 417 (Table 5). Average household income increased from USD 1105 to USD 2062. Higher rate of increase in per capita income

was realized through increase in household income and decrease in household size. In the late eighties, rural nonfarm activities comprised 42 percent of the income in rural areas which has increased to 57 percent by 2008. Share of the farm sector has declined from about three-fifth to about two-fifth of the total income in the rural areas. Share of crop income to the total income has declined from one-third to one-fourth. Share of non-rice crops to the total income was doubled and non-crop agriculture contributed about 11 percent of the total income in rural areas.

Table 5 : Sources of rural household income in Bangladesh (%), 1988–2008*

Components	**1988**	**2000**	**2004**	**2008**
Crop income	34	24	26	26
Rice income	26	16	15	15
Non-rice crop income	8	8	11	11
Nor-crop agricultural income	11	13	12	11
Agricultural wage income	13	5	6	6
Total farm income	**58**	**43**	**44**	**43**
Trade/business income	9	21	19	15
Service income	18	17	16	10
Remittance income	5	13	14	23
Non-agricultural wage income	9	7	7	9
Total Nonfarm income	**42**	**57**	**56**	**57**
Total household income	**100**	**100**	**100**	**100**
Total household income (in 2004 US$)	1105	1325	1395	2062
Average per capita income (in 2004 US$)	187	245	264	417

Note: * Represent Nominal income variables are converted to 2004 constant prices using the national GDP deflator of 64.78, 115.7, and 132.1 for 1987–1988, 1999–2000, and 2003–2004, respectively (base-year = 1995–1996). The real income variables are reported in 2004 constant prices and converted to 2004 constant US$ using the exchange rate US$1 = 58.83 in 2003–2004. Average total household income and per capita income are weighted by household size.
Source: Balagtaset.al., 2012, Table 2.

India has also experienced similar structural changes in rural economy. Recent studies on Indian economy have shown that agriculture is no longer the dominant sector of the economy (Papola, 2013; Reddy 2014). Share of agriculture has declined from about two-thirds (64.36%) of the rural national domestic product (NDP) in 1980-81 to about a little over one-third by 2009-10 (Table 6). Contribution of non-agricultural activities was almost two-thirds (65%) of the rural NDP in 2009-10. The drivers of change have been construction, trade, hotels, transport, storage and manufacturing. The share of construction has increased from only 4 percent in 1980-81 to 15 percent in 2009-10. During the same period, share of trade, hotels, etc., have increased from about 7 percent to 18 percent. On the other hand, share of transport and storage has increased from about 1 percent to 7 percent. The share of manufacturing, which had the highest share in non-agriculture output in 1980-81, has been reduced to lowest share of about 12 percent in 2009-10. What is noteworthy is that though these changes have been in evidence since early 1980s, the acceleration of the shifts in the rural production structure has been more visible since 2004-

05. Overall, the faster growth of non-agricultural sector resulted in growing productivity differences between agriculture and non-agriculture (Binswanger-Mkhize 2013). The productivity gap between agriculture and non-agriculture increased from 1:2.7 in 1993-94 to 1:5.6 in 2009-10 (Papola, 2013).

Table 6: Changing structure of Rural Net Domestic Product (NDP) in India

Sectors	**1980-81**	**1993-94**	**2004-05**	**2009-10**
I. Agriculture	64.36	56.99	38.34	35.00
II. Non-Agriculture	35.64	43.01	61.66	65.00
Manufacturing	9.16	8.15	11.13	11.85
Construction	4.05	4.61	7.91	15.00*
Trade / Hotels, etc.	6.68	7.77	14.98	18.00*
Transport / Storage	1.32	3.41	5.81	7.00*

Note: *Projected
Source: Papola (2013)

An analysis of trends in output and employment in rural India by Nagaraj et al. (2014) revealed that non-agriculture sector emerged as a dominant sector in the rural Net Domestic Product (NDP). In the early eighties, agriculture used to contribute about two-third of the rural NDP which has reduced to about one-third in the recent years (Table 7). Importance of non-agriculture sector has also increased in terms of employment. Nonfarm sector now employs about one-third of the rural work force in India against only one-fifth in the eighties. However, in terms of employment, agriculture is still the major employer. In the recent years, agriculture sector employs about two-third of the rural work force in India compared to the four-fifth of the labor force in the early eighties.

Table 7: Trends in output and employment in rural India (%)

Year	Structure of Rural NDP		Trends in Employment in Rural India Based on Usual Status	
	Agriculture	Non-Agriculture	Agriculture	Non-Agriculture
1980-81	64	36	81	19
2009-10	35	65	68	32

Source: NSSO Employment and Unemployment Surveys, as reported in Nagaraj et al. (2014).

Household level longitudinal panel data based analysis from six villages in Maharashtra and Telangana indicated that agriculture was the primary occupation for about 88 percent of the sample households in the mid-1970s, which has been reduced to about 70 percent in 2012. On the other hand, Nonfarm occupations are the primary occupation for about one third of the labor force against only 12 percent in the mid-1970s. Counting both primary and secondary

occupations, non-agriculture provides employment to 45 percent of the workforce in 2012. On the other hand, agriculture was the source of primary and secondary occupation for 115 percent of the workforce. This implies that many of the rural folks are now engaged in multiple occupations (Deb, Bantilan and Khan, 2014).

3.2 Rural Population and Labor Force

Rural labor force depends to a large extent on the demographic characteristics of the rural population. Distribution of people in different age group has significant impact in the economy. Composition of the household members with different age groups impart differential impact on the livelihood strategy of the household (Hossain and Bayes, 2009). Household with more children and old age people implies more dependent and leads to more burden of the family. On the other hand, households with more working age people reduce the burden and they can enjoy a good living standard. It is because the former has more dependents (bread eaters), and the later has more earners (bread-winners).

Following the conventional literature, we have defined the rural population into three categories: Children (up to 14 years), working age (15 to 59 years) and Old Age (60 years and above). Distribution of the population of sample households into different age cohorts revealed that about two-third of the population in Bangladesh and India is in the working age (Pramanik, Deb and Bantilan, 2014; Khan, Deb and Bantilan, 2014). On the other hand, about one fourth of the total population was children while one-tenth was old age. More or less the distribution was same for both male and female population. In terms of distribution of population among different age cohorts, there was a rising trend of working age population over the last three years (2010/11 to 2012/13). It is pertinent to mention here that at the national level, share of working age population to the total population in Bangladesh, as per the 2011 Census, was around 70 percent (BBS, 2014). With the improvement in life expectancy and better health services, many at the age bracket of 60 years and above are also working in various economic and domestic activities.

4. SOURCES RURAL LIVELIHOODS AND DETERMINANTS

4.1 Occupational distribution of employed population

Employed population of the sample households in all three study regions (Bangladesh, East India and SAT India) were engaged in various types of farm and nonfarm occupations. Some of them were engaged in one activity as their main or primary occupation while part of their time was involved in another activity as secondary occupation. We have counted occupational distribution into various occupations considering their primary occupation as well as their involvement in the economic activities either as primary or as secondary occupation. It was revealed that many had multiple occupations. Occupational distribution of the sample households in Banglaesh, East India and SAT India during 2010 to 2012 is reported in Table 8 to 10.

Bangladesh: About two-fifth of the employed labor force in Bangladesh was engaged in agricultural activity as primary occupation while three-fifth of the labor force was engaged in nonfarm activties as main occupation (Table 8). Crop farming was the primary occupation for about one-third of the total labor force. Four percent of the labor force was engaged as agricultural labor. Considering both primary and secondary occupation, two-third of the employed labor force was enaged both in agroculture and non-agricultural activtites. Engagement in agriculture as primary or secondary activties for the employed labor force decined at the rate of two percent per annum while it was incraesed at the rate of one percent per annum for non-agricultural activties indicating a situation where some of the labor force are trying to be engaged within one sector on a full time basis rather than engaging in both sectors on a part time basis.

Table 8: Occupational distribution of employed population in Bangladesh, 2010 to 2012

Occupation	Primary Occupation (%)			Primary or Secondary Occupation (%)		
	2010	2011	2012	2010	2011	2012
Agriculture:	**41.06**	**40.67**	**38.94**	**68.71**	**66.54**	**62.44**
Farming	35.31	35.19	32.72	50.83	49.18	47.12
Agri-labor	4.33	4.08	4.48	9.70	11.53	10.95
Other Agriculture Work	1.41	1.40	1.74	8.18	5.83	4.37
Non-agriculture:	**58.94**	**59.33**	**61.06**	**67.85**	**68.51**	**71.00**
Business	8.29	8.51	8.18	11.79	11.88	10.84
Cottage industry	1.06	0.82	0.81	1.52	1.75	1.51
Foreign Service	9.94	9.78	9.80	9.94	9.78	9.80
Maid Servant	0.24	0.47	0.34	0.24	0.47	0.34
Mechanics	2.68	3.15	3.33	2.93	3.73	4.03
Rickshaw/van pulling	2.93	2.11	2.07	3.04	2.35	2.19
Other Transport	1.76	1.97	2.88	2.00	2.08	3.47
Service	25.02	25.74	26.39	25.74	26.21	27.20
Shop keeping	1.76	1.64	1.85	2.46	2.46	2.77
Nonfarm labor	2.33	2.57	3.00	2.46	2.79	4.26
Other Nonfarm Work	2.93	2.57	2.41	5.72	5.01	4.60
All	**100/00**	**100.00**	**100.00**	**136.57**	**135.06**	**133.44**

Source: Authors' calculation, based on VDSA Panel Data.

East India: About three-fifth (57 percent) of the total labor force in East India was engaged in agricultural activity either as primary occupation in 2010 (Table 9). On the other hand, non-agriculture was the main occupation for about two-fifth (42 percent) of the total labor force in 2010. Within a short span of three years, nonfarm as main occupation has increased to 51 percent

in 2012. During the same period, it has decreased to 49 percent for agriculture. Share of agriculture labor as main occupation has declined but non-agricultural labor has incresaed.

Table 9: Occupational distribution of employed population in East India, 2010 to 2012

Occupation	**Primary Occupation (%)**			**Primary or Secondary Occupations (%)**		
	2010	**2011**	**2012**	**2010**	**2011**	**2012**
Agriculture	57.26	53.71	48.70	98.57	97.50	94.25
Farming	45.89	43.72	40.56	58.31	59.41	57.88
Livestock	1.58	2.04	1.15	16.70	18.95	19.42
Farm labor	9.79	7.95	6.99	23.56	19.14	16.95
Non-agriculture	42.74	46.29	51.30	62.49	68.31	71.94
Business	4.32	6.23	6.57	7.36	10.12	10.84
Caste occupation	1.05	1.40	1.88	3.31	3.22	3.30
Salaried job	14.32	13.96	14.29	14.43	14.09	14.40
Nonfarm labor	19.68	20.84	24.19	33.00	35.56	38.07
Others	3.37	3.87	4.38	4.38	5.33	5.33
All	100.00	100.00	100.00	161.06	165.82	166.19

Source: Authors' calculation, based on VDSA Panel Data.

SAT India: In 2010, about three fourth of the total employed persons were engaged in agriculture as primary occupation while the rest (one-fourth) were engaged in nonfarm activities (Table 10). Within a short span of only three years, percent of employed population in nonfarm activities as primary occupation has increased by four percent. In other words, nonfarm activities as primary occupation were increasing annually at the rate of 1.3 percent. Major shift was from farm to nonfarm labor and engagement in business. In case of employment in agriculture, share of farm labor as primary occupation has reduced and participation in livestock related occupations has increased. Considering both primary and secondary occupations, the percent of people engaged in farm activities was almost same over the study period whereas in nonfarm activities, it was increased from 39 percent in 2010 to 43 percent in 2012.

Table 10: Occupational distribution of employed population in SAT India, 2010 to 2012

Occupation	Primary Occupation (%)			Primary or Secondary Occupations (%)		
	2010	2011	2012	2010	2011	2012
Agriculture	**72.54**	**70.02**	**68.87**	**121.05**	**122.28**	**122.41**
Farming	45.21	44.04	44.39	63.82	63.66	65.82
Livestock	7.85	4.79	4.52	20.55	20.86	20.64
Farm labor	19.47	21.20	19.96	36.69	37.76	35.94
Non-agriculture	**27.46**	**29.98**	**31.13**	**39.23**	**41.39**	**43.48**
Business	3.49	4.19	4.88	5.39	5.94	6.74
Caste occupation	2.42	2.49	2.34	4.68	4.73	4.44
Salaried job	8.04	9.28	10.11	8.40	9.52	10.39
Nonfarm labor	9.80	9.73	9.60	14.74	15.31	15.91
Others	3.72	4.29	4.22	6.03	5.89	5.99
All	**100.00**	**100.00**	**100.00**	**160.28**	**163.67**	**165.89**

Source: Authors' calculation, based on VDSA Panel Data.

Education and employment of labor force: Major occupational pattern of the rural labor force having different levels of education during 2010-2012 is reported in Table 11 to 13. Workers with high levels of education (Graduate and above) in Bangladesh were engaged mostly in service (76 percent) followed by business (11 percent). Workers of Bagnladesh without any formal education were mostly engaged in farming (52 percent) followed by service (12 percent) and business (10 percent). SSC and HSC passed workers of Bangladesh were engaged mostly in service (57 percent), farming (23 percent) and business (15 percent).

Table 11: Major occupational pattern ofworkers with different levels of education in Bangladesh: 2010-2012

Education Level and Period of Information	Occupational Pattern (Per Cent of Worker in Braces)				
	First	Second	Third	Fourth	Fifth
No Formal Schooling	Farming (52)	Service (12)	Business (10)	Nonfarm labor (9)	Agri-Labor (8)
Primary Attended	Farming (40)	Service (21)	Nonfarm labor (15)	Business (9)	Transport (7), Agri-Labor (7)
Secondary Attended	Service (45)	Farming (30)	Business (10)	Nonfarm labor (6)	Transport (3)
SSC or HSC Passed	Service (57)	Farming (23)	Business (15)	Nonfarm labor (2)	Fish Farming (2)
Graduate and Above	Service (76)	Business (11)	Farming (8)	Other Nonfarm work (5)	

Source: Authors' calculation, based on VDSA Panel Data.

In case of East India, farming was the major occupation for employed labor force having education level up to intermediate (Table 12). Nonfarm labor was the second most important occupation (about 25 percent) for labor force having education level up to secondary attended. Workers with education level of SSC or intermediate passed, second most important occupation was service where one-fourth of workers of this educational category were occupied. Workers without formal education were engaged in farming, and farm and nonfarm labor. Gradute and above educated labor force were not engaged in service (52 percent) followed by farming (29 percent) and business (8 percent).

Table 12: Major occupational pattern for workers with different levels of education in East India: 2010-2012

Education Level and Period of Information	Occupational Pattern (Per Cent of Worker in Braces)				
	First	Second	Third	Fourth	Fifth
No Formal Schooling	Farming (44)	Nonfarm labor (27)	Farm Labor (17)	Others (3), Salaried job (3), Caste occupation (3)	Business (2), Livestock (2)
Primary Attended	Farming (50)	Nonfarm labor (25)	Farm labor (10)	Salaried job (6)	Business (4)
Secondary Attended	Farming (48)	Nonfarm labor (26)	Salaried job (8)	Farm labor (7)	Business (6)
SSC or Intermediate Passed	Farming (39)	Salaried job (23)	Nonfarm labor (17)	Business (10)	Others (8)
Graduate and Above	Salaried job (52)	Farming (29)	Business (8)	Others (6)	Livestock (3)

Source: Authors' calculation, based on VDSA Panel Data.

Analysis of occupational pattern for workers in SAT India along with their education level revealed that highly educated (graduate and above) labor force were engaged in salaried job (45 percent) followed by farming (33 percent) (Table 13). About half of the employed population having education level up to intermediate (12 years) were engaged in farming. If we include farm labors, then two-third of the labor force having education up to intermediate level was engaged in agriculture related activities.

Table 13: Major occupational pattern of workers with different levels of education in SAT India: 2010-2012

Education Level and Period of Information	Occupational Pattern (Per Cent of Worker in Braces)				
	First	Second	Third	Fourth	Fifth
No Formal Schooling	Farming (48)	Farm Labor (28)	Livestock (9)	Nonfarm labor (8)	Caste Occupation (3)
Primary Attended	Farming (50)	Farm Labor (21)	Nonfarm labor (9)	Livestock (8)	Business (4)
Secondary Attended	Farming (47)	Farm Labor (19)	Nonfarm labor (11)	Livestock (6)	Salaried job (5)
SSC or Intermediate Passed	Farming (43)	Salaried job (17)	Nonfarm labor (11)	Farm Labor (10)	Business (8)
Graduate and Above	Salaried job (42)	Farming (34)	Others (8)	Business (7)	Nonfarm labor (4)

Source: Authors' calculation, based on VDSA Panel Data.

4.2 Occupational Mobility

To study the dynamics of rural livelihoods, it is worthwhile to assess the occupational mobility matrix. The matrix illustrates the movements of rural households across occupations, and thus represents the dynamics of rural livelihoods. We have analyzed the mobility in occupations between 2010 and 2012. Considering 2010 as the base period, we tried to see what changes occurred in 2012. Occupational mobility matrices for the study regions are presented in Table 14 to 16. We observed varied level of occupational mobility across the three study regions.

In Bangladesh, occupational mobility was high for waorkers engaged in nonfarm activties than in farm and agricultural activities (Table 14). For example, 88 percent of the employed labor force eangaged in farming in 2010 remained in farming in 2012 while only 7 percent of the workers engaged in transport remained in transport sector in 2012. Similarly, 85 percent engaged in other agriculture related work (livestock and fish farming) remained in those activties in 2012. Service as an occupation was found to be less volatile where 91 percent of the occupants stayed in their occupation. In case of business occupation, 76 percent stayed in business while others shifted to different kinds of agricultural (9 percent) and non-agricultural (15 percent) occupations.

In eastern India, occupational mobility was low for caste occupations and farming (Table 15). Occupational mobility was high for farm labor who have shifted to nonfarm labor and farming. This is an indication of low rewards and vulnerability of farm labors in their occupation. More than 80 perecent of the workers enaged in occupations like business, service and nonfarm labor in 2010 remained in their occupation implying that they had relatively stable situation in their occupation.

Table 14: Individual occupational mobility matrix in Bangladesh: 2010 vs 2012

Occupation (2010) %	**Occupation (2012) %**							
	N (2010)	**Farming**	**Other Agriculture Work**	**Business**	**Service**	**Other Nonfarm Work**	**Mechanics**	**Transport**
Farming	272 (100)	88	2	2	5	0	0	2
Other Agriculture Work	46 (100)	9	85	0	0	4	0	2
Business	72 (100)	8	1	76	6	6	1	1
Service	260 (100)	2	0	2	91	2	0	2
Other Nonfarm Work	56 (100)	9	4	4	5	73	5	0
Mechanics	20 (100)	5	0	0	10	0	85	0
Transport	35 (100)	9	3	3	3	3	3	77

Source: Authors' calculation, based on VDSA Panel Data.

Table 15: Individual occupational mobility matrix in East India: 2010 Vs 2012

Occupation (2010) %	**Occupation (2012) %**							
	N (2010)	Farming	Farm Labor	Business	Service	Caste Occupation	NonfarmLabor	Other Nonfarm Work
Farming	391(100)	84	2	1	2	1	8	2
Farm Labor	71(100)	14	51	7	1	0	24	3
Business	35 (100)	6	0	83	6	0	3	3
Service	124 (100)	6	0	4	81	1	4	3
Caste occupation	9 (100)	11	0	0	0	89	0	0
Nonfarm Labor	163 (100)	4	5	4	5	0	81	2
Other Nonfarm work	24 (100)	8	0	0	21	4	17	50

Source: Author's calculation based on VDSA data base

Table 16 provides information about occupational mobility of employed workforce in SAT India in 2012 compared to 2010. It was revealed that highest mobility was observed for nonfarm labor and workers engaged in other nonfarm activities. Only two-third of the people engaged in nonfarm labor and other nonfarm activities in 2010 retained in this profession in 2012 while one-third of them switched to farming and service (salaried jobs). Probably it indicates a situation that people working as nonfarm labor and in other nonfarm activities wanted to be engaged in occupations which were stable and economically better rewarding. In the absence of employment

opportunities of their choice and commensurate return they tried with nonfarm labor and other nonfarm activites and eventually gave up. Mobility was low for farming, caste occupations, business and service. About 85 percent of the occupants engaged in caste occuption, business and services remained in their respective occupations. Most of the people (89 percent) engaged in farming remained in farming. Movement from farm and nonfarm labor to farming was notable. One tenth of the total workforce engaged in agriculture labor switched to farming. One tenth of the nonfarm labor also moved to self-employed farming indicating spread of peasant farming in the dryland agriculture through expansion of tenancy markets.

It would have been interesting to see movement within agriculture, for example, crop farming to livestock and fish farming, and engagement in horticultural and high value crops. We didn't have such information at the household member level. Therefore, we were unable to analyse such situation. However, we have observed such mobility among the working population in our sample households in Bangladesh and SAT India.

Table 16: Individual occupational mobility matrix in SAT India: 2010 Vs 2012

Occupation in 2010 (%)	**Occupation in 2012 (%)**							
	Number	**Farming**	**Farm Labor**	**Business**	**Salaried Job**	**Caste Occupation**	**NonfarmLabor**	**Other Nonfarm work**
Farming	1080 (100)	89	5	1	1	0	2	1
Farm Labor	369 (100)	11	81	2	2	1	2	1
Business	80 (100)	11	1	84	0	0	3	1
Salaried Job	150 (100)	8	1	0	85	0	5	1
Caste Occupation	55 (100)	9	5	0	0	84	2	0
NonfarmLabor	189 (100)	11	8	3	5	1	68	5
Other Nonfarm work	73 (100)	5	0	4	11	1	8	70

Source: Authors' calculation, based on VDSA Panel Data.

4.3 Duration of Employment and Labor Productivity

Under the VDSA project, every month data were collected about all members of the households about their engagement in economic and domestic activties and number of hours invoved in different activties. We have processed these data and calculated full time equivalent days of work for all members who are engaged in self-employed or paid work. The results are presented in the Table 17. People engaged in services have higher level of employment days in all the three regions and it ranged between 245 days to 284 days in a year. The next was business category people who were engaged about 200 days in a year. Transport was the third highest employment days where people have worked about 160 days in Bangladesh, 180 days in eastern India and 110 days in SAT India. Most of these people are engaged in rickshaw and van pulling, auto and bus drivers. Agricultural labors have lowest number of employment days approximately 100 days in a year in Bangladesh and SAT India, and about 75 days in eastern India. This confirms disguised unempoyment in agriculture sector. Other nonfarm activties provided employment of about 170 days in Bangladesh, 150 days in east India and 100 days in SAT India.

Table 17: Duration of employment (days/year) in Bangladesh and India: 2010 to 2012

Activity	**Bangladesh**			**East India**			**SAT India**		
	2010	**2011**	**2012**	**2010**	**2011**	**2012**	**2010**	**2011**	**2012**
Agricultural Labor	102	102	100	75	72	72	113	106	110
Nonfarm labor	134	94	134	147	157	164	84	88	104
Business	204	210	214	212	205	179	201	197	220
Service	260	246	278	269	284	286	253	264	267
Transport	150	169	168	127	184	180	192	112	108
Caste Occupation	NA	NA	NA	117	129	160	162	202	181
Other Nonfarm work	192	165	174	138	150	178	110	89	97

Note: NA indicates data mot available.
Source: Authors' calculation, based on VDSA Panel Data.

Labor productivity is one of the important factor which influence movement across various employment opportunities. Labor productivity for different wage activities in the study regions is stated in Table 18. It is revealed from the analysis that agricultural labor had the lowest productivity in all the three regions. Agriculture labors received an average daily wage of USD 2.50 in Bangladesh, USD 1.80 in eastern India and USD 2.70 in SAT India. Nonfarm labors received higher wage than that of agriculture labors in all the three regions. Compared to agriculture labors, nonfarm labors received 10 percent higher wage in Bangladesh and 20 percent higher wage in east India and 30 perecent higher wage in SAT India. This explains movement and preference for work by labor groups in nonfarm activity than in agriculture. Highest productivity was observed in transport sector (daily earning ranged between 3.50 dollars in eastern India and 5.30 dollars in Bangladesh) followed by service (daily earning ranged between

3.00 dollars in Bangladesh and 6.80 dollars in eastern India). Business people received daily earning of USD 3.50 in both Bangladesh and eastern India and USD 4.20 in SAT India.

Table 18:Labor productivity(USD/day) in Bangladesh and India: 2010 to 2012

Activity	Bangladesh			East India			SAT India		
	2010	2011	2012	2010	2011	2012	2010	2011	2012
Agricultural Labor	2.39	2.52	2.51	1.53	1.73	2.05	2.47	3.00	2.67
Nonfarm labor	2.69	2.87	2.88	2.10	2.45	2.55	2.84	3.25	3.38
Business	3.50	3.45	3.48	3.72	3.20	3.66	4.07	4.72	3.79
Service	2.88	3.04	2.95	6.70	7.08	6.72	4.75	4.59	4.77
Transport	4.79	5.39	5.79	2.62	4.20	3.52	7.00	4.02	3.36
Caste Occupation	NA	NA	NA	2.50	2.93	3.76	2.18	2.53	2.77
Other Nonfarm work	2.20	2.54	2.52	2.14	2.47	2.78	3.24	3.05	3.27

Note: NA indicates data mot available.
Source: Authors' calculation, based on VDSA Panel Data.

4.4 Level and Sources of Household Income

Per capita average income was lowest in east India and highest in SAT India. Aveage per capita income showed an increasing trend over the three years of study (Table 19). Per capita average annual income ranged between USD 265 and USD 407 in East India, USD 361 and USD 426 in Bangladesh, and USD 711 and USD 775 in SAT India. Compared to East India, average per capita income was 15 percent higher in Bangladesh and more than double in SAT India. Income from both farm and nonfarm sources was higher in Bangladesh than in Eastern India. On the other hand, average per capita income in SAT India from both farm and nonfarm sources was higher than that of East India and Bangladesh.

An analysis of sources of income has revealed that income sources are diversified in all the three regions (Table 20). Higher level of diversity in income sources was observed in subsequent years. Study regions indicated mixed results. Share of agriculture to the total income was increasing over the three years of study in eastern India from 27 percent to 31 percent. Thanks to the various new agricultural projects and programs initiated by the Governments of Bihar and Odisha. In case of Bangladesh, share of agriculture income to the total income declined from 54 percent in 2010 to 44 percent in 2012. In SAT India, agriculture is still the dominant sector but its share declined from 60 percent in 2010 to 56 percent in 2012. Role of nonfarm sources as livelihood has increased both in Bangladesh and SAT India. In eastern India, two third of the income came from nonfarm sector.

Table 19: Trends in per capita household income (USD) in Bangladesh and India, by income sources: 2010 to 2012

Sources of Income	Bangladesh			East India			SAT India		
	2010	2011	2012	2010	2011	2012	2010	2011	2012
Farm	**194**	**201**	**184**	**72**	**99**	**128**	**427**	**434**	**425**
Crop farming	115	61	90	51	87	119	275	235	257
Livestock farming	50	94	60	8	-2	-4	87	129	107
Fish farming	16	33	23	0	0	0	0	0	0
Farm Labor	14	13	12	12	14	13	65	71	61
Nonfarm	**166**	**225**	**236**	**194**	**280**	**279**	**283**	**341**	**332**
Business	42	44	41	22	32	39	30	45	36
Service	29	30	29	65	88	85	61	78	84
Caste Occupation	2	2	2	9	13	12	22	25	24
Nonfarm Labor*	31	42	56	65	86	81	53	46	44
Remittances	61	105	107	13	19	31	37	31	31
Other Nonfarm	1	2	2	19	41	30	81	116	113
Total	**361**	**426**	**420**	**265**	**379**	**407**	**711**	**775**	**757**

Note: * For Bangladesh Nonfarm labor income also includes income from Rickshaw, van pooling, other transport, etc.
Source: Authors' calculation, based on VDSA Panel Data.

Table 20: Trends in percentage share of different income sources in Bangladesh and India, 2010 to 2012

Sources of Income	Bangladesh			East India			SAT India		
	2010	2011	2012	2010	2011	2012	2010	2011	2012
Farm	**53.87**	**47.22**	**43.79**	**27.17**	**26.12**	**31.45**	**60.06**	**56.00**	**56.14**
Crop farming	31.81	14.34	21.38	19.25	22.96	29.24	38.68	30.32	33.95
Livestock farming	13.96	22.14	14.24	3.02	-0.53	-0.98	12.24	16.65	14.13
Fish farming	4.31	7.63	5.40	0.00	0.00	0.00	0.00	0.00	0.00
Farm Labor	3.85	3.07	2.81	4.53	3.69	3.19	9.14	9.16	8.06
Nonfarm	**46.13**	**52.78**	**56.25**	**73.21**	**73.88**	**68.55**	**39.80**	**44.00**	**43.86**
Business	11.75	10.35	9.73	8.30	8.44	9.58	4.22	5.81	4.76
Service	8.06	6.93	6.79	24.53	23.22	20.88	8.58	10.06	11.10
Caste Occupation	0.56	0.57	0.49	3.40	3.43	2.95	3.09	3.23	3.17
Nonfarm Labor	8.49	9.83	13.40	24.53	22.69	19.90	7.45	5.94	5.81
Remittances	16.93	24.55	25.36	4.91	5.01	7.62	5.20	4.00	4.10
Other Nonfarm	0.28	0.47	0.48	7.17	10.82	7.37	11.39	14.97	14.93
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Per capita income (Current US$)	**361**	**426**	**420**	**265**	**379**	**407**	**711**	**775**	**757**

Source: Authors' calculation, based on VDSA Panel Data.

Policy makers are interested to know about relative importance of various sources of income to the total income of various occupations. To quantify this, we have categorized all sample households into two major occupational categories: Farm and Nonfarm. Analysis of trends and sources of per capita household income for Farm and Nonfarm households revealed that farm hoseholds in Bnagladesh derived 84 to 88 percent of their income from agriculture (Table 21). Farm households of Eastern India received 68 to 78 percent of their income from agriculture. Farm households in SAT India received 80 percent of their income from agriculture. Between 2010 and 2012, per capita average income of farm households has increased by 20 percent in Bangladesh (from 285 to 339 dollars), 33 percent in Eastern India (from 299 to 397 dollars), and 11 percent in SAT India (from 789 to 874 dollars),

Table 21: Contribution (%) of different income sources to the income of Farm Households in and Bangladesh and India, 2010 to 2012

Sources of Income	**Bangladesh**			**East India**			**SAT India**		
	2010	**2011**	**2012**	**2010**	**2011**	**2012**	**2010**	**2011**	**2012**
Farm	**88.3**	**88.5**	**83.5**	**67.6**	**69.9**	**76.9**	**80.7**	**79.1**	**80.3**
Crop farming	44.2	19.0	42.2	53.3	62.2	72.2	54.4	46.4	52.2
Livestock farming	25.9	43.2	25.5	6.5	-0.5	-1.2	15.6	22.0	18.4
Fish farming	9.6	19.4	11.8	0.0	0.0	0.0	0.0	0.0	0.0
Farm Labor	8.7	6.9	4.0	7.8	8.2	6.0	10.8	10.8	9.7
Nonfarm	**11.7**	**11.5**	**16.5**	**32.4**	**30.1**	**23.1**	**19.3**	**21.0**	**19.7**
Business	4.2	3.3	4.2	2.4	5.2	4.5	1.4	2.2	1.7
Service	2.0	2.3	1.8	13.1	2.1	2.0	1.9	2.4	2.1
Caste Occupation	0.1	0.4	0.3	1.6	1.2	0.5	1.4	0.8	1.3
Nonfarm Labor*	3.4	3.2	3.2	7.2	12.5	7.7	4.2	3.8	3.0
Migrant workers (Remittances)	1.4	1.8	2.7	2.5	3.0	2.0	2.8	3.1	3.3
Other Nonfarm	0.6	0.5	4.4	5.5	6.1	6.4	7.7	8.8	8.4
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Per capita Income (USD)	285	360	339	299	307	397	789	906	874

Note: * For Bangladesh Nonfarm labor income also includes income from Rickshaw, van pooling, other transport, etc.

Source: Authors' calculation based on VDSA data base

Our analysis revealed that nonfarm households in Bangladesh received 80 to 86 percent of their income from nonfarm activties (Table 22). Nonfarm households in Eastern India received 85 to 90 perecent of their income from nonfarm sources while it was about 80 percent for nonfarm households in SAT India. Between 2010 and 2012, per capita average income of nonfarm households has increased by 28 percent in Bangladesh (from 380 to 485 dollars), 51 percent in Eastern India (from 281 to 425 dollars), and 8 percent in SAT India (from 751 to 812 dollars),

Table 22: Contribution (%) of different income sources to the income of Nonfarm Households in Bangladesh and India, 2010 to 2012

Sources of Income	**Bangladesh**			**East India**			**SAT India**		
	2010	**2011**	**2012**	**2010**	**2011**	**2012**	**2010**	**2011**	**2012**
Farm	**20.5**	**15.1**	**14.0**	**10.9**	**15.1**	**13.3**	**22.0**	**17.6**	**19.6**
Crop farming	13.0	6.4	5.7	9.1	14.2	13.3	9.9	5.5	9.0
Livestock farming	5.9	7.6	6.0	-0.5	-1.1	-1.6	5.2	5.5	4.7
Fish farming	0.9	0.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0
Farm Labor	0.7	0.8	2.0	2.3	1.9	1.5	6.8	6.5	6.0
Nonfarm	**79.5**	**84.9**	**86.0**	**89.1**	**84.9**	**86.7**	**78.0**	**82.4**	**80.3**
Business	19.3	16.0	14.9	10.5	9.5	11.8	8.4	10.3	7.8
Service	13.9	10.6	11.3	34.4	33.6	32.9	21.3	22.7	23.9
Caste Occupation	1.1	0.8	0.7	3.5	3.0	3.5	6.9	7.3	6.0
Nonfarm Labor*	12.2	12.6	15.4	25.2	20.7	20.9	12.9	9.5	9.0
Migrant workers (Remittances)	31.5	41.9	39.2	7.2	6.0	9.6	5.6	5.9	6.7
Other Nonfarm	1.5	3.0	4.5	8.3	12.0	8.0	22.8	26.6	26.8
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Per capita Income (USD)	380	446	485	281	419	425	751	779	812

Note: * For Bangladesh Nonfarm labor income also includes income from Rickshaw, van pooling, other transport, etc.
Source: Authors' calculation based on VDSA data base

4.5 Determinants of Income

To know the contribution of various factors to the income earned by the households we have used a panel data regression model. Through the regression analysis, we tried to determine various factors related to the household, village and rural economy which have association and influence on per capita income of the household (farm, nonfarm and total income). Table 23 presents the results of the regression analysis.

Table 23: Determinants of income of the rural households in Bangladesh and India: Estimating through a Panel Regression model

Variables	**Per-capita Farm Income**	**Per-capita Nonfarm Income**	**Per-capita Total Income**
Constant	-89.770	184.089***	96.112
Per capita land ownership (hectares)	269.041***	128.852***	404.550***
MV adoption rate (%)	1.134***	-0.843***	0.512**
Farm Equipment (USD	0.020***		
Livestock Inventory (USD)	0.113***		
Ownership of Non-land Assets (USD)		0.007***	0.010***
Age of the Household Head (Years)	-3.024***	0.708	-2.871***
Education of the Household Head (Years)	-1.742	13.161***	8.874***
Dummy for Gender of the Household Head (Male=1)	116.015***	-104.474***	47.795
Dependency Ratio	-5.650	-82.797***	-85.443***
Amount of loan obtained (USD) by the household	0.143***	0.022***	0.167***
Infrastructural Dummy (Village with developed infrastructure=1)	-14.363	94.117***	80.756***
Large Farm Dummy (Large farm size=1)	64.183**	-39.522*	70.147*
Year_2011	8.198	54.808***	66.778***
Year_2012	17.818	29.274***	40.992***
Region Dummy (Sat India =1)	150.703***	6.354	182.782***
Region Dummy (Bangladesh =1)	288.879***	37.532*	361.293***
Number of Observation	5513	5513	5513
R Square	0.380	0.206	0.391
Wald chi2	1516.890	721.430	1612.170
Prob> chi2	0.000	0.000	0.000

Note: *, ** and *** represent the coefficients are significant at 10%, 5% and 1% level of significance, respectively.
Source: Authors' calculation based on VDSA data base

Average per capita farm income of the households was positively associated with per capita land ownership, adoption rate of high yielding (modern) varieties, ownership of farm equipment and livestock resources at 1 percent level of significance. Estimated coeffiencts indicated that one additional hecatre of per capita land ownership by the household would result 269 dollars of per capita farm income. Increase in adoption of high yielding (modern) varieties by 10 percent will increase per capita farm income by 11 dollars and ownership of farm quipment by 1000 dollars will result additional per capita income of 20 dollars. Increase in ownership of livestock by 1000 dollars will increase per capita farm income by 113 dollars. Dummy for Gender of the household head (Male=1) was positive and significant at 1 percent level of significance implying that male headed households had 116 dollars higher farm income on a per capita basis than the female headed households. Amount of loan obtained by the household was positive and significant at 1 percent level of significance and the value of estimated coefficient indicated that 1000

dollars of additional loan will provide additional 143 dollars of per capita farm income to the household. Region Dummy for both SAT India and Bangladesh was positive indicating that farm households in Bangladesh and SAT India had higher level of farm income than their counterparts in East India. Estimated coefficients indicated that per capita farm income was 151 dollar higher in SAT India and 289 dollars higher in SAT India. Large Farm Dummy (Large farm size=1) was positively associated with farm income at 5 percent level of significance. Estimated coefficient of the large farm dummy showed that large farmers had 64 dollars of higher per capita farm income than other farmers. Age of the household head was negatively associated with per capita farm income at 1 percent level of significance.

Amount of per capita nonfarm income was positively associated with per capita land ownership, ownership of non-land assets, education level of the household head, amount of loan obtained by the household at 1 percent level of statistical significance. Estimated coefficients indicated that one additional hectare of per capita land ownership would increase per capita nonfarm income of the household by 129 dollars. Positive association of nonfarm income with ownership of nonland asset implies that nonfarm income increases with the increase in nonland asset ownership. One year additional education of the household head will increase per capita nonfarm income by 13 dollars. Access to loan by 1000 dollar by the household increases its per capita nonfarm income by 22 dollars. Infrastructural Dummy for the village was positive and had significant effect on per capita nonfarm income indicating that village with developed infrastructure had 94 dollar of higher income on a per capita basis. Year dummy for 2011 and for 2012 was positive and highly significant implying that per capita nonfarm income was higher in 2011 and 2012 than the base year 2010. Region dummy for Bangladesh was significant at 10 percent level of significance and estimated coefficient indicated that Bangladesh households had about 38 dollars of higher nonfarm income than others. Factors negatively associated with per capita nonfarm income earned by the household at diferent level of statistical significance were adoption rate of high yielding varieties (modern varieties) and Large Farm Dummy. It is quite natural. Households having good amount of land and cultivating high yielding varities which provide higher level of income are expected to devote their time and other resources in farming, and they will happily forego the option for earning through engaging in nonfarm activties.

Per capita total income earned by the household was positively associated with per capita land ownership, ownership of non-land assets, education level of the household head and amount of loan obtained by the household at 1 percent level of significance. Estimated coefficients indicated that one additional hectare of per capita land ownership would increase per capita income of the household by 405 dollars. On the other hnad, ownership of non-land asset by 1000 dollar will increase per capita income by 10 dollar. Per capita income will increase by about 9 dollar with one additional year of schooling of the household head. Access to loan amounting 1000 dollar will provide additional income of 167 dollars. Infrastructural Dummy for the village was positive and had significant effect on per capita income indicating that village with developed infrastructure had 81 dollar higher income on a per capita basis. Year dummy for 2011 and for 2012 was positive and highly significant implying that per capita income was higher in 2011 and 2012 than the base year 2010. Region Dummy for SAT India and Region Dummy for Bangladesh was positively associated with per capita income at 1 percent level of significance. This indicates that households in Bangladesh and SAT India had higher income than their counter part in East India. Per capita total income earned by the household was positively associated with adoption rate of high yielding varieties (modern varieties) at 5 percent level of significance indicating that higher the

adoption level higher the level of per capita income of the household. Per capita total income earned by the household was positively associated with Large Farm Dummy at 10 percent level of significance implying that large farms have more economies of scale and therefore they are able to earn 70 dollar higher on a per capita basis because of such virtuous benefit of land ownership. Age of the household head and Dependency Ratio was negatively associated with per capita income at 1 percent level of significance. This indicates that households having more number of dependant population have less income on a per capita basis.

4.6 Income Inequality

Estimated value of the Gini Coefficient was more or less same across all the three study regions and ranged between 0.42 and 0.49 (Table 24). Relatively high level of income inequality among sample households implies that all households were not equally able to take advantage from earning opportunities emerged in the study villages.

Table 24: Trends in income inequality among rural households in Bangladesh and India, 2010 to 2012

Country/Region	Gini ratio		
	2010	2011	2012
Bangladesh	0.44	0.48	0.42
East India	0.43	0.46	0.46
SAT India	0.49	0.47	0.47

Source: Authors' calculation based on VDSA data base

4.7 Why average income varied across villages in Bangladesh and India?

To know the across village differences in average income of the households, we have used a multiple regression model. Through the regression analysis we tried to determine various factors related to the village economy which have association and influence on per capita income of the village (farm, nonfarm and total income). Table 24 present the results of the regression analysis.

Average farm income of the village was positively associated with per capita land ownership, MV adoption rate (%), access to financial capital, number of milk dairies in the village. On the other hand, it was negatively associated with distance from national highways. Presence of marketing infrastructure such as milk dairies are very important for taking advantages of yechnologies developed for highly perishable commodities like milk. For promotion of high value crops and other agricultural commodities which are mainly produced for market will essentially require close linkage with the market through processing industries and marketing agencies.

Table 25: Determinants of average income of the villages in Bangladesh and India: Results of the Regression Analysis

Variables	**Per-capita Total Income of the village**	**Per-capita Nonfarm Income of the village**	**Per-capita Farm Income of the village**
Constant	188.810***	228.238***	69.761*
Per capita land ownership (hectares)	-18.062	-28.706	219.844**
MV adoption rate (%)	0.003	-1.390***	1.223**
Ownership of Non-land Assets (’000USD)	79.970***	0.242***	
Average schooling years of adult population	13.596	-6.556	
Amount of loan obtained (’000USD) per capita	218.240***	1.606**	136.760***
Number of Milk Dairies in the village	39.127***	31.442***	36.418***
Infrastructural Dummy (Village with developed infrastructure=1)	57.506**	65.910***	
Distance from national highways (km)			-1.323*
Number of Observation	126	126	126
Adjusted R Square	0.74	0.56	0.58

Note: *, ** and *** represent the coefficients are significant at 10%, 5% and 1% level of significance, respectively.
Source: Authors’ calculation based on VDSA data base

Average nonfarm income of the village was positively associated with ownership of non-land assets, access to financial capital, number of milk dairies in the village. One implication of the findings is that linkages with agro-based processing industries such as milk dairies has the potential for increase in both farm and nonfarm income. On the other hand, it was negatively associated with adoption level of modern agricultural technology implying that villages which had experienced technological revolution in agriculture were able to prosper through intensification of agriculture rather than moving towards nonfarm opportunities.

Overall income of the village was positively associated with ownership of non-land assets, access to financial capital, number of milk dairies in the village and better infrastructure in the village. This confirms the importance of new income generating assets such as power tiller, thresher, harvester, rice and wheat mills, pumpsets, brick fields, solar dryer, etc. for improving income level of the village. Importance of electricity, road connectivity, access to input and output markets, banks, processing instuties for enhancing overall income of the villagers.

5. CONCLUSIONS AND POLICY IMPLICATIONS

Household level panel data based analysis of rural livelihoods in three study regions (Bangladesh, East India and SAT India) for the 2010/11 to 2012/13 revealed some important insights. Per capita income of the rural households in all the three regions increased significantly.

Share of farm income to the total household income has increased in East India while it has decreased in Bangladesh and SAT India. Role of nonfarm sector as a source of employment and income has increased. Agriculture is still the dominant sector in East India while farm sector lost its dominance in Bangladesh and SAT India. Farm households rely on agriculture for 80 to 90 percent of their household income. On the other hand, nonfarm households received about 80 percent of their income from nonfarm sources. Average per capita farm income of the household was positively associated with per capita land ownership, adoption rate of high yielding (modern) varieties, ownership of farm equipment and livestock resources. Amount of per capita nonfarm income was positively associated with per capita land ownership, ownership of non-land assets, education leve of the household head, amount of loan obtained by the household. Per capita total income earned by the household was positively associated with per capita land ownership, ownership of non-land assets, education level of the household head and amount of loan obtained by the household. Age of the household head and Dependency Ratio was negatively associated with per capita income. Results of our study indicated that per capita income of the farm households can be increased through development and promotion of high yielding (modern) varieties, supporting accumulation of farm equipment and livestock resources by the households. Overall household income can be increased through supporting education in the villages, building better infrastructure and road network in the village, providing access to financial capital through credit market. We do hope that leaders of Bangladesh and India will be able to provide necessary policy support to the farm and nonfarm sector to enhance economic growth and increase per capita income of the rural households.

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