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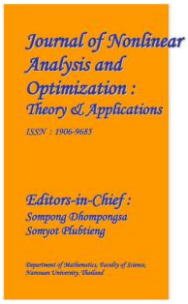

LIVELIHOOD AND OCCUPATIONAL CHOICE IN FLOOD AFFECTED AREAS: A STUDY IN LAKHIMPUR AND DHEMAJI DISTRICTS, ASSAM

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Abstract

Livelihood and climate are two closely associated issues in social science research. Natural disasters have caused significant loss of economic and human losses of the civilization since time immemorial, however in the past decades the degree of damages aggravated. In Assam, flood is the most severe threat to the life and livelihood of the people. Among the districts of Assam, Dhemaji and Lakhimpur are the two highly flood-affected districts in recent decades. Dhemaji district almost half of the villages are affected by flood annually. The rate of affected villages is slightly lower in Lakhimpur district. In the year 2015, more than two third (66.35 per cent) of the total villages are affected by flood. Among the recent years, only 2018 experience lesser number of flood-affected villages, which is still one fourth of the total number of villages. In Lakhimpur district, the number of affected villages varies from 7.07 per cent to 38.89 per cent. A huge number of populations are affected by flood annually in both the districts. The damages to the house property due to flood in Dhemaji district is more than Lakhimpur district. The flash flood in Dhemaji district causes severe damage to the huts and kutcha houses of the affected localities. In the year 2015, as high as 6118 numbers of houses were fully damaged due to flood. In Lakhimpur district, 19304 houses are fully or partially damaged by flood in the year 2017. Due to the damages of house property, the flood-affected people of the district have to incur a significant portion of their household income in repairing and reconstructing their houses.

(Key Words: Livelihood, flood, livestock, Assam)

1.1 Introduction:

Climate change is one of the most serious concerns in the livelihood of the people, especially the poor. Natural disasters have caused significant loss of economic and human losses of the civilization since time immemorial, however in the past decades the degree of damages aggravated. Globally the damage during 1992 and 2002 decade is seven times higher than the losses during 1960s (Van den berg, 2010). Poor people and economies are severely affected during natural disasters than the richer people and economies. Even at a local level poor people are often less able to cope than the richer people in the same area (Masozera, Bailey, & Kerchner, 2007). Through destruction of asset base of households, they are forced to adopt a defensive strategy with one or two income generating activities. On the contrary, amidst environmental risk a household may diversify to reduce income risk. Studies find that in coming days the developing countries will face severe affects of climate change (Parvin, Shimi, Shaw, & Biswas, 2016). With passing years, this will affect the livelihood of the people severely.

In Assam, flood is the most severe threat to the life and livelihood of the people. Among the districts of Assam, Dhemaji and Lakhimpur are the two highly flood-affected districts in recent decades. Located in the foothills of Arunachal Pradesh, the people of these two districts have to face regular occurrences of flood during the summer. The regular occurrences of flood in the study area result in severe damage to the crops, human settlements, livestock sector and physical infrastructure of the area. All these damages affect the livelihood of the people significantly. In recent years the damages due to flood are aggravated in both the districts. As a result, a significant and persistent shift

in livelihood option is observed during the study. Despite huge geographical and economic effects of flood in the study area no scientific assessments of flood is yet to be done in the districts. With this backdrop, in this paper, the researcher aims at finding out the economic losses due to flood in both the districts. Occurrence of flood not onlyreduces the income of the agriculture dependent people but it also force them incur a significant portion of households' income in mitigating the loss or in compensating the losses.

1.2 Data and Methodology:

The study area is comprised of two eastern most districts of Assam viz. Lakhimpur and Dhemaji located on the north bank of mighty river Brahmaputra. Both the districts are located in the North Bank Plain Zone (NBPZ) of the six agro-climatic zones of Assam. One of the unique characteristics of the NBPZ is that the principal crop of the zone is paddy grown during the rainy summer season of the year (Mandal, 2014). Both Lakhimpur and Dhemaji districts are located near the foothills of Arunachal Pradesh with the altitude of 102 metre and 89.75 metre from mean sea level respectively. As the study area is located near the foothills of Arunachal Pradesh, it exhibits variability in temperature, rainfall, wind etc. Flood, siltation, land erosion and flood-induced sand deposition are the major geo- climatic situations, which have been affecting not only the geography of the region but also the livelihood of the rural poor people of the study area largely.

There are nine and five development blocks in Lakhimpur and Dhemaji districts respectively. Nine development blocks are selected from the two districts purposively based on occurrence, frequency and damages of flood in recent times. All five development blocks of Dhemaji district viz. Bordoloni, Dhemaji, Machkhowa, Murkongselek and Sissiborgaon and four development blocks of Lakhimpur district viz. Bihpuria, Nowboicha, Ghilamara and Dhakuakhana are selected for the study. From each development block, three flood-affected villages and one flood-free village are selected randomly. From each village proportionate number of households is taken randomly for the study. For comparative analysis of flood-affected and flood-free areas, one flood free village from each development block is selected randomly. The sample size for the study is 394, the number of households selected from flood affected area is 295 and flood-free area is 99. Secondary information is collected from District Disaster Management Authority of both districts.

1.3 Findings and Analysis:

The paper deals with the flood damages in the study during the period of the study. A sizeable area of the study area is affected by flood in last few years. Table 1.1 shows the number of villages affected by the flood in last few years.

Table 1.1: Number of Villages Affected

Year	Dhemaji		Lakhimpur	
	Number	Percentage	Number	Percentage
2014	644	56	153	12.88
2015	763	66.35	309	26.01
2016	462	40.17	227	19.11
2017	478	41.57	462	38.89
2018	303	26.35	84	7.07
2019	495	43.04	230	19.36

Source: i) DDMA, Dhemaji
ii) DDMA, Lakhimpur

Table 1.1 shows that in Dhemaji district almost half of the villages are affected by flood annually. The rate of affected villages is slightly lower in Lakhimpur district. In the year 2015, more than two third (66.35 per cent) of the total villages are affected by flood. Among the recent years, only

2018 experience lesser number of flood-affected villages, which is still one fourth of the total number of villages. In Lakhimpur district, the number of affected villages varies from 7.07 per cent to 38.89 per cent. A huge number of populations are affected by flood annually in both the districts. Table 1.2 and figure 1.1 show the number of people affected by flood in recent years.

Table 1.2: Total Population Affected

Year	Dhemaji	Lakhimpur
2014	3,20,893	1,12,506
2015	3,41,492	1,59,513
2016	1,85,550	1,24,445
2017	2,08,571	3,34,041
2018	1,09,168	65,510
2019	1,60,545	1,15,251

Source: i) DDMA, Dhemaji
ii) DDMA, Lakhimpur

In terms of population affected, Dhemaji district is more severely affected by flood. As many as 341492 people are affected directly by flood in the year 2015. In these six years considered in the study at least, 100000 people are affected by flood in Dhemaji district.

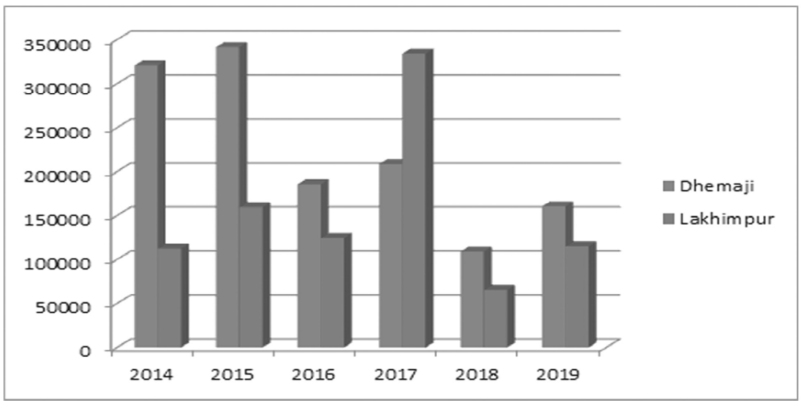


Figure 1.1: Total Population Affected

In Lakhimpur district, barring the year 2017, the number of population affected is less than the population affected in Dhemaji district. In the year 2017, the total population affected in Lakhimpur is 334041. Except for the year 2018, more than one lakh people are affected by flood annually in Lakhimpur district too. In addition to this huge number of directly affected people, many people are indirectly affected by flood. As the road connectivity during flood becomes in operational, the people are unable to reach the market or have to incur substantially more expenses to reach the market.

The agriculture sector of the study area is the worst affected sector during flood. Flood destroys paddy cultivation in the study area. It damages standing crops, destabilizes the sowing seasons, wipes away the capital etc. Moreover, sand deposition on the cultivable land makes the sand not suitable for cultivation. Table 1.3 shows total crop area affected by flood in recent years.

Table 1.3: Total Crop Area Affected in hectare

Year	Dhemaji	Lakhimpur
2014	65818	3200.25
2015	87459	21146.84

2016	23543	13766
2017	16275	24511.04
2018	12600	1632.59
2019	11949	5800.63

Source: i) DDMA, Dhemaji
ii) DDMA, Lakhimpur

From table 1.3 it is clear that significant portion cultivable land in both the district is affected by annual flood. In the year 2014, the crop area affected by flood is 65818 hectares, which rose to 87459 hectares in 2015. However, it falls to 23543 hectares in 2016, 16275 hectares in 2017, 12600 hectares in 2018 and 11949 hectares in 2019. In Lakhimpur district, the maximum amount of crop area affected is 24511.04 hectares in 2017; this fluctuates to as low as 1632.59 hectares in 2018.

The livestock sector of the rural area is badly affected by recurring floods. During floods, the livestock suffers due to lack of raised platform to stay, lack of food and lack of proper medication etc. Losses of livestock during flood have direct impact on the income of the households. It reduces income of the households substantially. In fear of flood, the households in the riverbank areas are reluctant to adopt livestock rearing as livelihood option and are deprived of a good opportunity to earn. Table 1.4 represents the number of livestock affected by flood in recent years.

Table 1.4: Number of Livestock Affected

Year	Dhemaji			Lakhimpur		
	Large[1]	Small[2]	Poultry	Large	Small	Poultry
2014	31845	21230	16714	9854	5365	4802
2015	23392	13429	13062	22864	8665	16150
2016	6530	5834	7169	15340	9240	8714
2017	41207	13613	24222	115285	63939	57130
2018	30686	15293	35962	11245	8579	14517
2019	37252	14212	16168	14782	11754	20146

Source: i) DDMA, Dhemaji
ii) DDMA, Lakhimpur

Table 1.4 shows that the livestock sector of the study area is prone to adversities of flood. The flash flood in many cases washed out the livestock. Even after the flood, the livestock suffers from various illnesses in the study area. Due to huge loss of livestock, the people of the study area suffer huge blow in their income portfolio.

There are few instances where human lives are lost due to flood. In Dhemaji district, as much as 10 individuals lost their life due to flood in the year 2017. The losses of human lives due to flood in Dhemaji district are five in 2014, two in 2015, seven in 2016, ten in 2017, three in 2018 and seven in 2019. Similarly the losses of human lives due to flood in Lakhimpur district are one in 2014, three in 2015, six in 2016, fourteen in 2017, none in 2018 and none in 2019.

1.4 Occurrences of Flood in the Study Area:

The study area is highly prone to flood. All the 295 households experienced at least one year of flood

[1] Large animal includes cows, buffaloes and horses etc.
[2] Small animal includes goats and pigs etc.

in last five years prior to survey. One hundred and seventy (57.63 per cent) households experienced flood in each year of the last five years prior to survey. Table 1.5 shows the number of households as per affected years in the reference period.

Table 1.5: Years Affected by Flood in Reference Period

Year(s) Affected	Dhemaji	Lakhimpur	Total
1	31 (19.02)	22 (16.67)	53 (17.97)
2	0 (0)	21 (15.91)	21 (7.12)
3	10 (6.13)	15 (11.36)	25 (8.47)
4	10 (6.13)	16 (12.12)	26 (8.81)
5	112 (68.71)	58 (43.94)	170
Total	163 (100)	132 (100)	295

(Source: Field Survey)

* Figures within brackets are percentage of total

It is observed from the table **1**.5 that almost three fourth of total respondents in the flood affected areas are having experience of flood at least in three years out of last five years prior to the survey In Dhemaji district, 68.71 per cent of total flood affected people are experiencing flood in each year while in Lakhimpur district the rate is 57.63 per cent. In the affected years, the frequency of flood varies. There are as high as six waves of flood experienced by the households in each year. More the number of waves of flood larger are the damages and severe is the affect on livelihood of the people. Table 1.6 shows the households as per number of flood waves experienced in a year.

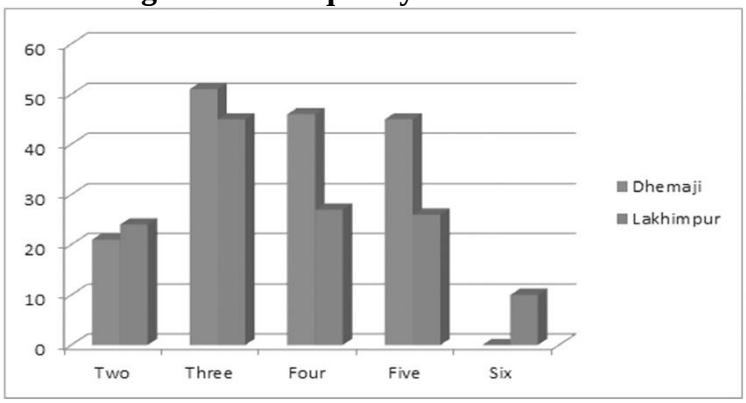
Table 1.6: Number of Flood Waves in a Year

Frequency of Flood Waves	Dhemaji	Lakhimpur	Total
2	21	24	45
3	51	45	96
4	46	27	73
5	45	26	71
6	0	10	10

(Source: Field Survey)

It is clear from table 1.6 that four to five major waves of flood are common in both the districts. In addition to these major waves, few minor waves of flood also occur in the study area. The frequency of flood waves in the study area is shown in figure 1.2

Figure 1.2: Frequency of Flood Waves



The first wave of flood that occurs due to breach of embankment causes more damages than the subsequent waves. During subsequent waves, the rural people can minimize the damages as they adopt some strategies. It is observed during the survey that if there are only two waves of flood, paddy cultivation can still be done at the end of the sowing season. However, if number of wave increases then it is impossible for them to complete their sowing.

1.5 Damages to House Property: The major damage due to flood in the rural area is damage to house property. Flash flood damages kutcha and semi pucca houses substantially. Moreover, sand deposition and siltation are two major problems faced by the households after the flood. Table 1.7 shows the damages to houses during flood in the study area.

Table 1.7: Number of House Damaged by Flood

Year	Dhemaji			Lakhimpur		
	Partially	Fully	Total	Partially	Fully	Total
2014	17802	826	18628	N. A.[3]		
2015	20228	6118	26346	237	18	255
2016	5077	108	5185	290	61	351
2017	12741	130	12871	18852	452	19304
2018	25	11	36	N. A.		
2019	297	07	304	12	4	16

Source: i) DDMA, Dhemaji
ii) DDMA, Lakhimpur

Table 1.7 represents damages to house property in Lakhimpur and Dhemaji district. The damages to the house property due to flood in Dhemaji district is more than Lakhimpur district. The flash flood in Dhemaji district causes severe damage to the huts and kutcha houses of the affected localities. In the year 2015, as high as 6118 numbers of houses were fully damaged due to flood. In Lakhimpur district, 19304 houses are fully or partially damaged by flood in the year 2017. Due to the damages of house property, the flood-affected people of the district have to incur a significant portion of their household income in repairing and reconstructing their houses. Another issue the flood-affected people are facing is they have to shift their houses due to flood in recent years. Among the respondent households in the flood-affected areas, 52 households (13.20 per cent) had to repair or reconstruct their houses three years prior to the survey. The average cost of repairing a damaged house incurred by the household is INR 15650 that is more than 10 per cent of average annual household income of the respondents. This expenditure puts a huge burden on the livelihood of the poor people in the study area. The cost of reconstruction of the houses is even more than repairing. A total 32 households have to reconstruct their houses, which were damaged during flood in last three years prior to the survey. The average cost of reconstruction of a house incurred by the affected household is INR 79805, which is 47.90 per cent of average annual household income of the respondents. The cost of reconstruction and repairing does not include the cost of household labour. This huge cost in terms of money and time adversely affect the livelihood of the flood-affected people. Moreover, most of the respondent households experienced some minor damages to their houses. Huge amount of silt and sand deposited during flood have to be removed from their houses after each flash of flood. This also takes away man days from their usual works.

1.6 Loss of Workdays:

Coping with flood or fighting with flood takes time and effort of the people. Due to recurrent flood in

[3] Data not available.

the study area households lost workdays during flood and after flood while compensating the flood damages. The AHDR, 2014 finds that average workdays lost annually due to flood in Dhemaji and Lakhimpur district is 51 days. Table 1.8 shows the average workdays lost due to flood in the study area in last three years.

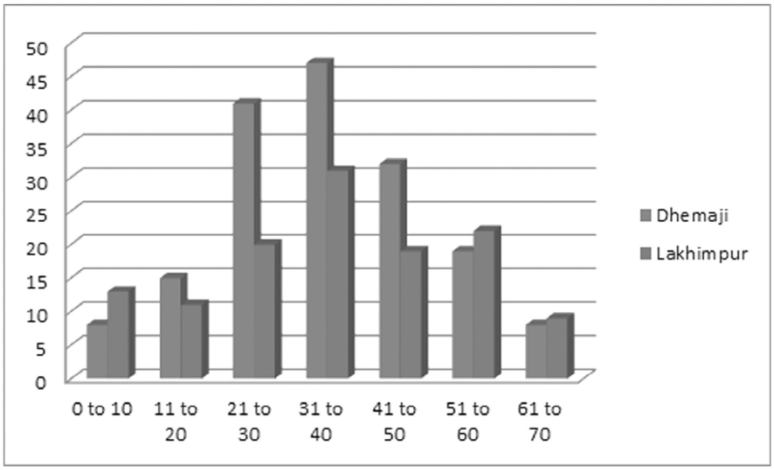
Table 1.8: (Workdays Lost due to Flood)

Days Lost	Dhemaji	Lakhimpur	Total
0-10	8	13	21
11-20	15	11	26
21-30	41	20	61
31-40	47	31	78
41-50	32	19	51
51-60	19	22	41
61-70	8	9	17
Total	163	132	295

(Source: Field Survey)

The average workdays lost due to flood in Dhemaji and Lakhimpur district is 38.47 days and 39.81 days respectively. In Dhemaji district, 47 households lost average workdays lost in the range 31-40 days. Eight households in the district lost workdays in the range of 61-70 days. In Lakhimpur district, 31 households lost average workdays between 31-40 days. The workdays lost due to flood is represented in the figure 1.3

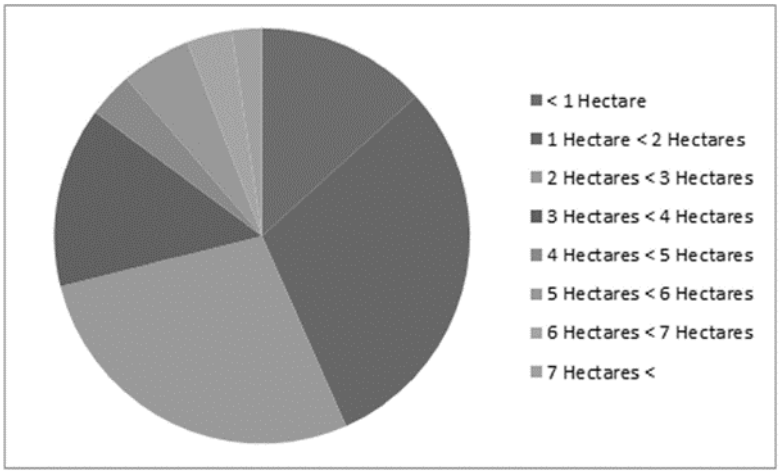
Figure 1.3: (Workdays Lost due to Flood)



It is found that the average workdays lost in Lakhimpur district is more than the average workdays lost in Dhemaji district. It is because the nature of flood in Dhemaji is flash flood where flood comes in a flash and subdues quickly.

1.7 Land Affected by flood: A significant portion of households' landholding is affected by flood in the study area. Among the surveyed households in the flood-affected areas, 78.32 per cent of total land holding is affected by flood. Out of total 805.4 hectares of total landholdings of the surveyed households, 630.80 hectares are affected by flood in five years prior to the survey. The land under possession of 101 households (39.45 per cent) is fully affected by flood in years under consideration. Figure 1.4 shows the total land affected by flood in the reference period.

Figure 1.4: (Number of Households as per Flood-Affected Land Area)



The data show that, for 30.08 per cent of flood-affected households, the area affected by flood is more than one hectare and less than two hectares. On the other hand, for 27.73 per cent of flood-affected households, the area affected by flood is more than two hectares and less than three hectares. For 14.84 per cent of flood-affected households, the area affected by flood is more than four hectares. The study also finds that the land affected by flood is mostly the agricultural land; more precisely the land available for paddy cultivation. The paddy-growing villagers are most severely affected by annual flood in the study area. Because of that, they are forced to shift their cropping pattern for which no institutional and technical support is available among the public.

In the study area, a sizeable portion of land is degraded by flood permanently or for a longer period. Soil erosion results in loss of land in the study area. Moreover sand deposition in the agricultural land in the study area, cause permanent or very long-term damage to the cropping field. The farmers often complained that the plot of land where sand is deposited is not suitable for any kind of cultivation for approximately a decade. They have also opined that if those plots of land are not used for couple of years, it becomes very difficult to convert to land into cultivable land. So, they sometimes cultivate on those land without any expectation of production. Sand deposition causes damages to the land, which is almost irreversible. Land degraded due to flood-induced sand deposition is directly affecting the livelihood of the people (Das, 2012). The study done by Das (2012), finds that in Dhemaji district, the average damage due to flood-induced sand deposition ranges from INR 690 to INR 1845 per hectare annually. Due to this significant loss in production and productivity, the paddy-growing farmers are forced to adapt some alternative livelihood strategy.

Land degraded due to flood in the study area is mainly caused by soil erosion and sand deposition. Though the land affected by sand deposition may be reversible in a decade, for the present study it is assumed permanently degraded. As land on which sand deposited is remain unproductive for quite long term, hence it has negative impact on the livelihood of the people. The land degraded due to flood in the study area ranges between 0.13 hectare and 6.07 hectares. The average land area degraded by flood in the period of study is 1.31 hectares.

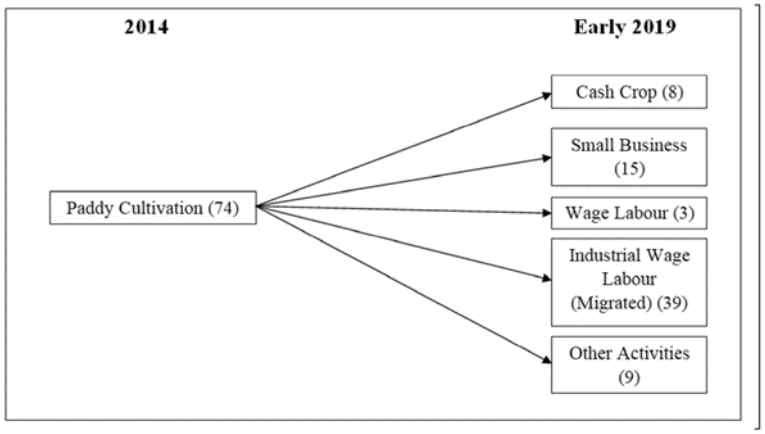
1.8 Change in Primary Occupation:

Flood poses a serious threat to the occupational pattern of the affected areas (Parvin, Shimi, Shaw, & Biswas, 2016). The agriculture and livestock sector face the severe impacts of flood. Damage to standing crops, losses of livestock, deterioration of quality of land etc. result in lower income from agriculture and livestock sector. Moreover, regular flood causes unemployment problem in these sectors. In the absence of institutional support to cope with the damages and absence of adequate compensation from the government side, force the households to adopt alternative or supplementary livelihood strategies. The study done by Parvin et al (2016) finds that during 2004 flood, 33.3 per cent lost their primary livelihood activities, and 46.5 per cent were forced to change their main source of

earning. In the study area, too people changes their primary source of livelihood from agriculture and allied sector to some other alternate sector. The study finds that, in the flood-affected areas, 111 households have shifted their primary occupation from paddy cultivation and livestock rearing to other activities in last few years. On the contrary, the shift in primary occupation in flood-free areas is not significant and those who have shifted their primary source of income due to some favorable situation emerged with time.

As flood creates substantial damages in the paddy cultivation, 74 households are forced to shift their primary occupation from paddy cultivation to other activities in the last five years prior to the survey[4]. They shifted their main economic activities into cash cropping, small businesses, industrial wage labour (mostly migrated) etc. The shift in primary occupation from paddy cultivation to other activities due to flood is depicted in figure 1.5.

Figure 1.5: (Shift in the Primary Occupation from Paddy Cultivation)



From figure 1.5, it is clear that during the period 2014 and early 2019, out of the 74 households who had shifted their main occupation 39 households were shifted to industrial wage labour as primary occupation. Similarly, 15 households shifted their main occupation into small businesses, eight households shifted their main occupation into cash cropping, three households shifted their main occupation into wage labour and nine households shifted their main occupation into other activities.

On the contrary, there are few instances where households shifted their main occupation into paddy cultivation. Twenty-three households, in the study area shifted their main occupation into paddy cultivation during 2014 and early 2019.Among these 23 households, 10 households shifted from cash cropping, 5 households shifted from industrial wage labour and 8 households shifted from wage labour. This shift into paddy cultivation as main occupation is also caused by flood. Flood in two ways caused this shift in favor of paddy cultivation. Firstly, due to flood the main occupation of the households was affected badly. The income flow from that activity was hampered during flood and the sustainability of the activities became uncertain. Hence, the households shifted into paddy cultivation, as paddy cultivation requires less institutional and financial support to sustain. Secondly, due to flood some plots of land that were not suitable for paddy cultivation became suitable due to siltation during flood. The silt carried with by the river is fertile and increases the productivity of soil.

Flood also creates substantial damages to the livestock sector of the study area. During and after the flood, the households find it difficult to manage fodder for their livestock. Moreover, during and after flood, the livestock growers experience various known and unknown diseases. In most of the cases, these diseases become fatal due to the absence of veterinary services. Due to this uncertainty, people in the flood-affected areas shifted their main occupation from livestock sector to other sector. During the period 2014 and early 2019, thirty-seven households are forced to shift their primary occupation from livestock rearing to other activities. The shift in primary occupation from livestock rearing to other activities due to flood is depicted in figure 1.6.

[4] Survey done during September 2019

Figure 1.6: (Shift in the Primary Occupation from Livestock Rearing)

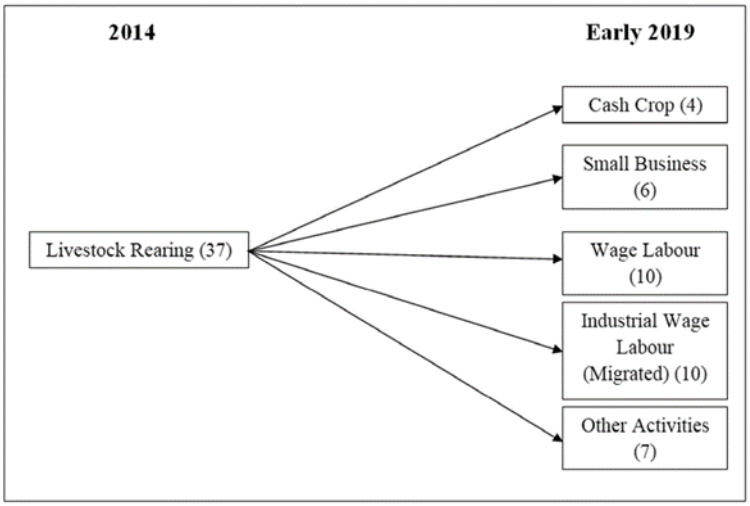


Figure 1.6 shows that during the period 2014 and early 2019, out of the 37 households who had shifted their main occupation 20 households were shifted into wage labour. Out of these 20 households, 10 were shifted into industrial wage labour. Similarly, six households shifted their main occupation into small businesses, four households shifted their main occupation into cash cropping and seven households shifted their main occupation into other activities. Few households had shifted their main occupation into livestock rearing during the reference period. However, that shift is not significant.

1.9 Conclusion:

This paper attempts to analyse the impacts of flood on livelihood decision of the households. A district level and household level analysis on damages due to flood is done in this paper. Flood is one of the major environmental issues in the study area. Without proper management from the government's end, the people of the study area have to live with flood. Accordingly, their livelihood will also be dependent on occurrence and intensity of flood in the years to come. This paper tries to find out some of the impact of flood on the livelihood of the people in last few years. In depth, study in this context will provide more inputs into the inter-relationship between flood and livelihood.

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