SUSTAINABLE LIVELIHOOD THROUGH AGRICULTURE:

A CASE STUDY OF MOKOKCHUNG AND ZUNHEBOTO DISTRICTS OF NAGALAND

Thesis

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By

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Declaration

I, Ms.Bolivi S Kiba ,bearing ph.D. registration No.649/2015, is hereby declare that the subject matter of the thesis "**Sustainable Livelihood through Agriculture: A case study of Mokokchung and Zunheboto districts of Nagaland**" is the record of work done by me, and that the contents of this thesis does not form basis of the award of any previous degree to me, or to the best of my knowledge to anybody else, and that the thesis has not been submitted by me for any degree in any university /Institute.

This is being submitted to Nagaland University in partial fulfilment for Degree of Doctor of Philosophy in Economics.

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ABBREVIATIONS

RAP	Restricted Area Permit
LPG	Liquefied Petroleum Gas
NTFP	Non-Timber Forest Product
KVK	Krishi Vigyan Kendra
ATMA	Agricultural Management Agency
SHG	Self Help Groups
VC	Village Councils
VDB	Village Development Board
APL	Average poverty line
BPL	Below poverty Line
AAY	Antyodaya Anna Yojana.
HH	Households
GDP	Gross Domestic Product
NAAS	National Academy of Agricultural Sciences
NAIP	National Agricultural Innovation Project
GOI-UNDP	Government of India-United Nation Development Programme
APMCs	Agricultural Produce Market Committee
NGO	Non Governmental Organisation
MT	Million Tonnes
KG	Kilograms
MW	Megawatt
DFID	Department for International Development
USAID	United States Agency for International Development
ZBTO	Zunheboto
MKG	Mokokchung
SMS	Short Message Service
IWMP	Integrated Watershed Management Programme
MART	Management of Agricultural Research and Technology
LVI	Livelihood Vulnerability Index
IPCC	Intergovernmental Panel of Climate Change
GSVA	Gross State Value Added

CONTENTS

CHAPTER-1
INTRODUCTION

1.1. DEFINITIONS AND CONCEPTS OF LIVELIHOOD

The concept of sustainable livelihood originates in the late 1980s as a substitute to the technocratic concept of 'employment' to better describe how people struggle to make a living (Scoones, 2009)[1]. The livelihood studies were at the centre stage of development in the late 1990s and the beginning of the new millennium around the world especially with the UN declaration of Millennium Development Goals. A livelihood is sustainable when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets and provide sustainable livelihood opportunities for next generation and which contributes net benefits to other livelihoods at local and global levels in the short and long term. It is difficult to comprehend the importance of different livelihoods to different people. It is also important to understand how different people adapt different strategies to exploit diversity and opportunities and cope with risk, uncertainty in their day to day activities (Chambers and Conway, 1992)[2]. It includes complex, contextual, diverse and dynamic strategies developed by farmers to meet their needs (Gaillard et al., 2009)[3].

The concept of sustainable livelihood through agriculture seeks to link livelihood and agriculture by addressing the problems and widens the scope of rural sustainable activity. The continued importance of agriculture in rural areas suggests that there is a need to develop agriculture in terms of farmers' ability to adopt, which will eventually lead towards sustainability by increasing production and income without depleting natural resources. Sustainability of agriculture is important since it provides the basis of improved livelihood for poor people living in rural areas. Sustainable agriculture is the practice of farming producing not only for today alone but also thinking, maintaining and keeping something for the future generation (Woodhouse et al,

[1] Scoones, Ian (2009).Livelihoods perspectives and rural development: The Journal of Peasant Studies, 36:1, 171-196

[2] Chambers, R. and Conway, G.R. (1991). Sustainable Rural Livelihoods: Practical Concepts for the 21st Century: Institute of development studies, IDS Discussion Paper 296.

[3] Gaillard, J. C.,. Maceda, E.A., Stasiak, E., Berre, L..I., and Espaldon, M.V.O.(2009).Sustainable livelihoods and people's vulnerability in the face of coastal hazards: Journal of Coastal Conservation 13 (2), PP.119-129.

2000)[4]. Agricultural sustainability then demands that farmers continue to make a good living and that the population as a whole be supplied with an abundance of high quality food at reasonable cost (Vanloon et al., 2005)[5]. The sustainability of agriculture means making efficient use of natural resources, sustain the economic viability of farm operations and enhance the quality of farmers and society as a whole. In the context of rural household, without sustainable system, it is alluring for farmers to focus on short-term subsistence needs meanwhile longer term view of their needs is ignored and consequently the system become unsustainable. Hence, sustainable livelihood is attainable only if the current agricultural practices focus on longer term. These strategies are entrenched in the structure of the organization and governed by institutions wherein land is placed in property systems and wages and prices are ruled by supply and demand conditions in markets and government regulations, credit in government policies.

1.2. SUSTAINABLE LIVELIHOOD AND AGRICULTURE

The predominance of the people in rural areas that are engaged in agriculture for their livelihood is evident. Sustainability of agriculture cannot be understood without knowing the socio economic state of the farmer's households, accessibility of capital assets, and livelihood sustainability of the farmers by reducing associated risks and vulnerabilities to enhance income generation and to have positive effect of institutional support system on the farmer's livelihood. "Livelihood is defined as adequate stock and flow of food and cash with an individual or a family to meet its basic needs. Livelihood security then means secured ownership of, or access to resources and income-earning activities, including reserves and assets to offset risks, ease shocks and meet contingencies" (Acharya, 2006)[6]. Sustainable agriculture indicates the achievement of farmers livelihood having adequate food, clothes and shelter and also by having livelihood security with secured ownership, access of land and resource to tackle the risk and vulnerabilities and meet their livelihood sustainability goals. For those reasons improvement in the existing socio economic conditions, capital assets, production and productivity associated with livelihood

[4] Woodhouse, P., Hewlett D., and Rigby, D.(2000).Agriculture and Rural Livelihood:Department for InternationaDevelopment, working paper no-2, pp.1-39.

[5] Vanloon et al.,(2005) .Agricultural Sustainability: Strategies for Assessment: ed, Tejeshwar Singh for Sage publication India pvt. Ltd, Chennai enterprises, New Delhi.

[6] Acharya, S.S. (2006).Sustainable Agriculture and Rural Livelihoods: Agricultural Economics Research Review, Vol. 19 July-December 2006 pp 205-217.

sustainability of the farmers and secure institutional support system will lead to sustainable livelihood of farmers through agriculture.

1.3. DIVERSIFYING LIVELIHOOD ACTIVITIES AND AGRICULTURE

Agriculture is the paramount source of livelihood for the farmers and a larger proportion of the rural households depend on agriculture for livelihood stability. The rain fed agriculture alone does not provide them sufficient income even for meeting the basic needs for subsistence. So, diversification is driven by push factors to cope with the livelihood challenges (Khatun and Roy 2016)[7]. Inadequate or excess rainfall conditions lately have increased uncertainty and risks, which had made the livelihood of the rural household too challenging and unsustainable. Accordingly, farmers who adjust on diverse livelihood activities consider on different economic activities and hence results in improved living conditions by adding to their income. Thus, livelihood diversification is an important strategy to help the rural people come out of poverty by constructing a diverse portfolio of activities and social support capabilities in their effort for improving their living conditions (Elli, 1998)[8]. Livelihood diversification can be significant sources of improvement in livelihood capabilities of the farmers, elevating their standard of living condition and sustainability.

To bring about rapid growth of incomes for farmers residing in rural areas and the economy as a whole, countries must go through agricultural transformation (Kimenju and Tschirley, 2008)[9]. Agricultural transformation is the need of the hour for the farming community, which can be in the form of diversifying into other agricultural related activities like poultry, piggery, handicraft, horticulture, plantations etc., until and unless the farmers seeks for alternate additional income for livelihood sustainability, the farmers cannot meet their ends. It is now an exception that "Diversification makes smooth flow of income to the household by reducing both predictable and unpredictable fluctuations in households' income. Predictable seasonal fluctuations in income can be enhanced by combining enterprises and activities that generate

[7] Khatun, B. and Roy, B.C. (2012).Rural Livelihood Diversification in West Bengal: Determinants and Constraints: Agricultural Economics Research Review, Vol. 25(No.1) January-June 2012, pp 115-124.

[8] Ellis, F. (1998).Survey article: Household strategies and rural livelihood diversification: The Journal of Development Studies. Vol.35, No.1, pp.1–38.

[9] Kimenju, S.C., and Tschirley, D.(2008), "Agriculture and Livelihood diversification in Kenyan rural households",Tegemeo institute of agricultural policy and development WPS 29/2008,Egerton@tegemeo.org.

returns during different times of the year. Unpredictable fluctuations are those, which create an unexpected loss in income, may be reduced by a diversified portfolio of economic activities" (Saha and Bahal, 2014)[10].

Lately, sustainable livelihoods have been growingly recognized as a key element of sustainable development during the past decade. But in India, land-based livelihoods of small and marginal farmers are increasingly becoming unsustainable, considering their land is no longer able to meet the requirements of food for the families and of fodder for their cattles (Hiremath, 2007)[11]. For that reason, diversification of livelihood can transform farmer's living standard only if efficient use of resources without depleting natural resources is followed. The policies to combat rampant destructions of natural resources should be strictly implemented if diversification of sustainable livelihood is to be made a reality.

1.4 LIVELIHOOD VULNERABILITY OF THE FARMERS

Vulnerability is one of the factors that determine whether people have risks to their livelihoods or not. According to IPCC (2007), the vulnerability assessment indicates the ability of the community to respond to hazards or variability in natural conditions and or secure their livelihood[12]. For farming community, any climatic change has direct impact on crop production and thus livelihood based on agriculture becomes vulnerable (Suryanto and Rahman, 1996)[13]. It changes time and seasons of planting and growing period, cropping patterns; also increases soil erosion, land-slides, land degradation, and destruction of crops. It reduces productivity, planted

[10] Saha,B. and Bahal,R.(2014), "Livelihood Diversification Pattern among the Farmers of West Bengal", RESEARCH PAPER, 59(3): 2014: DOI 10.5958/0976-4666.2014.00001.1

[11] Hiremath,B.N. (2007).The changing faces of rural livelihood in India, National Civil Society conference on what it takes to eradicate poverty: held at Institute of Rural Management, Anand, 4-6 December.

[12] IPCC,(2007), in M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. Van der Linden & C.E. Hanson (eds.), Climate change 2007: Impacts, adaptation and vulnerability, contribution of working group II to the fourth assessment report of the intergovernmental panel on climate change (IPCC), pp. 73–133, Cambridge University Press, Cambridge.

[13] Suryanto, S. and Rahman, A. (1996), Application of livelihood vulnerability index to assess risks for farmers in the Sukoharjo Regency and Klaten Regency, Indonesia, Jàmbá: Journal of Disaster Risk Studies 11(1), 739. https://doi.org/10.4102/ jamba.v11i1.739 .

and harvested acreage, biodiversity loss, especially affects crops those are relatively sensitive to water availability and temperature changes (Runtunuwu & Syahbuddin, 2007)[14].

Marshall et al., (2009)[15] described vulnerability as an outcome of three different elements: sensitivity, exposure and adaptive capacity. Many factors contribute to social and economic vulnerability including rapid population growth, poverty and hunger, poor health, low levels of educations, gender inequality, social exclusion, fragile, marginal and/or hazardous location, resource degradation, and lack of access to infrastructure, resources and services, including knowledge and technological means (Devi et al., 2016)[16]. The rural populations being primarily depended on agricultural activities for their survival; they have been facing various adverse impacts threatening their livelihoods (Martin and Lorenzen, 2016)[17].

1.5 .CHANGE IN CROPPING PATTERN

Cropping pattern is defined as the yearly sequence, temporal and spatial arrangement of crops in a given land area. It reflects the geo climatic, socio cultural, economic, historical and political conditions of a region (Agrawal and Kassam, 1976)[18]. The Cropping pattern depend on the availability and access to capital assets i.e., natural, human, physical, financial and social assets, the techniques of production and the institutional support system. The change in cropping pattern indicates changes in the composition of crops as well as their relative contribution to the total output growths due to proportionate change in areas (Khatun et al., 2017)[19].

The income from traditional crop cultivation has declined despite increase in the prices of agricultural commodities. At the same time, the costs and risks in agricultural production have increased, leading to farmers' livelihood vulnerability. Under this situation, the only way for the rural households to survive and sustain is to either adopt additional sources of livelihoods or

[14] Runtunuwu, E. & Syahbuddin,H. (2007), 'The alteration of precipitation and its impact on planting period' , Journal of Land and Climate 26(1), 1-12.

[15] N.A. Marshall, P.A. Marshall, J. Tamelander, D. Obuura, D. Malleret-King, J.E. Cinner(2009), "A Framework for Social Adaptation to Climate change. Sustaining Tropical Coastal Communities and Industriesl",, IUCN Climate Change and Coral Reefs Working Group. (International Union for Conservation of Nature IUCN), Switzerland, 2009

[16] Letha Devi G, Dhirendra Varma, Mukund A Kataktalware, (2016), "The Livelihood Vulnerability Analysis: A Pragmatic Approach to Assessing Risks from Climate Variability and Change—a Case Study Of Livestock Farming In Karnataka,India".3*IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS) e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 9, Issue 2 Ver. II (Feb. 2016), PP 15-www.iosrjournals.org.*

[17] Martin, S.M., Lorenzen, K (2016), "Livelihood diversification in rural Laos", World Development, 83, 231-243.

[18] Agrawal,D.J., and Kassam,A.H.(1976).The importance of multiple cropping in increasing world food supplies: A special publication No. 27, American Society of Agronomy, Madison, Wisconsin. pp. 2-3

[19] Khatun,A., Parvin, N., Dewan,M.M. R., and Saha.A.(2017). Cropping Patterns in Mymensingh Region: Diversity, Constraint and Potential. Bangladesh Rice J. 21 (2) : 217-235.

change cropping pattern. (Khatun and Roy 2012)[20]. Consequently, changing the existing cropping pattern is of great importance as it signifies the farmer's survival, capabilities and livelihood sustainability.

The recent changes in economic conditions particularly the changes derived from agrarian reforms, are expected to motivate farmers to introduce more market-oriented farming. Furthermore, interest in growing commercial crops like vegetables and fruit trees, fish and shrimp is expected to grow (Tanaka 1995)[21]. The farmers are keen on changing the traditional cropping pattern, dominated by rice production to cash and vegetable crops, with the view to sustaining their livelihood in the era of rapid rise in expenditure and prices simultaneously.

In order to build up farmers' livelihood sustainability, the agriculture production needs to enhanced and be market oriented. This would be possible through enhanced cropping intensity, change in cropping pattern, improvement in seeds of high yielding varieties, better cultivation practices and post-harvest technology etc. Further, the institutional support system in agriculture is also expected to strengthen and build a strong demand and supply networking for establishing good market systems across the states. The State governments are trying to re-orient agriculture in this direction through various policy measures (Kumar and Singh 2020)[22]. The farmers in order to make ends meet, they are seeking to make additional income by changing the cropping pattern to cash and vegetable crops as it has higher market value which is expected to improve their livelihood.

1.6 OVERVIEW OF AGRICULTURE IN INDIA

1.6.1 Agriculture in India

Agricultural system in India is strategically utilized as per the location where they are more suitable. Because of geographical locations, certain part experience different climates thus affecting agriculture productivity differently. Presently, the country holds the second position in agricultural production in the world. As per the report published for the period from April 2013-

[20] Khatun,B., and Roy,B.C. (2012).Rural Livelihood Diversification in West Bengal: Determinants and Constraints,Agricultural Economics Research Review, Vol. 25(No.1) January-June 2012 ,pp 115-124.

[21] Tanaka,K. (1995).Transformation of Rice-Based Cropping Patterns in the Mekong Delta: From Intensification to Diversification. *Southeast Asian Studies*, Vol. 33. No.3, December 1995

[22] Kumar,V.,and singh,J.(2020).Identifying the Most Remunerative Crop-Combination Regions in Haryana: A Spatial-Temporal Analysis Centre for Research in Rural and Industrial Development (CRRID) Chandigarh,NABARD research study-7.

February 2014, India has exported agricultural product worth Rs 2, 68,469 crores. Agricultural export stood at Rs 41,600 crores in the year 2004-2005 and thus there has been an increase of 645 times in last 10 years. Despite the steady decline in agriculture contribution to GDP, India agriculture is the biggest industry in the country and plays a key role in the socio economic growth of the country. On that account, agriculture is unquestionably the largest livelihood provider, providing nearly half of the working population in India (Kaur, 2013)[23].

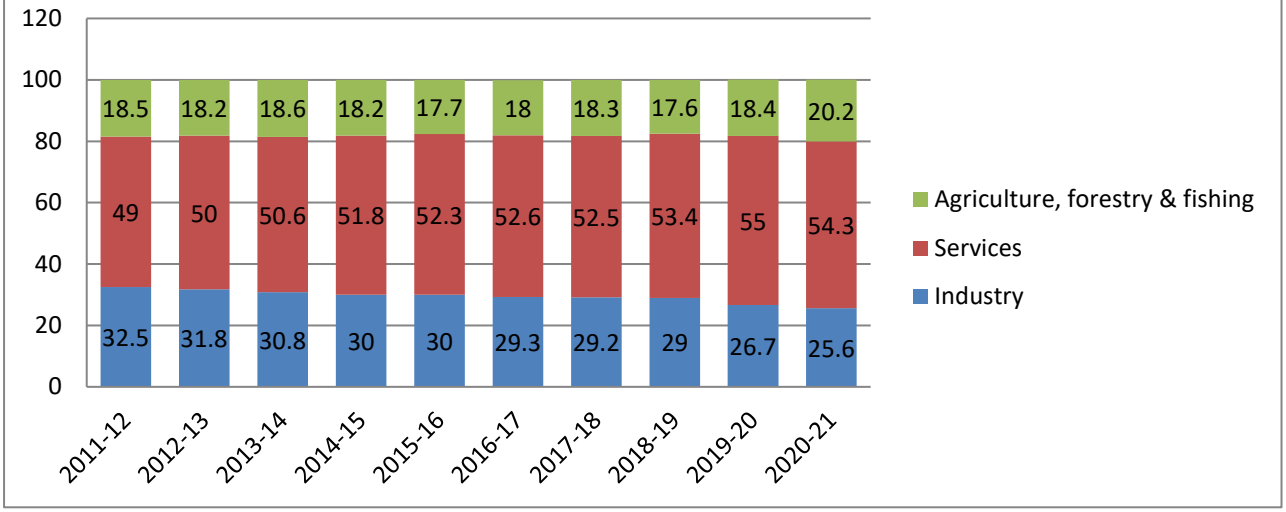
[23] Kaur,G.(2013).Sustainable Development in Agriculture and Green Farming in India: International journal of sustainable development,http://www.ssrn.com/link/oida-intl-journal-sustainable.dev.html.

Table no 1.1: Share of Agriculture in Gross Value Added by Economic Activity at Constant (2011-12) Basic Prices

Industry		**2011-12**	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**
Agriculture, forestry & fishing	Rs. In crores	1501947	1524288	1609198	1605715	1616146	1726004	1840023	1887145	1968571	2028288
	% share	18.5	18.2	18.6	18.2	17.7	18.0	18.3	17.6	18.4	20.2
	Growth rate %	-	1.5	5.6	-0.2	0.6	6.8	6.6	2.6	4.3	3.0
GVA at basic prices	Rs. In crores	8106946	8546275	9063649	9712133	10491870	11328285	12034171	12744203	13271471	12411495
	Growth rate %	-	5.4	6.1	7.2	8.0	8.0	6.2	5.9	4.1	-6.5

CAGR of Agriculture =3.05%; CAGR of GVA=4.35%
Source: Pocket book of Agricultural Statistics 2020-21

Figure no..1.1: % share of agriculture and other sectors in GVA in India

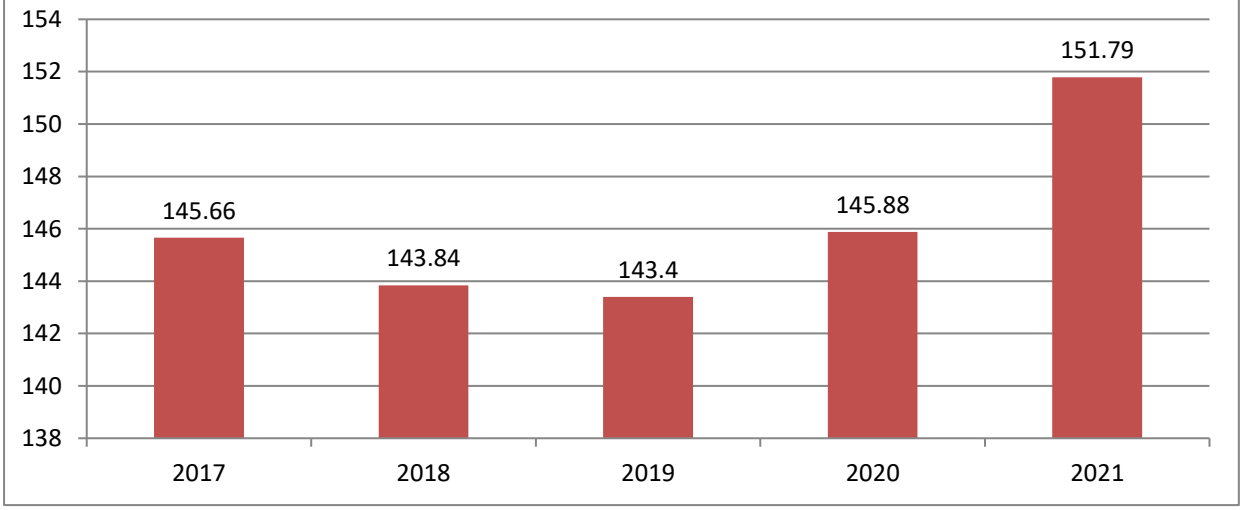


Source: Table no 1.1

Table no. 1.1 reveals that in India, the compounded annual growth rate of agriculture for the last ten years is 3%, which is less than that of Gross Value Added of economic sectors with 4.35%. The share of agriculture and allied sector has been the lowest in the economy; nevertheless, its share has increase from 18.5% to 20.2% during 2011-12 to 2020-21.

The number of people employed across the agriculture sector in India from 2017 to 2021 is shown in figure no 1.2, which is increasing over the years. This indicates that agricultural sector still holds an important place in Indian economy, where more than one hundred fifty million people are directly engaged for their livelihood.

Figure no. 1.2: Employment in agricultural sector in India (in million)



Source: “Employment in agriculture sector”, Statista, 2021

The Area, Production and Yield of Total Food grains, Rice and Maize in India for 2015-16 to 2019-20 are given below in table no. 1.2.

Table no. 1.2: All-India Area, Production and Yield of Total Food grains, Rice and Maize.2015-16 to 2019-20

(Area in Hectare, Production in M.T., and Yield in Kg. /Hectare)

State	A/P	Total Food Grains		Rice		Maize	
		2015-16	**2019-20**	**2015-16**	**2019-20**	**2015-16**	**2019-20**
All India	A	123217.68	126994.53	39656.45	3912.96	7179.86	7552.92
	P	241541.56	297504.46	91412.78	10276.51	16053.06	19429.33
	Y	2041	2343	2305	2622	2236	2572

Source: NER Data Bank, 2019.

Table no.1.2 shows that during 2015-16 to 2019-20, in all India, area under total food grains increased from 123217.68 to 126994.53 hectares and the production increased from 241541.56 to 297504.46 million tonnes. The yield increased from 2041 to 2343 kgs/hectare. The area under rice increases from 39656.45 to 3912.96 hectares, and the production increases from 91412.78 to 10276.51 million tonnes. The yield increases from 2305 to 2622 kgs/hectare during the corresponding period. The area under maize increases from 7179.86 to 7552.92 hectares, and the production increases from 16053.06 to 19429.33 million tonnes. The yield increases from 2236 to 2572 kgs/hectare during the corresponding period.

1.6.2. Agriculture in North-East

The backbone of the economy of North-East states of India is agriculture the land based activities and agriculture provides livelihood to 70% of its population but it produces only 1.5% of country's food grain production and continues to be a net importer of food grain even for its own consumption. Land is held almost by all but most of the farmers are marginal and small farmers (78.92%). The productivity of land as compared to its potential is low, except for few pockets in Manipur, Assam and Tripura (Patel, 2013)[24]. The present status of Agriculture of North-East region,, the cropping pattern with the exceptions of Sikkim, is

[24] Patel, (2013).Harnessing Agricultural potential in North Eastern Region of India. Agribusiness Wikipedia.org.,dramretpata@yahoo.com

characterized by predominance of Rice as the leading crop (NAAS, 2001)[25].The prevalence of subsistence agriculture and lack of crop diversification is hampering life of the rural farmers. The state-wise estimates of Area, Production and Yield of total food grains, rice and maize are given below in table no.1.3.

Table no. 1.3: State-wise Estimates of Area, Production &Yield, 2015-16 to2019-20

(Area in Hectare, Production in M.T., and Yield in Kg. /Hectare)

State	A/P	Total Food grains		Rice		Maize	
		2015-16	2019-20	2015-16	2019-20	2015-16	2019-20
Arunachal Pradesh	A	221.82	228.76	1280.30	133.01	39.30	41.48
	P	327.48	373.19	203.22	244.07	60.22	63.35
	Y	1476	1631	1584	1835	1532	1514
Assam	A	2683.09	2487.66	2080.01	2024.31	28.40	36.64
	P	5358.60	5263.40	3983.77	3595.06	87.20	128.04
	Y	1997	2105	1915	2089	3070	3495
Manipur	A	296.89	207.57	42.0	38.50	0.00	2.22
	P	435.71	42.38	117.13	17.64	0.00	4.94
	Y	1468	2030	2670	3775	0.00	2228
Meghalaya	A	139.99	140.82	96.81	97.36	8.06	18.17
	P	357.67	360.82	238.18	240.39	41.24	41.75
	Y	2555	2565	2460	249	2284	2298
Mizoram	A	48.53	45.61	36.66	34.74	5.62	5.86
	P	77.42	76.46	60.81	59.05	9.87	10.30
	Y	1595	1376	1659	1700	1756	17.58
Nagaland	A	321.19	340.55	196.48	211.28	63.64	63.74
	P	515.84	565.42	310.66	352.61	125.92	126.46
	Y	1606	1660	1581	1669	1979	1984
Sikkim	A	62.47	55.16	10.67	8.69	38.95	38.39
	P	94.13	92.09	13.13	16.14	68.31	67.91
	Y	1507	1669	1230	1858	1754	1769
Tripura	A	294.90	308.03	199.82	196.76	7.23	12.49
	P	818.33	853.31	575.83	582.14	10.02	17.75
	Y	2775	2770	2882	2959	1385	1422

Source: NER Data Bank, 2019-20.

Table 1.3 shows, Assam is leading in area and production of total food grains among the north-east states, followed by Nagaland, Tripura, Manipur, Arunachal Pradesh, Meghalaya,

[25] NAAS (2001).Strategies for Agricultural Research in the North-East: National academy of agricultural sciences India June 2001, Policy paper -9.

Sikkim and Mizoram. But Tripura leads in yield of total food grains among the states, which is followed by Meghalaya, Assam, Nagaland, Mizoram, Sikkim, Arunachal Pradesh and Manipur.

Assam also leads in the area and production of Rice cultivation among the north-eastern states, followed by Arunachal Pradesh, Tripura, Nagaland, Meghalaya, Manipur, Mizoram and Sikkim. Tripura leads in yield of rice cultivation followed by Manipur, Meghalaya, Assam, Mizoram, Arunachal Pradesh, Nagaland and Sikkim.

Nagaland leads in area and production of Maize cultivation among the states, followed by Arunachal Pradesh, Sikkim, Assam, Meghalaya, Tripura, Mizoram and Manipur(0). But Assam leads in yield of Maize, followed by Meghalaya, Nagaland, Mizoram, Sikkim, Arunachal Pradesh, Tripura and Manipur.

1.6.3 Agriculture in Nagaland

Nagaland is an agrarian state located in an altitude ranging from 120m to 3800m above sea level. Agriculture is considered a prime source of livelihood and revenue for the state. In Nagaland, there are four types of traditional agricultural systems are jhum cultivation, terrace cultivation, Zabo and home gardens (GOI-UNDP 2009)[26]. There is a gradual shift in cropping pattern from mono-cropping to double cropping due to increase in population and the initiatives taken by government in developing and encouraging farmers. It is possible to integrate traditional agricultural practices into sustainable commercial agriculture with suitable policy attention on the various parameters associated with each agricultural system, thereby strengthening farmers' livelihood through agriculture.

Agriculture is considered as the significant contributor to the Net State Domestic Product and also the largest employer of the working force in the state. Though the dependency of employment on agriculture has declined from as high as 96.50% in the 1950s to about 68% in 2000s, it continues to be the main source of livelihood. Shifting and terraced cultivations remains the dominant forms of agricultural practice in the State. Shifting or Jhum occupies about 90% of the area under agriculture. The single cropping system is prevalent, where cultivation is done only during kharif season in the state. The multiple cropping (both kharif and rabi seasons) is yet to be practiced by farmers except in very small and negligible

[26]GOI-UNDP, (2009). Traditional Agricultural Practices and sustainable Livelihood. Government of Nagaland, Department of Planning and Coordination, Nagaland: Kohima.

pockets. The technological interventions in terms of improved seeds, fertilizers and better implements are meagre. Lately, the state government is trying to turn this into an advantage by accessing markets for organic foods.[27].

Rice is the dominant food which occupies about 70 percent of the total cultivated area and constitutes about 75 percent of the total food grain production in the State. Other crops include maize, linseed, potato, pulses, soybean, sugarcane, jute, gram, cotton, castor, etc. During the last four decades, the food grain production in Nagaland has shown an upward trend from 62,000 metric tons in 1964–65 to 386,390 tons in 2001–02. The productivity increased from 700 kg per hectare to 1300 kg per hectare over the period[28]. Non-traditional crops such as wheat, barley, spices, rubber and sugarcane are also gaining popularity in the last few years, promising to convert agriculture from subsistence farming to commercially viable activity. The land is exceptionally fertile and can produce quality agro-based, horticulture and floriculture products through organic farming. Strategic initiatives in the fields of animal husbandry, fishery and sericulture could result in generation of resources and overall development of the rural economy. The major cash crops in Nagaland are Sugarcane, potato, ginger, Naga chilly, etc. covering an area of about 5510 Ha. The total food-grain production in 2007-2008 is about 4, 79,720 MT as per the Directorate of Economics & Statistics, Govt. of Nagaland. The marketing of the cash crops are through local markets, entrepreneurs and APMCs in the state. The estimated average income of all the above mentioned cash crops is Rs.55, 000 /Ha. The Area, Production and yield of Total Food grains and Total Cereals from 2015-16 to 2019-20 are given below in table no. 1.4.

Table 1.4. Area, Production and Yield of Food grains and Total Cereals, 2015-16 to 2019-20

(Area in Hectare, Production in M.T., and Yield in Kg. /Hectare)

State	**A/P**	**Total Food Grains**		**Total Cereals**	
		2015-16	**2019-20**	**2015-16**	**2019-20**
Nagaland	A	321.19	340.55	283.70	300.24
	P	515.84	565.42	472.73	518.64
	Y	1606	1660	1666	1727
All India	A	123217.68	126994.53	9836.23	99007.21
	P	241541.56	297504.46	235218.08	274479.27
	Y	2041	2343	2393	2772

[27] Integrated watershed management programme (IWMP), State perspective and strategic plan (spsp) of Nagaland, state level nodal agency for IWMP, Department of Land Resources, Government of Nagaland.

[28] Ibid

Source: NER Data Bank,2019-20

Table no.1.4 shows that during 2015-16 to 2019-20, in Nagaland, area of production of total food grains increased from 321.19 to 340.55 hectares and the production increased from 515.84 to 565.42 million tonnes. The yield increased from 1606 to 1660 kgs/hectare. The area of Nagaland total cereals increases from 283.70 to 300.24 hectares, and the production increases from 427.73 to 518.64 million tonnes. The yield increases from 1666 to 1727 kgs/hectare during the corresponding period. The data reveals that the yield of food grains and total cereals are lower in Nagaland as compared with all India average.

1.7 STATEMENT OF THE PROBLEMS

The traditional agricultural system '*Shifting or Jhum cultivation'* is the commonly practice in Nagaland, which is seasonal and subsistence in nature. The farming is done during summer months, which entirely depends on monsoon rain. So, the employment in the farming sector is seasonal, which leads to low income and seasonal unemployment. The bulks of Naga households are subsistence farmers and grow food generally for home consumption only (Mart Team, 2011)[29]. Only recently, few farmers are changing their cropping pattern from rice to cash crop and vegetable production for market, thus for majority, livelihood through farming is unsustainable. About 71.14 % of people live in rural area and 61.66% depend on agriculture for their livelihood, out of which 55.2% are cultivators and 6.46% are agricultural labours. (GoN, 2017)[30]. Despite having favourable agro-climatic condition, the productivity is low as compared to other states in the country. If the farmers grow crops with proper planning with adequate institutional, technical and infrastructural supports, significant growth of farmer's income can be anticipated. But there is no proper planning, participation for farmers to be involved and bring about community empowerment by considering a number of socio-economic issues which determine the life of rural poor. The farmers are not only isolated from economic opportunities, they still suffer from inadequate public services, underdeveloped market, poor infrastructural facilities etc.

[29] Mart Team (2011) .Livelihood Based Agri Business and Market Studies for North East Rural Livelihood Project: Final report, Nagaland April 2011.

[30] GoN (2017). '*Statistical handbook of Nagaland'*, Directorate of Economics & Statistics government of Nagaland Kohima.

The wider framework of institutional support structure is considered crucial because the poverty alleviation policies and interventions, which are intended to aim at creating opportunities and minimizing constraints in these structures, which would enable the poor from organizing effective livelihood strategies. Thus, the effectiveness of these policies and interventions would determine the extent of vulnerability and well-being of the poor and sustainability of their livelihood. Here the notions like claims and access are considered key in the livelihood approach. These notions point at the possibility to call upon moral and practical assistance and to effectiveness in the use of resource. Access is the process that would bring stakeholders from endowment to entitlement. Livelihoods that determine well-being are increasingly conceptualized as partly the outcome of negotiations and bargaining between individuals with unequal power within and outside the households. Among many, considerations of gender have been one of the important areas of concern, which affect levels of well-being of individuals within the household and seem to have important policy implications.

The principal source of livelihood in rural area is agriculture in Nagaland, yet the process of development in this sector is not satisfactory. The prominent agricultural practice of shifting cultivation is devastating and far-reaching effect on the environment and ecology. This is mainly due to decline in the years of jhum cycle from earlier 15–20 year cycle to 10 years and below, that the resilience of ecosystem has broken down with large-scale deforestation, soil and nutrient loss, and invasion by weeds and other species. This has resulted in low productivity of land, decline in availability of NTFP and employment opportunities and income have not been generation on a regular basis under the current system. In addition, generally the Naga villages are located on hill tops, therefore difficult to established and maintain proper road connectivity for all seasons. Further, the farmers mostly cultivate for meeting their basic requirements, not on business scale or terms. As such, the marketable surplus tends to be low and therefore making their livelihood from agriculture alone unsustainable. Other economic activities in rural area are piggery, live stocks, handloom and handicrafts etc. which are mainly taken up for meeting domestic needs. If not, these activities have the potential for providing a means of sustainable livelihood, if the existing traditional practices are improved by adopting modern techniques.

The support systems like extension services from government and NGOs are not efficient in providing technical supports and promoting extensive cultivation of potential

crops like potato, maize, chillies etc. Agricultural financing and marketing infrastructure and services are inadequate and inefficient. The sale volume is low hence incentive to carry the produce to higher markets is also low (MART Team, 2011)[31]. The farmers have no knowledge to explore and establish linkages with the outside markets for both output and inputs. Thus, limited government initiative on current context-specific agricultural innovations, agrarian markets, all season storage facilities, conservation, processing and procuring of organic products, market risks, post harvest management, climate variations, health risks of farmers land compatible seeds and Land use plan are the major causes of the continued deterioration of agriculture as livelihood. The unsustainable pattern of production, problem of scarcity of labour during peak season due to the absence of household members for extended periods, especially young people and school children, lack of marketing facilities, lack of financing and investment are other obstacles for making agriculture as a sustainable livelihood option for the rural population.

If sustainable livelihood through agriculture is to be made a reality, it must be flexible enough to cope with diversity, enhance opportunity, and recognize the change or policy to be undertaken for the livelihood sustainability of the poor. This will require considerable support or incentives over the initial years thereby increasing their standard of livelihood as well as future sustainability.

1.8 SIGNIFICANCE OF THE RESEARCH

The current study is important to understand how farmers adapt and engage in different livelihood strategies to cope with risk and uncertainty so as to maintain sustainable livelihood. Research on sustainability of livelihood in agriculture is important as it provide the basis for improving livelihood for the poor people living in rural areas. Perhaps, there is a need to develop agriculture in terms of farmers' ability to adapt diverse sustainable livelihood by increasing production and income without depleting natural resources. The study is important to understand whether it is possible to integrate traditional agricultural practices into sustainable commercial agriculture with suitable policy attention on the various parameters associated with each agricultural system.

[31] Mart Team (2011).Livelihood Based Agri Business and Market Studies for North East Rural Livelihood Project: Final report, Nagaland April 2011.

The research on the effectiveness of institutional support system determines the extent of vulnerability, well-being and sustainability of farmer's livelihood. Hence the study on the policies and interventions which are intended to creating opportunities and minimizing constraints in these structures that would enable the poor to organize effective livelihood strategies is important.

The study is also important to understand the impact of integrated farming system , with crop production, incorporated other economic activities like piggery, live stocks, handloom and handicrafts etc. which are primarily taken up for meeting domestic needs, whether these activities have the potential for supporting sustainable livelihood of the farmers.

1.9 OBJECTIVES

The overall objective of the study is to assess the sustainability of farmers' livelihood under current agricultural practices and evaluate the potentials for future sustainability. The specific objectives are as follows:

1. To examine the assets of the farmers as these determine the status of rural livelihood.
2. To estimate the farmers' livelihood strategies and the extent of farmers' livelihood diversification and its determinants.
3. To assess the extent of farmers' livelihood vulnerability to climate change and other livelihood factor variability within the Sustainable Livelihood framework. This is to understand whether or not, the areas that are exposed to similar level of risks and the same level of dependence on agriculture will have same level of livelihood vulnerability.
4. To determine the institutional support system in sustainability of farmers' livelihood
5. To identify the problems and challenges faced by farmers and suggest measures to improve farming system for sustainable livelihood.

1.10 HYPOTHESES

1. Capital assets positively determine farmers' livelihood sustainability.

2. The more diversified is the livelihood activities of the farmer, the higher is the livelihood sustainability. The extent of diversification is determined by economic, demographic and physical features of the households.

3. The areas that are exposed to similar level of risks and the same level of dependence on agriculture do not have same level of livelihood vulnerability.

4. In response to market opportunity, farmers are adopting changes in cropping pattern, switching from rice cultivation to vegetable crops for livelihood sustainability.

5. The weak institutional support system and infrastructure are major problems towards ensuring sustainable livelihood opportunity for the rural people.

1.11 AREA OF THE STUDY

The areas selected for the study are Zunheboto and Mokokchung districts of Nagaland, where the farming system is predominantly of *Shifting or Jhum* cultivation.

Zunheboto is bordered by Mokokchung district in the east, Kohima district in the south and Wokha district in the west. It covers an area of 125500 hectares which shares 7.57% of the State's total geographical area. Out of this area, 30.12% is used for agricultural crop production in 2011. The total population is 141,014 according to 2011 census. The density of population is 123.4 persons per sq. km., sex ratio is 976 female per 1000 male and the literacy rate of the district is 85.26%. In the district 65.82% of its working population is engaged in agriculture (Census, 2011).

Mokokchung district is bounded by Assam on the North, Tuensang and Longleng Districts in the East, Zunheboto in the South and Wokha and Assam on the West. It occupies a total area of 161500 hectares which shares 9.74% of the state's total geographical area. According to 2011 census 21.75 % of the area is used for agricultural crop production and 58.11% of its working population is engaged in agriculture. The total population is 194,622, density of population is 121 per sq. km., the literacy rate is 91.62% and the sex ratio is 925 per 1000 male (Census, 2011).

1.12 METHODOLOGY

1.12.1. **Sources of Data**

The study is based mainly on primary data and supplement by secondary data. Primary data were gathered through sample survey using interview and questionnaire methods. The secondary data were collected from sources like administrative reports, published and unpublished documents, articles, journals books, newspapers etc.

1.12.2. **Sample Design**

The primary data were collected using stratified, simple random sample technique. Out of total sixteen districts in Nagaland, Mokokchung and Zunheboto districts are selected for the study. From Zunheboto district, 3(three) ranges were selected for the survey.viz, Satakha, Pughoboto and Zunheboto ranges and from Mokokchung district selected two ranges , viz.,Ongpangkong and Asatkong ranges. For Mokokchung, from each selected range, 2(two) villages were included in the survey, so four sample villages were Longkhum, Chuchuyimpang, Sungratsu and Mongsenyimti. From Zunheboto district, the survey included the following villages: Kilo Old, Satakha, Asukhomi and Lazami. Thus, the sample survey cover 8 (eight) villages. From each selected village, 10% of the household was selected which include both progressive and non-progressive farmers.

Table 1.5 : Sample villages, Households and Population.

District	**Range**	**Village**	**Households**	**Average household size**	**Population**		
					Male	Female	total
Mokokchung	Ongpangkong	Longkhum	42	5	112	97	209
		Chuchuyimpang	73	5	188	185	373
	Asatkong	Sungratsu	42	6	108	112	220
		Mongsenyimti	41	6	153	126	279
	Sub total		198	6	561	520	1081
Zunheboto	Satakha	Kilo Old	5	6	22	22	44
		Satakha	11	9	42	41	83
	Zunheboto	Asukhomi	17	6	74	75	149
	Pughoboto	Lazami	71	7	216	183	399
	Sub total		104	7	354	321	675
Total	5	8	302	6	915	841	1756

Source: Field Survey. 2015-16

As shown in table 1.5 in the sample aggregates includes, 302 households from eight villages. The average household size is 6.22 and the population is 1756 where 915 are male and 841 are female.

For Mokokchung, 198 households were surveyed from four sample villages in two ranges. The average household size is 5.54 and the population is 1081, where 561 are male and 520 are female. Similarly for Zunheboto, 104 households were surveyed from four sample villages in three ranges. The average household size is 6.9 and the population is 675 where 354 are male and 321 are female.

1.13 METHODS OF DATA ANALYSES

For the analysis of the collected data, various methods have been used which are:

(i). **Binary Logistic Regression Analysis** was used to analyze the impact of five capital assets (Human, Physical, Financial, Social and Natural) and Institutional support system. The livelihood outcomes were represented by binary variables. Where, the livelihood outcomes have only tow responses i.e, either Yes or No.

Binary logistic model

Let Y_i represent response variable, x_i represents covariates, and we get:

$$(P(Y_i = 1) = \pi_i = \frac{exp(\beta_0 + \beta_1 x_i)}{1 + exp(\beta_0 + \beta_1 x_i)}$$

(ii) **The Simpson Index of diversity (SDI)** was used for measuring the extent of diversification among different diversifier's households in the study area.

The formula is as follows:

SDI=1- $\sum_{i=1}^{N} P^2$P

Where SDI is the Simpson Diversification Index, N is the total number of revenue sources and Pi is the proportion of revenue that comes from source i. The index values vary from 0 to 1. The index value is 0 when there is a complete specialization and 1 as the level of diversification increases.

(iii).**Multiple Regression Analysis**: The multiple regression analysis was used for analyzing the livelihood diversification of farmers and its determinants. Multiple regression analyze is a mathematical tool to estimate the functional relationship between two or more variables[32].

The regression equation is given as;

$Y=a+bX_0+b\ X_1+\ldots\ldots\ldots+b\ X_n+\mathcal{E}$

[32] Gupta,S.P.(1997).Statistical Methods.Sultan Chand & Sons,New Delhi

Where, ‘a’ is the intercept.

‘b’ and ‘c’ are the coefficients and

$X_0 + X_1 + \ldots\ldots\ldots\ldots X_n$ represents different independent variables in the observation and Ɛ is the error term.

(iv). **Livelihood Vulnerability Index (**LVI): LVI was used to understand the vulnerability of livelihood of farmers in the hilly areas of Mokokchung and Zunheboto districts of Nagaland. The composite index approach was used to convert the scale of each sub-component derived from The Life Expectancy Index (UNDP 2007)[33], which is calculated as follows:

$$\text{Index } S_d = \frac{\text{Sd} - \text{Smin}}{\text{Smax} - \text{Smin}}$$

where, S_d is the value of the sub-components of the area d, and S_{min} and S_{max} indicate the minimum and maximum values of each sub-components that is determined by the data from the study area.

Once standardized, the sub-components are averaged by using the following formula, and then calculate the value of its main components.

$$M_d = \frac{\sum_{i=1}^{n} index\, s_{d}i}{n}$$

The value of M_d is equal to one of the main components in the area *d*. The *di* index reflects the value of the sub-components that are indexed by *i*. Based on these equations, the LVI grades can be obtained by using the following equation:

$$LVI_d = \frac{\sum_{i=1}^{9} w_{M}i\, M_{d}i}{\sum_{i=1}^{9} w_{M}i}$$

Or

$$LVI_d = \frac{W_{SDP}\, SDP_d + W_{LS}\, LS_d + W_{FA}\, FA_d + W_{KC}\, KC_d + W_{SN}\, SN_d + W_H\, H_d + W_F\, F_d + W_W\, W_d + W_{NDC}\, NDC_d}{W_{SDP} + W_{LS} + W_{FA} + W_{KC} + W_{SN} + W_H + W_F + W_W + W_{NDC}}$$

Where, LVI_d represents the index value for the susceptibility in area, *d*, measured by nine major components selected for this study. W_{Mi} represents the number of sub-components

[33] UNDP Annual report (2007)

that eflect to the main component, which is equally contributed to the overall LVI (Sullivan, Meigh & Fediw 2002)[34]. The scale of LVI ranges from not vulnerable to very vulnerable, where:

(1) 0 to 0.2 = not vulnerable
(2) 0.21 to 0.4 = vulnerable
(3) 0:41 to 0.5 = very vulnerable

Categorization of major components into contributing factors from the IPCC (Inter-governmental Panel on Climate Change) vulnerability definition for calculation of the LVI–IPCC.

$$CF_d = \frac{\sum_{i=1}^{n} w_{Mi} M_{di}}{\sum_{i=1}^{n} w_{Mi}}$$

Once exposure, sensitivity, and adaptive capacity are calculated, the three contributing factors are combined using the following equation:

$$LVI - IPCC_d = (ed - ad) * sd$$

(v). **Percentage Change formula**: For analyzing the changes in cropping pattern and production of important crops the percentage change formula was applied.

$$\%\, change = (finalvalue - initial\ value/initial\ value) \times 100$$

(vi) **Mean and Standard Deviation:** The levels of institutional support for the livelihood diversification were analysed using mean and standard deviation as follows:

Mean: $\bar{X} = \frac{\Sigma X}{N}$

Standard Deviation: $\sigma = \sqrt{\Sigma f dx^2/N - (\Sigma f dx/N)^2}$

(vii) **CAGR** is used to find the growth rate of GSDP and NSDP in Nagaland. It is a mathematical measure for compounded annual growth rate for a specific period of time, expressed in percentage. The formula is as follows:

$$CAGR = (Initial\ value/Final\ value)^{1/n} - 1$$

[34] Sullivan, C., Meigh, J.R. & Fediw, T.S.(2002).Derivation and testing of the water poverty index phase 1:Final report, Department for International Development, UK.

Where, n is the period of time in years.

1.14 CHAPTERIZATION

Chapter -1 **Introduction**

This chapter includes the definitions and concepts of sustainable livelihood, statement of the problem, objectives, hypothesis, the area of the study and methodology.

Chapter-2 **Literature Review**

This chapter represents the literature reviews on the topic of the study, which were previously undertaken that provide a basis for the current study.

Chapter-3 **Socio Economic Profile**

The physical and climatic conditions, demographic features and infrastructure etc of the State as well as the area of study are highlighted here.

Chapter-4 **Assets and Livelihood Strategies of Farmers**

The analysis of the assets and strategies of the farming households that determine the status of livelihood is presented in this chapter. Further, the analysis of farmers' livelihood diversification and its determinants are also presented.

Chapter-5 **Livelihood Vulnerability and Sustainability of the Farmers**

The first section of this chapter presents the analysis of livelihood vulnerability of the farmers in the study area. The subsequent sections comprise of the analysis of changes in cropping pattern, which reflects the sustainability of livelihood in agriculture. Further, discussion on production of important crops in sample villages is highlighted in this chapter.

Chapter -6 **Institutional Support Systems and Implications**

This chapter highlights the institutional support systems and implications of various schemes and policies of the Government on rural livelihood sustainability. Moreover, the identified problems and challenges for sustainable livelihood of the farmers are presented.

Chapter-7 **Summary and Conclusion**

This chapter contains the summary of the findings and policy suggestions based on the findings.

1.15 LIMITATIONS OF THE RESEARCH

The major limitations of the research are as follows:-

I. It is very difficult to get the required information from the farmers because most of the farmers do not use standard measurement as well as the response from the farmers depends on their mood therefore occasionally not accurate.

II. Moreover, the information obtained from the farmers regarding production, productivity and profitability, costs etc are approximation only as they hardly ever kept records and thus forget some of the important data needed for the research.

III. Some of the other major limitations encountered are time constraints and ignorance or illiteracy of the farmers.

CHAPTER-2
LITERATURE REVIEW

2.1. INTRODUCTION

This chapter highlights the literature review referred for the study. The main concepts included are Sustainable Livelihood approach, Socio economic characteristics, Livelihood Assets and strategies, Cropping pattern and Livelihood diversification and Vulnerability, Institutional Support System, Agriculture and Livelihood and Sustainability Livelihood through Agriculture. The literature comprises the detailed and relevant information on sustainable livelihoods through agriculture in rural areas. The reviewed literatures were sourced from the secondary data. This chapter contains the deliberate discussion on agricultural livelihood sustainability of the farmers which is an important concept in this research.

2.2 CONCEPT OF SUSTAINABLE LIVELIHOOD

Carswell (1997)[1] opines that the concept of sustainable livelihood strive to go beyond the conventional definitions and approaches to poverty eradication. The attention is now to the various factors and processes which either restrains or enhance poor people's ability to make a living in an economically, ecologically and socially sustainable manner. A livelihood consists of capabilities, assets and activities required for a living. According to him, a livelihood is sustainable if it can cope and recover from stresses, shocks, maintain or enhance its capabilities without destroying the natural resources. The portfolio of assets helps people to construct their living with tangible assets and resources, and intangible assets (claims and access). It helps to utilise a resource for obtaining information, material, technology, employment, income etc. Therefore, sustainable livelihoods means earning a living based on capabilities and assets (Oughton and Wheelock, 2003)[2]. And people can utilise their assets to improve their livelihood (Xu et al., 2015)[3].

[1]Carswell,G.(1997).Agricultural Intensification and Rural Sustainable Livelihoods: A Think Piece. http://www.ids.ac.uk/ids/research/env/index.html, IDS Working Paper 64.
[2]Carswell,G.(1997).Agricultural Intensification and Rural Sustainable Livelihoods: A Think Piece. http://www.ids.ac.uk/ids/research/env/index.html, IDS Working Paper 64.
[3] Xu,D., Zhang ,J., Rasul ,G., Liu ,S., Xie ,F., Cao ,M.,and Liu,E. (2015).Household Livelihood Strategies and Dependence on Agriculture in the Mountainous Settlements in the Three Gorges Reservoir Area, China, Sustainability 2015, *7*, 4850-4869,ISSN 2071-1050.

2.3. SUSTAINABLE LIVELIHOOD APPROACHES AND PERSPECTIVES

DFID (1999) [4], livelihoods approach means the objectives, scope and priorities for development which increases the sustainability of farmers livelihoods through access to education, information, technologies, training, nutrition, health, cohesive social environment, natural resources, basic infrastructure, financial resources and institutional environment that supports multiple livelihood strategies and promotes equitable access to competitive markets for all. Sustainable livelihood approach reveals the varieties of activities that people carry out to make a living (Chambers (1995),[5] which includes means to promote choice, opportunity and diversity (Neiland, 2004)[6] .

According to Holland and Blackburn (1998) [7], sustainable livelihood approach produces a more holistic view on what resources, or combination of resources, are important to the poor, including not only physical and natural resources, but also their social and human capital. The sustainable livelihood approach facilitates an understanding of the linkages between people's livelihood strategies, asset status, natural resources, and for understanding both the problem and the scope for promoting sustainable development at the local level (Krantz, 2001)[8].

Adato and Meinzen (2006),[9] sustainable livelihoods approach provides important insights about the reality of rural households, putting people at the centre of development. It recognises and seeks to understand the relationships between multiple influences on livelihood, acknowledges the multiple strategies that people adopt to secure their livelihoods and it seeks to achieve multiple livelihood outcomes. Farrington et al. (1999)[10], their analysis seeks to understand what such policies are, why they operate well or poorly in practice, and then to identify how the structures and processes through which they function can be improved. The new livelihoods approaches attempt to address such problems by delinking the

[4] DFID (1999).Sustainable livelihoods guidance sheets: Department for International Development framework,http://www.eldis.org/vfile/upload/1/document/0901/section2.pdf.
[5] Chambers,R. (1995).Poverty and Livelihoods: Whose Reality Count: IDS Discussion Paper 347, IDS, Brighton, UK.
[6] Neiland,A.E.(2004),"'Poverty and Small-scale Fisheries in West Africa", A Review of Fisheries Development Policies Since 1950 FAO and Kluwer Academic Publishers, Dordrecht, pp: 252
[7] Holland,J.,and Blackburn ,J.(1998).Participatory Research and Policy Change, London: Intermediate Publications Limited.
[8] Krantz,L.(2001).The Sustainable Livelihood Approach to Poverty Reduction. Proposal Draft. Stockhom, Sweden: Division of Policy and Socio Economic Analysis Swedish International Development Agency.
[9] Adato,M., and Menzien ,D.(2006). Agricultural Research, Livelihoods, and Poverty: Studies of Economic and Social Impacts in Six Countries ,Published for the International Food Policy Research Institute
[10] Farrington et al (1999).Sustainable Livelihoods in Practice: Early applications of Concepts in rural areas. Natural Resource Perspectives No.42, ODI, London.

concepts ‘rural’ and ‘agricultural’ and widening the scope of rural development activity (Carney 1999)[11].

Qing Tang et al. (2013),[12] based on the Sustainable Livelihoods Approach (SLA), a conceptual framework for agricultural practices and sustainable rural livelihoods for the Yangou watershed within the Chinese Loess Plateau was discussed in their paper. During 1997 to 2006, 48.4 ha (95%) sloped farmland in the Yangou watershed area was converted to new land management. This has resulted in significant positive impacts on the sustainable rural livelihoods of the watershed area that reduced dependence upon grain and subsidies income through diversified strategies for livelihood, and also improved environmental indices. The data show that the incomes from fruit sale and labor to total income were considerably increased (59% and 14%, respectively). The watershed community also experienced 159% raise in per capita net income, while the watershed itself experienced a 99% decrease in sediment yield from 1998 to 2007. Effective agricultural practices can sustain rural livelihoods, particularly in rapidly developing and transforming areas. The study found that agricultural practices that include building terraces, returning sloped farmlands to forestland and grassland, and expanding orchards all have had positive and significant impacts on farmers' livelihood assets, strategies, outcomes, and reduce vulnerabilities.

Scoones (1997), in IDS working paper entitled “Sustainable Rural Livelihood: A framework for analysis” outlines the framework for livelihood resources which are combined in the pursuit of different livelihood strategies. This paper aims to clarify the conceptual and analytical approaches, explore the range of methodological tools and discuss the practical and operational consequences of a sustainable livelihoods approach. The paper indicates that livelihood resources may be combined creatively and innovatively, often in complex ways, to create more livelihoods in a particular area. Socio-economic differences like contrasts of asset ownership, income levels, gender, age, religious affiliation, caste, social or political status etc also have a major impact on the composition of livelihood portfolios. It also indicates the ability to pursue different livelihood strategies is dependent on three broad clusters of livelihood strategies which are agricultural intensification/ extensification, livelihood diversification and migration. He concluded that proper institutional system is

[11] Carney,D.(1999).Approaches to sustainable livelihood for the rural poor. Overseas Development Institute, www.odi.org/resource/docs/3093.pdf.

12 Tang,Q., .Bennett,S.J., Xu,Y., and Li ,Y.(2013). Agricultural practices and sustainable livelihoods: Rural transformation within the Loess Plateau, China, Applied Geography, Volume 41, July 2013, Pages 15-23.

potentially a significant undertaking for Planning and implementing a sustainable rural livelihoods policy[13].

Oughton and Wheelock (2003), "In capabilities approach to sustainable household livelihoods", aims to build a framework with which to compare the relationships between micro business household livelihoods and individual well being. The data is based on the interview taken from 28 micro business households in the rural north of England. The study found out that insecurity and risk leads to low and unreliable incomes. The study also found out that, there is lack of employment opportunities dominated by constraints insecurity, limited natural resources and livelihood capabilities restrict the choice of functioning and few marketable skills. The study suggests that policies should support and expand the value of the capability set of business households in ways by recognizing that micro businesses are embedded within the social institution of the household[14].

According to Butler and Mazur (2007)[15], sustainable livelihood approach focuses on the livelihood systems of the poor and the ways in which the poor adapt to maintain their livelihoods under conditions of severe environmental, economic or political stress. The first step is the understanding of the wealth of the poor like indigenous knowledge, special skills, individual or group resourcefulness and social support systems, and the strategies that people use to cope for survival which may become part of daily life. The strength of the Sustainable Livelihood approach lies with the diverse framework for understanding the ways that families derive their livelihoods from different capabilities and assets, then for working with community members and other organizations to reduce household vulnerability. What works in one location may not necessarily work in another setting.

National Agricultural Innovation Project (NAIP) report[16] "Live better with the flood": An Approach for Sustainable Livelihood Security in District Dhemaji, Assam, which is being funded by the World Bank and Government of India country-wide initiative led by Indian Council of Agricultural Research (ICAR) lead consortium partner along with the local NGO as well as Assam Agricultural University as consortium partner. The project covers more than

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[13] Scoones, I. (1997).Sustainable Rural Livelihoods: A Framework for Analysis: Http://www.ids.ac.uk/ids/research/env/index.html.IDS Working Paper 72.

[14] Oughton, E., and J. Wheelock, (2003).Capabilities Approach to Sustainable Household Livelihoods: Review of Social Economy, Vol. 61, No. 1, (March 2003), pp. 1-22.

[15] Butler,L.M.,and Mazur,R.E.(2007).Principles and Processes for Enhancing Sustainable Rural Livelihoods: Collaborative Learning in Uganda:, International Journal of Sustainable Development & World Ecology 14(6):604-617.

[16] ICAR (2014).Live better with the flood: An Approach For Sustainable Livelihood Security In District Dhemaji, Assam. Indian Council of Agricultural Research (ICAR) June 2014.

3400 small and marginal farm families in the flood affected area during the five year of research on field. Several technological intervention in Integrated Farming System, restructuring of existing cropping pattern with HYV, Improved vegetable cultivation for additional income generation, introduction of new crop and HYV of seed suitable for the Agro-Climatic and Soil conditions. Project also developed and strengthened the local community institutions to carry forward the activity in future in a sustainable manner. The project has recommended three modules for scaling up based on feasibility, replicability and economically viability. They were Rice-Fish-Horticulture, Livestock-Fish-Horticulture and Restructured cropping pattern. The research results would be useful for farmers, extension workers and State planning departments to explore possibility of replicating in similar areas .

2.4. SUSTAINABLE LIVELIHOOD FRAMEWORKS

Farrington (1999),[17] describes the livelihoods framework as an analytical structure for coming to grips with the complexity of livelihoods, understanding influences on poverty and identifying where interventions can best be made. The framework identifies five types of capital asset which are human, natural, financial, social and physical. These assets constitute livelihood building blocks. To a limited extent they can be substituted for each other. Thus, the poor may draw on social capital such as family or neighbourhood security mechanisms at times when financial capital is in short supply. People are likely to pursue multiple activities and outcomes. Outcomes will not be simply monetary or even tangible in all cases. They may include, for instance, a sense of being empowered to make wider, or clearer, choices. Kumar et al (2006),[18] examined the importance of capital assets such as, physical, natural, financial, human, and social capital assets and study how people combine these in their livelihood strategies.

Goswami and Paul (2012),[19] assessed the impact of extension programme of joint forest management within the Sustainable Livelihoods Framework to identify the current livelihood strategies and objectives in terms of vulnerability, policies, institutions and processes and levels of access to assets and entitlements. It was found that the poor pursue a

[17] Farrington et al (1999).Sustainable Livelihoods in Practice: Early applications of Concepts in rural areas: Natural Resource Perspectives No.42, ODI, London.

[18] Kumar et al. (2006).Sustainable Agriculture and Rural Livelihoods: A Synthesis, Agricultural Economics Research Review Vol. 19 (Conference No.) 2006 pp 1-22.

[19] Goswami. and .Paul,M.(2012).Using Sustainable Livelihoods Framework for Assessing the Impact of Extension Programmes: An Empirical Study in the Context of Joint Forest Management: Integrated Rural Development and Management (IRDM) Faculty Centre, Ramakrishna Mission Vivekananda University,

range of livelihood strategies in response to emerging needs, opportunities or constraints. Part of the income is consumed, re-invested back and also used for reducing vulnerability.

2.5. SOCIO ECONOMIC CHARACTERISTICS AND LIVELIHOOD

Scoones (1998),[20] depicts socio-economic differences like contrasts of asset ownership, income levels, gender, age, religious affiliation, caste, social or political status etc have a major impact on the composition of livelihood strategies. Crozall and Smith (1984),[21] attributes socio-economic characteristics influence decision-making ability, availability and level of use of conventional inputs and acceptance of new technology. And identifying socio-economic and socio-psychological variables determined the effect of the household's adoption of innovation and production (Alfred 2015)[22]. Henceforth, Capability building activities on resource mobilization, management and alternative livelihood opportunities must be provided to improve the quality of life of the people (Nacario 2014)[23].

The Socio-economic status of hill farmers is an important subject for study as farmers in hills are dwelling in a complex, diverse and risk-prone situation. They are usually practicing traditional ways of cultivation which adds very little to the input. A hill farmer who is only dependent on agriculture hardly secures his family food security (Roy et al., 2013)[24]. According to Adams (1982),[25] the farmers with higher scores on socio-economic status scale used institutional sources more frequently than the farmers with lower scores who relied mostly on non-institutional personal sources. Khrishnankutty et al. (2021),[26] describes that the farmers' decisions are influenced to a large extent by socioeconomic factors and that holding size, education status and yield influenced cultivation decisions.

Obi and Njoku (2014) aims to identify socio-economic determinants of choice of livelihood activity among rural dwellers in southeast Nigeria based on data collected from 160 households by using Multi-stage sampling technique. The study found that Age, years of education and monthly income were the major socio-economic factors affecting livelihood

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[20] Scoones,I.(1998).Sustainable rural livelihoods: A framework for analysis: *Working Paper 72*. Brighton: IDS.

[21] Crozall ,H.E.,and Smith,L.P.(1984).The Fight For Food: Factors Limiting Agricultural Production. George Allers and Unwin Pub. Ltd 40 Museum St. London WCIA, ILU UK.

[22] Alfred,Y.(2005).Measurement of farm households' socio-economic and socio psychological variables: a paradigm for evolving a more appropriate method, journal of agriculture and social research (jasr) vol. 5, no.1, 2005.

[23] Nacario (2014).Productivity and Livelihood Analysis of Selected Areas of Lisbon: University of Agriculture, San Jose, Pili, Camarines Sur 4418, Philippines.

[24] Roy et al (2013).International Journal of Agriculture and Food Science Technology:ISSN 2249-3050, Volume 4, Number 4 (2013), pp. 353-358 © Research India Publications http://www.ripublication.com

[25] Adams,M.E. (1982).Agricultural Extension in developing countries: Intermediate tropic Agriculture series. Longman Group Ltd Essex UK. pp 93–105.

[26] Khrishnankutty et al (2021).Sustainability of Traditional Rice Cultivation in Kerala, India: A Socio-Economic Analysis, Sustainability 2021, 13, 980.

activities. The study suggests that government should drive for mechanization of farming activities so as to attract young graduates into the agricultural sector[27].

Emtage and Suh (2005) examine variations in socioeconomic characteristics, farming assets and livelihood systems in rural households in Leyte Province, Philippines. The study found that on average more than half of the households have cash incomes below the poverty threshold. Land ownership is highly concentrated within a few households. The supply of own food, education levels and housing quality are low. Out of four communities, the situation in one was grime, while the other three communities face challenges but their situation appears to be relatively stable, possibly due to the better agricultural infrastructure development and access to land provided through community forestry programs[28].

Majule (2012) [29] explored the implications of ecological, social and economic characteristics on community livelihoods and environment in Mwanambaya and Kwala villages in the coastal areas of Tanzania based on the data collected through focus group discussions (FGD) and participatory rural assessment (PRA) taking 10% of the total households in each village. The agriculture production is the main source of livelihoods for more than 70% of the households. Soils fertile, water availability, suitable pasture, vegetation attracted pastoralist in particular to Kwala area. Exploitation of natural resources including cutting trees for charcoal and building, overgrazing contributed to land degradation. The study also found that livelihoods in both urban and rural population of Tanzania depend on natural resources. Therefore, suggests for establishment and implementation of village land use plans in order to sustain productivity and conserve ecosystems.

2.6. LIVELIHOOD ASSETS AND STRATEGIES

The asset portfolio and application method influences farmers' strategies for achieving their livelihood objectives (Xu et al., (2015), [30] Ashley and Carney (1999),[31]conceptualize livelihood capital assets as a fundamental condition that affects and reflects the basic livelihood of farmers with the ultimate goal of improving rural livelihood.

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[27] Obi,C.C.I.,and Njoku,E.C.M.(2014),.Socio-Economic Factors Affecting Choice Of Livelihood Activities Among Rural Dwellers In Southeast Nigeria: IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS) e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 7, Issue 4 Ver. I (Apr. 2014), PP 52-56 .

[28] Emtage,J., and Suh,N. (2005).Variations in socioeconomic characteristics, farming assets and livelihood systems of Leyte rural households: Annuals of tropical research 27(1): 35-54 (2005).

[29] Majule,A.E.(2012).Implications of ecological and social characteristics to community livelihoods in the coastal areas of Tanzania: African Journal of Environmental Science and Technology Vol. 6(1), pp. 72-79.

[30] Xu et al (2015).Household Livelihood Strategies and Dependence on Agriculture in the Mountainous Settlements in the Three Gorges Reservoir Area, China, Sustainability 2015, *7*, 4850-4869.

[31] Ashley,C.,and Carney,D.(1999).Sustainable livelihoods: Lessons from early experience, FID, London.

Soini E. (2005)[32] argues that unequal distribution and limited assets constraints households from improving their livelihood goals. As maintained by Shylendra (2002,[33] rural households engage in different livelihood strategies, which are important to achieve long term strategies and ensure fair and equal distribution. Hague (2003) reveals that there is a need for transformation of subsistence farming to market-oriented commercial agriculture as a strategy for livelihood promotion.[34] Livelihood strategies are the combination of different activities people choose in order to achieve their livelihood goals. People's choice of livelihood strategies depends on their access to assets and the policies, institutions and processes which in turn help them to achieve positive livelihood outcomes (Alinovi et al., 2010)[35].

DFID (2001),[36]describes that the relationships between assets and their accessibility are very important for livelihood strategies of the people. It reveals that people's ability to escape from poverty is critically dependent upon their access to assets. Different assets are required to achieve different livelihood outcomes. The main reason of vulnerability is due to change in land use, climate, market fluctuations and higher mechanization. It is very essential to identify and combine different assets to enables farmers achieve better livelihood outcomes (Veisi and Toulabi, 2012)[37].

Livelihood strategies may be described as a combinations of assets and activities to earn income or choices of people undertake in order to achieve livelihood goals (Brons ,2005[38]; Chambers and Conway, 1992[39]; Su & Shang ,2012[40]). Santiago and Lopez (2008)[41] hold that livelihood strategies are characterized by the allocation of assets, income-earning activities both on farm and off farm, and livelihood outcomes. According to Scoones (1998)[42], the ability to pursue different livelihood strategies is dependent on the basic material and social, tangible and intangible assets that people have in their possession and the

[32] Soini E. (2005).Livelihood, land use and environment interactions in the highlands of East Africa: ISBN 952-10-3413-0 (PDF) ISSN 0300-2934.
[33] Shylendra, H.S. (2002).Environmental Rehabilitation and Livelihood Impact: Emerging Trends from Ethiopia and Gujarat: Economic and Political Weekly, Vol. 37, No. 31, (Aug. 3-9, 2002), pp. 3286-3292
[34] Hague, T. (2003).Reforms for Agricultural Growth and Rural Development: Economic and Political Weekly, Vol 38, No-48, (Nov.29 - Dec. 5, 2003), PP. 5031-5033. http://www.pakjas.com.pk.
[35] Alinovi et al (2010).Livelihoods Strategies and Household Resilience to Food Insecurity: An Empirical Analysis to Kenya, agricultural development economic division FAO.
[36] . DFID (2001).Making government work for poor people building state capacity, London.
[37]Veisi,,H., and Toulabi,S.B.(2012).Participatory Analysis of the Sustainability of Livelihoods in the Agro-ecosystem of Abelard, Iran: International Environmental Modelling and Software Society(iEMSs),http://www.iemss.org/society/index.php/iemss-2012-proceedings.
[38] Brons,J.E. (2005).Activity Diversification in Rural Livelihoods, The Role of Farm Supplementary Income in Burkina Faso: Tropical Resource Management Paper NO.66
[39] Chambers,R., and Conway,G.R. (1992).Sustainable Rural Livelihoods: Practical Concepts for the 21st Century: IDS Discussion Paper 296, Brighton: IDS.
[40] Su,F.,and Shang,H. (2012).Relationship analysis between livelihood assets and livelihood strategies: A Heihe River as in example, Sciences in Cold and Arid Regions, 4(3): 0265–0274.
[41] Santiago,R.,and Lopez,A.(2008).Livelihood strategies of farmers in Bolivar, Ecuador: asset distribution, activity selection and income generation decisions in rural households: Thesis submitted to the faculty of the Virginia Polytechnic Institute and State University
[42] Scoones,I.(1998).Sustainable rural livelihoods: A framework for analysis: Working Paper 72. Brighton: IDS.

rural resource base sustainability has three broad clusters of livelihood strategies which are agricultural intensification/extensification, livelihood diversification and migration.

Human Capital: According to Sayer and Campbell (2003),[43]Human Capital means skills, knowledge, ability to labour and good health which enable people to pursue different livelihood strategies and achieve their livelihood objectives. DFID (2001), [44] describes household head as the main decision maker behind any livelihood strategy of the household. Galab et al. (2006),[45] measure human capital in terms of education level. The amount and quality of labour available varies according to household size, skill level, leadership potential, and health status (Kollmair and Gamper, 2002)[46].

Social Capital: Galab et al. (2006), [47] defines social capital as community group organisations. It is taken as means of social resources in which people draw different livelihood objectives (Moser 1998).[48]Social capital implies social resources like informal networks, membership of formalised groups and relationships of trust that facilitate co-operation (Sayer and Campbell, 2003)[49]. As stated by DFID (2001),[50] social capitals helps to cope with any kinds of vulnerability such as at the time of death, shared labour at the time of sowing and harvesting seasons and provide informal safety nets with mutual trusts and oneness. Lax and Krug, (2013)[51] also maintained social capital compensates calamities or shortage of other capitals, and indicates a strong connection between social capital and involvement into village organisations lead to an enhancement of income

Physical Capital: As stated by Galab et al. (2006),[52]physical capital means productive assets divided into farm and non-farm assets (Jonathan, 2000)[53]. Physical capital according to Lax and Krug (2013)[54] means physical requirements needed to support livelihood in regard to

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[43] Sayer,S.A and Campbell,B.M. (2003).The Science of Sustainable Development Local Livelihoods and the Global: Environment Cambridge University Press.

[44] DFID (2001).Making government work for poor people building state capacity, London.

[45] Galab et al (2006).Livelihood Diversification in Rural Andhra Pradesh: Household Asset Portfolios and Implications for Poverty Reduction: Working Paper 34, Oxford.

[46] Kollmair,M., and Gamper,S. (2002).The sustainable livelihoods approach: Input Paper for the Integrated Training Course of NCCR North-South Aeschiried, Development Study Group, University of Zurich (IP6).

[47] Galab et al (2006).Livelihood Diversification in Rural Andhra Pradesh: Household Asset Portfolios and Implications for Poverty Reduction: Working Paper 34, Oxford.

[48] Moser ,C.O.N.(1998).The asset vulnerability framework: reassessing urban poverty strategies: World Development, 26(1), pp. 1-19.

[49] Sayer,S.A., and Campbell,B.M.(2003).The Science of Sustainable Development Local Livelihoods and the Global: Environment Cambridge University Press.

[50] . DFID (2001).Making government work for poor people building state capacity, London.

[51] Lax,J.,and Krug ,J.(2013).Livelihood assessment: A participatory tool for natural resource dependent communities:Working Paper, No. 7.

[52] Galab et al (2006).Livelihood Diversification in Rural Andhra Pradesh: Household Asset Portfolios and Implications for Poverty Reduction: Working Paper 34, Oxford.

[53] Jonathan (2000).Sustainable livelihoods: International Social Science Journal, vol. 17, pp. 77–86.

[54] Lax,J., and Krug,J. (2013).Livelihood assessment: A participatory tool for natural resource dependent Communities:Working Paper, No. 7.

infrastructure, where an existing accessible infrastructure releases either labour or provides time as a resource. And lack of particular types of infrastructure is considered to be a core dimension of poverty. Without adequate access to services such as water and energy, long periods are spent in activities such as the collection of water and fuel wood leading to deterioration of human health (DFID 2001)[55].

Natural capital

Goldman et al. (2000),[56] coined the term natural capital as use of natural resources that are useful for livelihoods. Natural capital constitutes resources from intangible public goods such as the atmosphere and biodiversity to divisible assets used directly in the production of goods. According to Nacario et al. (2014),[57] the individual physical capital becomes inaccessible due to the underutilized natural capital. (Wikan, 2004)[58]. Lax and Krug (2013),[59] represents natural capital as an essential value which in fact is prone to calamities and rural communities derive all or part of their livelihoods from resource-based activities. Hence, it is important to consider access and quality of natural resources. (DFID , 2001)[60].

Financial Capital: Shah et al. (2005),[61]defines financial capital as the availability of cash or equivalent that enables people to adopt different livelihood strategies. Financial capital denotes the financial resources that people use to achieve livelihood objectives (Lasse, 2001).[62]It sets the precondition for the creation or improvement of other capitals as well (Galab et al., 2006)[63]

Kabir et al.(2012) studies the impact of small scale agricultural entrepreneurship on sustainable livelihood assets of rural poor women and role of NGOs to developed women living standard in Bangladesh. The study consists of 300 women entrepreneurs, Tobit and ordered probit regression estimation were used .The study found out livestock and poultry entrepreneurship is significant and positively associated with financial capital, physical and social capital, Vegetables entrepreneurship is significant and positively associated with natural capital and physical capital, Fisheries entrepreneurship also positive and significantly

[55] . DFID (2001).Making government work for poor people building state capacity, London.
[56] Goldman et al (2000).Institutional Support for Sustainable Rural Livelihoods in Southern Africa: Framework and Methodology, Natural Resource Perspectives: Number 49, March 2000, Overseas Development Institute.
[57] Nacario (2014.Productivity and Livelihood Analysis of Selected Areas of Libon: University of Agriculture, San Jose, Pili, Camarines Sur 4418, Philippines.
[58] Wikan, G. (2004).Cash, Crops and Cattle : A Study of Rural Livelihoods in Botswana: Botswana Notes and Records, Vol. 36, (2004) pp. 91-105.
[59] Lax ,J.,and Krug ,J.(2013).Livelihood assessment: A participatory tool for natural resource dependent Communities: Working Paper, No. 7.
[60] . DFID (2001).Making government work for poor people building state capacity, London
[61] Shah et al (2005).Livelihood assets and livelihood strategies of small farmers in salt range: A case study of Pind Dadan Khan District Jhelum, Pakistan", Pak. J. Agric. Sci., 42(1-2): 82-88.
[62] Krantz,L.(2001).The Sustainable Livelihood Approach to Poverty Reduction: International Development Cooperation Agency, Sweden.
[63]Galab et al (2006). Livelihood Diversification in Rural Andhra Pradesh: Household Asset Portfolios and Implications for Poverty Reduction: Working Paper 34, Oxford..

associated with human capital. It suggests institutional, organizational, and government support for sustainable small scale agricultural entrepreneurship[64].

Bazezew et al. (2013) explored livelihood assets, strategies and food security outcomes of rural households in a drought-prone environment in highland Ethiopia. The study was based on 210 households of Lay Gaint Woreda and sustainable rural livelihoods (SRL) framework was used. The study found out that 93% household livelihoods remain undiversified with small scale rain-fed agriculture providing the primary source of livelihood for the large majority of sample households. The use of yield-enhancing agricultural inputs such as chemical fertilizers and improved seeds was extremely low, and this was attributed to the severe land degradation and rainfall variability in the area. The study suggests improved natural resources management and diversification of livelihood strategies including interventions to create non-farm employment opportunities[65].

Purna and Nath (2011) in livelihood options for landless and marginalized communities in an agrarian society aim to study land based livelihood options which dominate Nepal. This paper is based on a research conducted in the Far Western Region of Nepal during July 2007-Nov 2008. The study reveals that food is barely enough for zero to three months for the majority in the region, they supplement their earning by cutting and sale of fire wood, and engage themselves in caste based occupation.[66]

Ziervogel and Calder (2003) examine climate vulnerability and its impact on rural livelihood. Its objective is to assess the potential role that seasonal climate forecast play in increasing adaptive capacity and contributing to sustainable pathways of rural livelihoods in response to climate variability. The study based on research undertaken in Lesotho, a small mountainous country in southern Africa. The study found out that the forecast reach a few commercial farmers but does not reach many households involved in subsistence and small-scale farming. Targeting forecasts is required so that they are available, accessible and usable for poor households and appropriate development of the seasonal forecast can be integrated into rural agrarian livelihood strategies.[67]

Shylendra (2002) explores various issues concerning livelihood strategy of local people with an objective to make an effort to rehabilitate a viable strategy for livelihood

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[64] Kabir et al(2012).Impact of Small Entrepreneurship on Sustainable Livelihood Assets of Rural Poor Women in Bangladesh:http://dx.doi.org/10.5539/ijef.v4n3p265.

[65] Bazezew et al(2013).Rural households' livelihood assets, strategies and outcomes in drought-prone areas of the Amhara Region, Ethiopia: Case Study in Lay Gaint District ,African Journal of Agricultural Research, Vol. 8(46), pp. 5716-5727, 27 .

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[67] Ziervogel, G., and Calder, R.(2013).Climate Variability and Rural Livelihoods :Area, Vol. 35, No.4 (Dec, 2003s), pp.403-417.

improvement. The survey carried out in project areas of Tigray region in Ethiopia and Gujarat region in India. The study reveals that with drought and low level of technology resulted in degradation of forests and major short term livelihood outcome being observed. The study suggest supplementary source of livelihood and strategies were important to achieve long term strategies ,ensuring fair and equal distribution and address clearly equity and gender concern.[68]

Sarkar (1998), in understanding sustainability of livelihood asses production and livelihood system adopted by the inhabitants northern mountainous belt of Bharmour, Champa district in Himachal Pradesh. The main finding was traditional livelihood systems based on agriculture and livestock rearing are subservient to ecological conditions, agriculture does not yield much due to topography of the land, inherent problem of depleting grazing pastures, preferred government jobs and agriculture supplemented by livestock rearing forms the core of traditional livelihood systems in this region. The study also found out that preference for permanent sources of cash income as well as sedentary patterns of living is now evident. He suggested that to promote sustainability, forest should be protected and conserved, and efficiency of the transportation system for enhancing sustainability to natural resource and rural livelihood[69].

Wikan (2004), in the study of rural livelihood in Botswana describe and analyzed the income strategies of several rural household based on data gathered through formal household interview from two villages i.e. Letlhakeng and Tutume in 1980 and 2000, supplemented by quantitative data. The study found out that farming has a very low potential for cash and employment generation. For rural households, the most common combination of livelihood strategies was wage income and farming, as most rural households do not grow enough food to provide for themselves throughout the year in both villages. The majority of rural households makes a living by diversifying their resources, and survives by combining income from the modern economy and the traditional subsistence sector[70].

2.7. CROPPING PATTERN

Cropping pattern is referred to the proportion of area under various crops at a point of time, change in its distribution over a period of time and factors affecting its change (Misra & Puri,

[68] Shylendra, H.S. (2002).Environmental Rehabilitation and Livelihood Impact: Emerging Trends from Ethiopia and Gujarat: Economic and Political Weekly, Vol. 37, No. 31, (Aug. 3-9, 2002), pp. 3286-3292.
[69] Sarkar, R. (1998).Understanding Sustainability: Study of a Hill Settlement: Economic and Political Weekly, Vol-33, No.44, (Oct.31-Nov.6, 1998), pp. 2800-2806.
[70] Wikan, G. (2004).Cash, Crops and Cattle: A Study of Rural Livelihoods in Botswana: Botswana Notes and Records, Vol. 36, pp. 91-105.

2011)[71]. Cropping pattern can change every year according to the variability of various factors affecting it. (Khan,2019)[72]. A small shift in crop pattern can lead to multiple increases in output and income of the farmers. (Lokesh,2019).[73] As cropping patterns of a region are closely influenced by the geo-climatic, socio-economic, historical and political factors (Husain, M., 1996)[74]. Singh (2013),[75] perceive the problem of crop pattern change is due to geographical facts and functional aspects in India. Gogoi (2016)[76] suggested proper cropping planning is an essential requirement for efficient agricultural economy. Cropping pattern to be adopted by the cultivators should be flexible(Venkatesh and Sen , 2018)[77].

2.8. LIVELIHOOD DIVERSIFICATION

The suggestions given by Brons (2005),[78] is that individuals can generate income by undertaking supplementary activities without giving up household farm income. Diversification of livelihood is essential for strengthening the income and consumption base of rural poor. Most of the rural households make a living by diversifying their resources, combining income from the modern economy and the traditional subsistence sector to make their livelihood sustainable (Mahajan , 2017 [79] & Wikan , 2004[80]). The low farm income is a critical factor encouraging livelihood diversification (Helmy, 2020)[81].

Ellis (1998),[82]describes livelihood diversification as a process by which households build a portfolio of different activities and assets in order to survive and improve their standards of living. Also Sekumade and Osundare (2014),[83]refers livelihood diversification to the ways by which households raise income, by reducing both predictable and unpredictable fluctuations (USAID, 2017)[84].

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[71] Misra,S.K.,and Puri ,V.K.(2011).Indian Economy-Its Development and Experience: Himalaya Publishing House, Pvt. Ltd.
[72] Khan ,M.(2019).Changing Cropping Pattern in Kheri District, Uttar Pradesh, India: Economic Affairs, Vol. 64, No. 4, pp. 803-812.
[73] Lokesh(2019):Trends and Decomposition of Agricultural Growth: Some Evidences from Himachal Pradesh: International journal of basic and applied research ww.pragatipublication.com ISSN 2249-3352 (P) 2278-0505 (E)
[74] Husain, M. (1996).Systematic Agricultural Geography,Rawat Publication, Jaipur and new Delhi 217. Link: https://bit.ly/2Q5VfpA
[75] Singh,A.K.(2013).Income and Livelihood Issues of Farmers: A Field Study in Uttar Pradesh: Agricultural Economics Research Review, Vol. 26 (Conference Number) 2013 pp 89-96.
[76] Gogoi,M.(2016).Cropping Pattern in Sivasagar District, Assam, India: A Case Study:ISSN 2278 – 0211 (Online) September, 2016 Vol 5 Issue 10www.ijird.com.
[77] Venkatesh,S., and Sen,C. (2018).Decomposition analysis and sustainability of cropping pattern in Andhra Pradesh, India: The Pharma Innovation Journal 2018; 7(10): 408-410.

[78] Brons,J.E. (2005),.Activity Diversification in Rural Livelihoods: The Role of Farm Supplementary Income in Burkina Faso, Tropical Resource Management Paper NO.66.
[79] Mahajan,G. (2017).Diversification of Rural Economy-A Review of Issues: Amity Journal of Agribusiness 2 (2), (30-39).
[80] Wikan, G. (2004).Cash, Crops and Cattle: A Study of Rural Livelihoods in Botswana: Notes and Records, Vol. 36, pp. 91-105.
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[82] Ellis F (1998).Survey article: Household strategies and rural livelihood diversification: The Journal of Development Studies. Vol.35, No.1, pp.1–38.
[83] Sekumade,A.B.,& Osundare,F.O. (2014).Determinant and effects of livelihood diversification on farm households in Ekiti State, Nigeria: Journal of Economics and Sustainable Development, 5(5), 1-2.
[84] USAID (2017).Livelihoods diversification analysis study report usaid/Senegal: Contracted under AID-685-C-15-00003 USAID Senegal Monitoring and Evaluation Project U.S. Agency for International Development 1300 Pennsylvania Avenue, NW Washington, DC 20523.

According to Etuk et al. (2018),[85] livelihood diversification reduces risks and stabilizes income flow and consumption which lead to improvement in quality of life, wealth accumulation and food security. Education determines livelihood diversification, therefore professional training and access to information should be enhanced to improve their livelihood (Dympep, 2018)[86]. The main constraints faced by the households are asset base like lack of credit facilities, awareness and training facilities, fear of taking risk, inadequate infrastructure, and lack of opportunities in non-farm sector, unfavourable agro-climate etc (Mithiya et al., 2018)[87].

Saha and Bahal (2014)[88] pointed out that the returns from agriculture have been uncertain and erratic, that is why agriculture does not provide enough livelihood security. To cope with the uncertainties, the supplementary activities adopted by people were dairy farming, piggery, sheep rearing, and poultry etc without giving up agriculture. They also adopt mixed farming, including bee-keeping, sericulture etc. Swargiary and Mahanta (2020)[89] opined that the people choose to pursue a supplementary occupation for flexible sources of income when primary activities fail to provide the livelihood. Hence, Livelihood diversification takes place when people change the composition of agricultural products they produce (Hussein and Nelson, 1998)[90].

Khatun and Roy (2012) studied rural livelihood diversification in West Bengal to understand the determinants and constraints to livelihood diversification among different livelihood groups. The study was based on the data taken from Barampur and Debogram in the Burdwan district and Narayanpur and Goaladi in the Purulia district, where 50 households from each village were selected randomly. The main determinants of livelihood diversification are household-head experience, educational level, social status, training, asset position, access to credit, rural infrastructure, agro climatic condition and the overall level of economic development of a region. The constraints in diversified as well as less diversified areas were poor asset base, lack of credit facilities, lack of awareness and training facilities, fear of taking risk, lack of rural infrastructure, and lack of opportunities in non-farm sector,

[85] Etuk et al (2018).Determinants of livelihood diversification among farm households in Akamkpa Local Government Area, Cross River State, Nigeria: Journal Agro search, vol 18.

[86] Dympep (2018).Livelihood Diversification Scenario in Hill State, Meghalaya: Impact and Determinants: Economic Affairs, Vol. 63, No. 3, pp. 775-778.

[87] Mithiya et al (2018).Trend, pattern and determinants of crop diversification of small holders in West Bengal: A district-wise panel data analysis: Journal of Development and Agricultural Economics Vol. 10(4), pp. 110-119, April 2018, ISSN2006- 9774.

[88] Saha,B., and Bahal,R.(2014).Livelihood Diversification Pattern among the Farmers of West Bengal: Research Paper, 59(3): 2014: DOI 10.5958/0976-4666.

[89] Swargiary,P., and Mahanta,A.(2020).Extent of Rural Livelihood Diversification: The Case of the Bodo's of Assam, India: Asia-Pacific Social Science Review 20(1) 2020, pp. 184–190

[90] Ka rim H., and Nelson.J.(2001).Sustainable livelihoods and livelihood diversification : IDS working paper 6 9.

The study suggests development of rural infrastructure in terms of road, market, electrification, telecommunication, storage facilities, institutional innovations to reduce entry costs and barriers to poor livelihood groups and a comprehensive development plan[91].

Okere et al. (2013) examined the patterns and determinants of livelihood diversification among farm households in Odeda Local Government area, Ogun state, Nigeria. The study was based on the primary data obtained from 70 randomly selected households drawn by multi-stage sampling across 14 farming villages in the study area. The study found out increase in education as well as farm income tends to lower the extent of livelihood diversification. The study also found out that low farm income is a critical factor encouraging livelihood diversification in the study area. The study suggests the need to focus on measure to raise their farm income in order to keep farm households in agriculture[92].

2.9. LIVELIHOOD VULNERABILITY

Using Livelihood Vulnerability Index (LVI), Sujakhu et al. (2019) assess the livelihood vulnerability of rural indigenous households to climate changes in Central Nepal, Himalaya with an objective to explore how cultural and gender-related aspects influence livelihood vulnerability in indigenous farming mountain communities. The study found out that female-headed families and disadvantaged social groups are more vulnerable. The overall vulnerability were due to climatic extremes and related hazards, dependency on natural resources, lack of financial assets, and weak social networking[93].

A similar study undertaken by Kabir et al. (2018) in South-Western Coastal Bangladesh. The index comprises of 31 subcomponents for 7 major components. The study indicates that food security was most vulnerable among the farmers. Further, suggests a quantified comparison of present and potential vulnerability which may help in determining the probable sector for capacity and resilience enhancement while divulging and signifying potential areas of development intervention[94].

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[91] Khatun,D., and Roy,B.C.(2012).Rural Livelihood Diversification in West Bengal: Determinants and Constraints: Agricultural Economics Research Review, Vol. 25(No.1),pp 115-124.

[92] Okere et al (2013).Patterns and Determinants of Livelihood Diversification among Farm Households in Odeda Local Government Area, Ogun State, Nigeria: Research journal's of Economics Vol. 1, www.researchjournali.com.

[93] Sujakhu N.M., Ranjitkar, S., He,J., Schmidt,D.,Su,Y., and Xu,J.(2019). Assessing the Livelihood Vulnerability of Rural Indigenous Households to Climate Changes in Central Nepal, Himalaya :doi:10.3390/su11102977 www.mdpi.com/journal/sustainability.

[94] Kabir,A., Rahman,S.N., Sraboni,H.J.(2018).Application of Livelihood Vulnerability Index in Assessing Local Vulnerabilities to Rapid Environment Change: A Case Study of South -Western Coastal Bangladesh International Journal of Science and Research (IJSR) ISSN: 2319-7064.

A major contribution in the study of farmers' livelihood vulnerability was made by Hahn et al. (2009) by creating the framework for assessment. In their study on risks assessment from climate variability and change in Mabote and Moma Districts of Mozambique developed farmers' Livelihood Vulnerability Index (LVI) for estimating climate change vulnerability. Altogether 400 households were surveyed covering the major components like socio-demographics, livelihoods, social networks, health, food and water security, natural disasters and climate variability. The Study found out that Moma is more vulnerable in terms of water resources while Mabote is more vulnerable in terms of socio-demographic structure[95].

Gravitiani et al. (2018) determine community livelihood vulnerability level in northern and southern coastal area of Java. The study aims to examine the social-economics vulnerability to climate change. The data were collected from 216 respondents from the coastal area and analysed using Livelihood Vulnerability Index (LVI), which indicates that the livelihood condition of coastal communities are vulnerable. However, based on LVI-IPCC analysis, contradicted the earlier result that coastal communities are not vulnerable[96].

Devi et al. (2016) assess risks from climate variability and change in livestock farming in Chitradurga and Kolar districts of Karnataka.The components selected are socio-demographics, livelihoods, social networks, health, food and water security, natural disasters and climate variability. For data analysis, Livelihood Vulnerability Index (LVI) was used and 120 households were surveyed in each district. The study found that Chitradurga district is more vulnerable in terms of water resources while Kolar district is more vulnerable in terms of socio-demographic structure[97].

Astuti and Handanyani (2020) asses mixed rural-urban neighbourhood in Tambak Lorok Semarang. Livelihood vulnerability index (LVI) and factor analysis were used to assess the level of vulnerability. The study found out that residents in the area have low capabilities to cope with their uncertain sources of income due to their limited capacity and was unable to optimize the potential of their proximity to urban services[98].

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[95] Hahn, M.B., Riederer, A.M., Foster, S.O.(2009). The Livelihood Vulnerability Index: A pragmatic approach to assessing risks from climate variability and change—A case study in Mozambique. Global Environmental Change 19 (2009) 74–88,journal homepage: www.elsevier.com/locate/gloenvcha

[96] E Gravitiani.E., Fitriana,S.N., and Suryanto.(2018). Community livelihood vulnerability level innorthern and southern coastal area of Java,Indonesia,IOP Conf. Series: Earth and Environmental Science **202** (2018) 012050 doi :10.1088/1755-1315/202/1/012050

[97] Devi,G.L., Dhirendra Varma,D, Kataktalware,M.A.(2016). The Livelihood Vulnerability Analysis: A Pragmatic Approach to Assessing Risks from Climate Variability and Change—a Case Study Of Livestock Farming In Karnataka, India.IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS) e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 9, Issue 2 Ver. II (Feb. 2016), PP 15-19.

[98] Astuti, M. F. K., Handayani.W.,(2020). Livelihood vulnerability in Tambak Lorok, Semarang:an assessment of mixed rural-urban neighbourhood.https://doi.org/10.1007/s10037-020-00142-7

Amuzu et al. (2016) determine households' livelihood vulnerability to climate change and climate variability in the coastal zone of Gambia. The major components are socio-demographic, livelihood strategies, social networks, health, water, natural disasters and knowledge and skills. Both primary and secondary data were used and analysed LVI based on a survey of 355 household heads. The LVI revealed Kombo South district is more vulnerable to health, food, knowledge and skills, while Lower Niumi district is more vulnerable to socio-demographic, livelihood strategies, social networks, water, natural disasters and climate variability. The overall LVI-IPCC main components of vulnerability reveal households in Kombo South are more vulnerable than households in Lower Niumi district[99].

Shahzad et al. (2019) assessed livelihood vulnerability due to climatic variability of natural resource dependent mountainous communities. Based on primary data collected from four villages complemented with secondary climatic data, livelihood vulnerability was estimated using both livelihood vulnerability index (LVI) and LVI-IPCC. The study found out that the comparative analysis of Tehsil Balakot of UC Balakot was more vulnerable with a LVI score of 0.41 than UC Kawai 0.35. The study also found out that in-depth analysis of differential vulnerability showed households in UC Balakot had the low adaptive capacity and higher exposure to natural disasters[100].

2.10. INSTITUTIONAL SUPPORT SYSTEM

Scoones (1997)[101] opines that the institutional support system is important for planning and implementing a sustainable rural livelihoods policy. Institutional support system like extension encourages a wider range of communication and learning activities. (Purcell and Anderson, 1997)[102]. Peters (2006)[103] suggests the development of agricultural extension work should be reviewed as it plays a key role in giving quality training to the farmers (Allahyari, 2008)[104].

[99] Amuzu,J.,Amos T. K.B., Jallow,B.P., Yaffa,S.(2016). Households' Livelihood Vulnerability to Climate Change and Climate Variability: A Case Study of the Coastal Zone, The Gambia.Journal of Environment and Earth Science www.iiste.org,ISSN 2224-3216 (Paper) ISSN 2225-0948 (Online),Vol.8, No.1, 2018.

[100] Shahzad, L., Tahir, A., Sharif, F., Hayyat, M., Ghani, N., Farhan, M.,Dogar, S. S.(2019). Does livelihood vulnerability index justify the socio-economic status of mountainous community?A case study of post-earthquake ecological,Adaptation of balakot population,Applied ecology and environmental research 17(3): 6605-6624.Http://www.aloki.hu, ISSN 1785 0037 (online)

[101] Scoones,I. (1997).Landscapes, Fields and Soils: Understanding the History of Soil Fertility Management in Southern Zimbabwe: Journal of Southern African Studies, 23, 615–634.

[102] Purcell,L., & Anderson,J.R, (1997).Agricultural research and extension: Achievements and problems in national systems: World Bank Operations Evaluation study, World Bank, Washington DC, USA.

[103] Peters,B.G.(2000). Institutional Theory and Public Organizations: Essays in Memory of Raimund, German

[104] Allahyari,M.S.(2008).Extension mechanisms to support sustainable agriculture in Iran context,: American Journal of Agricultural and Biological Sciences (3:4), pp. 647- 655.

Suri (2006)[105] claims that the political representatives are less sensitive to farmer's problem. So far, adopting sustainable agricultural knowledge and technology to the rural areas is absent (Allahyari, 2008)[106]. Efforts should be made to promote peer-to-peer collaboration for extension program in sustainable agriculture (Menalled et al., 2009).[107]As sustainability depends on the degrees of connectivity between institutional systems and farmers. Agricultural sustainability depends on optimal interplay between institutions, farming systems and agri-environmental policies (Ostrom, 1992)[108].Sustainable agriculture can only be achieved if the institutional environment is adequately reflected by governance structures leading to the implementation of strong institutional rules and favourable actions and outcomes at the action level (McGinnis, 1999)[109].

Gatzweiler (2003) determines institutional change towards sustainability in agriculture and environment works in central and eastern European agriculture. The study found that the quality of institutional change required for sustainability goes beyond the building of legislative frameworks and requires more time than was envisaged by the roadmap to accession. The study explores the role of social and human capital stocks in rural areas of CEECs outlining a number of differences in environmental governance in the agricultural sectors between various CEECs[110].

Mathuabirami and Kalaivani (2021) determine the institutional support for tribal farmer interest groups in Erode district of Tamil Nadu, India. The findings of the study are 100% of the respondents received information regarding input availability, subsidiary activities, and various schemes of the state department of agriculture. Also majority of the respondents received information on technical support for production of crop (98.00%) and received credit support whenever needed (98.00%). Furthermore, NGOs and State Department of Agriculture played a major role in improving the standard of living of these tribal people[111].

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[105] Suri K.C, (2006).Political Economy of Agrarian Distress: Economic and Political Weekly Vol.41, No.16, (Apr. 22-28, 2006), PP.1523-1529, http://www.jstor.org/stable/4418110.

[106] Allahyari,M.S. (2008).Extension mechanisms to support sustainable agriculture in Iran context: American Journal of Agricultural and Biological Sciences (3:4), pp. 647- 655.

[107] Menalled et al (2001).Weed aboveground and seed bank community responses to agricultural management systems: Eco. Appl. 11, 1586– 1601.

[108] Ostrom (1992). Crafting Institutions for Self-Governing Irrigation Systems: san Francisco, CA: ICS Press

[109] McGinnis,M.D. (1999). Polycentricity and Local Public Economies: Readings from the Workshop in Political Theory and Policy Analysis: Ann Arbour, MI: University of Michigan Press.

[110] Gatzweiler,F.(2003). Patterns of institutional change for sustainability in central and eastern European agriculture,CEESA Discussion Paper No. 16,ISSN 1616-9166.

[111] Mathuabirami, V. and Kalaivani, S. (2021). Institutional support for tribal farmer interest groups in Erode district of Tamil Nadu, India. Journal of Applied and Natural Science, 13 (SI), 167 - 171. https://doi.org/10.31018/jans.v13iSI.2823

Mwamfupe (2019) examines the access to institutional support for climate change adaptation in Rural Tanzania based on 416 sample farming households obtained through stratified random sampling. For small farmers,there was a mismatch between their perceived adaptation needs and available institutional support. The study also found out that access to market, climate information, agricultural inputs, skills and technologies, land tenure security etc are the critical institutional factor, necessary for effective adaptation to climate change. Further, the social, environmental, political and economic barriers hamper the functioning of institutional support system.[112].

Asokhan and Sirkar (2021) determine institutional support for enhancing the livelihood of tribal farmers through farmer producer groups. In Seethampeta block of Srikakulam district in Andhra Pradesh,145 respondents were selected through multistage proportionate random sampling method. Data were analysed using mean and standard deviation. The study reveals that members of tribal FPGs receive information on various schemes of department of agriculture and allied departments had highest mean score of 2.759 and lowest mean score was gained by being informed of quality testing of inputs had low mean score of 1.552. The institutional support was found to be of medium level for nearly three-fourths (74.48%) of the respondents. The study suggests that there is a need to supply need based and location specific support for the tribal farmers and making them aware of weather related information and testing of inputs for quality[113].

2.11. AGRICULTURE AND LIVELIHOOD

Acharya (2006)[114] suggested that the approach to sustainable agriculture and rural livelihoods should emphasize on reduction of the poverty of the present generation. He is of the opinion that in predominantly agricultural economies, livelihood of farmers may be difficult to improve without causing some damage to natural resources. In the situation of a trade-off, first priority needs to be accorded to elimination of hunger and reduction of poverty and malnutrition than environmental preservation. Government's social security and food assistance programmes should cover all the four rural livelihood systems, viz. production-based, labour-based, market based, and transfer-based systems.

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[112] Mwamfupe,A.(2019).Farmers 'Access to Institutional Support for Climate Change Adaptation in Rural Tanzania,Tanzania :Journal of Population Studies and Development, Vol. 26 No. 2, 2019: 118 – 144.

[113] Asokhan, M.,and Katiki Srikar,K.(2021). Institutional support for enhancing the livelihood of tribal farmers through farmer producer groups : The Pharma Innovation Journal 2021; SP-10(12): 1446-1448.

[114] Acharya,S.S.(2006). Sustainable Agriculture and Rural Livelihoods in Agricultural Economics: Research Review Vol. 19 July-December 2006 pp 205-217.

Israr and Khan (2010) aims to analyze the sources of livelihood in rural areas of Northern Pakistan.. The paper was based on 323 respondents from Shangla district. The findings of the study are the main sources of livelihood were agriculture and its related activities and supplemented by off farm activities. The income from farm sector was 40.63% and off farm activities is 59.37% .Morever, the natural resources available are underutilized .The study further suggests that the area has a natural advantage of cheaper grazing facility so encouragement of dairy farming business can enhance the income of rural people .[115]

NAIP (2014), the Planning Commission of India has identified 15 districts of the state as disadvantaged districts. Out of these, Dhar and Jhabua districts are characterized by degrading natural resources, adverse climatic extremes, undulating topography, shallow and eroded soil, small and fragmented size of holdings, low investment capacity of the farmers that have made traditional farming as a subsistence and uneconomic. Agriculture and allied activities are main source of livelihood in these districts. Cultivation of crops like maize, cotton, soybean, wheat and chickpea; vegetable crops namely, chilli, tomato, okara for seeds production resulted in an income of Rs 0.97 lakhs/ year in rain fed farming of small farmers in Jhabua. Innovative cultivation of crops viz., maize, soybean & wheat and vegetable crops okra, brinjal and chilli, *kadaknath* rearing and custom hiring promotes livelihood (Rs 2.05 Lakhs/year) among small holding farmers of district Jhabua. The interventions like capacity building on formation of seed societies, seed production technologies, quality assurance, seed processing, storage and marketing were regularly made for their smooth functioning. The positive effects of these seed societies are now more visible from the formation and execution of 26 new seed societies in the Jhabua and Dhar district. Ginger cultivation also appeared as new source of livelihood in disadvantaged districts like Dhar in Madhya Pradesh. Improved variety, drip irrigation, ridge sowing and need based crop protection measures promotes high rhizome yield and economic return. Low milk yield of livestock was mainly due to deficit in dry and green fodder. Introduction of chaff cutter and manger save about 296.34t/year of roughage thus, prevent the fodder wastage. Cultivation of vegetable chilli with innovative technologies like, improved variety/ hybrid, drip irrigation, ridge sowing and application of FYM has identified as alternative source of livelihood in disadvantaged districts of Madhya Pradesh.[116].

[115] Israr,M., and Khan,H. (2010),.An analysis of livelihood sources in hilly areas of northern Pakistan: sarhad j. agric, vol. 26, no.4, 2010, 665-672.

[116] NAIP(2014).Integrated farming system for sustainable rural livelihood in undulating and rain fed areas of jhabua and dhar districts of Madhya Pradesh final report: National Agricultural Innovation Project Indian Council of Agricultural Research Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (M.P.) Race Course Road, Gwalior - 474 002.

A study undertaken by Zhilong Wu et al. (2021)[117] addresses the issues of rural sustainable livelihood security (SLS) in the Poyang Lake Ecological Economic Zone. Using multiple econometrical and geographical methods, they tried to explore the rural SLS from 2010 to 2018 through, and identify its spatial-temporal pattern and constraints. The result shows that since 2009, rural livelihood security has been on a continuous decline, due to multiple socio-ecological reasons. Dominating factors, including proportion of fish farming area, rural per capita electricity consumption, urbanization rate, and farmers' per capita disposable income, possesses the highest power determinant value in shaping the spatial pattern of rural SLS. The constraints limiting rural SLS have transformed from backward economic efficiency to social inequality and ecological pressure. The authors have suggested for future policy that should emphasize on ecological protection and social construction, especially the organic fertilizer popularization and fisherman's livelihoods transition. Meanwhile, opined that by reinforcing rural power infrastructure and improving social services for agricultural mechanization would ensure rural sustainable livelihood security (SLS) in the region.

Farmers' household livelihood choice has been critical in ecosystem and natural resource sustainability in developing countries as opined by Yan Liu (2021), [118]. The author investigates the choices of farmer household livelihood, by using a multinomial logistic regression model to analyze 676 farmer household questionnaire responses from 6 counties in Anshun City, Guizhou Province. The factors such as land quality, regional accessibility, government policies, and farmer households' characteristics have significant effect on farmer household livelihood choices.The study found that good regional traffic accessibility facilitates farmer households' part-time non-agricultural employment. He suggests that government policies should target to diversify the choices of farmer household livelihoods in different eco-environment regions.

The NAIP sub project "Efficient Land Use Based Integrated Farming System for Rural Livelihood Security in Aurangabad, Dhule & Gondia Districts of Maharashtra" was executed in six clusters of varied climate, crop, physiographic and socio-economic conditions. The landless villagers decided to use common property resources such as water tanks, grazing lands, and tank beds for fish farming, goat keeping and growing summer crop in dry beds of water tanks. Successful implementation of these land use plans produced an outcome that

[117] **Zhilong, W., Liu, T.,Xia,M., Zeng,T. (2021) .Sustainable livelihood security in the Poyang Lake Ecological Economic Zone: Identifying spatial-temporal pattern and constraints, Applied Geography, Volume 135.**

[118] Liu,Y.(2021).Household livelihood choices under the different eco-environment in the Karst area: A case study of Anshun City, Southwest of China, Environmental Research, Volume 197.

provides a new way of using more than 6000 water bodies in the district. Group of 18 villagers trained in fish farming earned Rs.18000/year from a water tank. Fish farming potential of the district was thus identified. Similarly in an innovative way dry beds of seasonal water bodies were used for raising watermelon crop by a group of 30 farmers of the village. This activity generated an employment to 30 households during summer (a lean season) in a village of 200 households. Each villager earned Rs.10000/person on an average. In Sakri cluster 10 farmers replaced wheat with onion crop in 1 ha each for seed production and later the number of farmers growing onion increased to 160 with 80 ha area. The farmers have earned Rs. 1, 00,000/ha on an average and the onion produce from the cluster has become a selling brand in Dhule APMC, because of its quality[119].

Vaidyanathan (2000) studies how Indian agricultural developments have undergone changes since independence. The study focuses on self sufficiency in food consumption, trend in rural inequalities, distributive justice and the effect of government policies on incentive to growth. The study analyzes the data of last 50 years taken from National Sample Survey of Kerala, West Bengal, Tamil Nadu, Bihar and Maharashtra. The study found out that poorest 20% of rural below nutritional norms. There is a rapid growth of population, unemployment rate, growing regional disparities between rain fed and irrigated agriculture.[120].

2.12. LIVELIHOOD SUSTAINABILITY THROUGH AGRICULTURE

Habit and Anwar (2014)[121] assert agriculture as the main source of livelihood of rural area. The main agricultural practices are crop cultivation and animal husbandry. Singh (2013)[122] specifies that even after including income from animal husbandry, the farmers income remain low. Kumar (2010)[123] insists there are still subsistence farmers, who primarily depend on agriculture in the fields and kitchen gardens. The commodities which can be produced at the farm for self-consumption at little cost are being purchased at a higher market

[119] Chaturvedi et al(2014).Efficient Land Use Based Integrated Farming System for Rural Livelihood Security in Aurangabad:Dhule and Gondia districts of Maharashtra".
[120] Vaidyanathan, A. (2000).India's agricultural development policy: Economic and Political Weekly, Vol.35, No.20, (May 13-19, 2000), PP. 1715-1741.
[121] Habib,N., and Anwar,M.Z.(2014).An Analysis of Socioeconomic Profile of Rural Sugarcane Farmers in District Muzaffar Garh, Pakistan: Journal of Small Business and Entrepreneurship Development March 2014, Vol. 2, No. 1, pp. 191-199
[122] Singh,A.K.(2013).Income and Livelihood Issues of Farmers: A Field Study in Uttar Pradesh: Agricultural Economics Research Review, Vol. 26 (Conference Number) 2013 pp 89-96.
[123] Kumar,K.A. (2010).Local Knowledge and Agricultural Sustainability: A Case Study of Pradhan Tribe in Adilabad District::centre for economic and social studies, Hyderabad, Working Paper No. 81,January, 2010.

price. (Singh and Sachdeva, 2017)[124]. If farmers increase their production they can achieve food security and can attain sustainable livelihood from agriculture (Balcha, 2013)[125].

Agahi et al. (2012),[126]describes sustainable agriculture as an integrated system of plant and animal production practices which satisfy human needs, enhance the environmental quality, make the most efficient use of resources, sustain the economic viability of farm operations and improve the livelihood of farmers. For sustainable agriculture, promoting and improving farmer's knowledge and their attitude to increase agricultural productivity is essential(Khoram et al., 2006)[127].

Friedrich and Kienzle (2008),[128] made a breakthrough declaration in their study that a more recent factor contributing to the decline in global rice production is climate change. Rain fed cultivation is estimated to account for about 25 per cent of global rice production, which makes it particularly vulnerable to fluctuations in rainfall, as well as heat stress from high temperatures. With the expected demand for rice to increase in the coming years, food security is a serious threat unless this situation can be improved. Targeting forecasts can be integrated into rural agrarian livelihood strategies that could increase the sustainability of livelihoods (Ziervogel and Calder, 2003)[129]. The goal of developing sustainable agriculture is the responsibility of farmers, workers, policy makers, researchers, retailers and consumers. (Carreón et al., 2011[130] and Cramb et al., 2009),[131] suggests the active involvement of local people, positive market incentives and supportive government policies are essential in planning, implementing, monitoring and evaluating development and conservation programs. there is a need for transformation of subsistence farming to market-oriented commercial agriculture which would make a significant contribution in transforming rural livelihood (Hague 2003)[132].The capacity building at government level, access to finance etc, will also increase small-scale farmers income (Ladefoged et al., 2009)[133].In recent times, cash crops

[124] Singh,S., and Sachdeva,J.(2017).Factors Affecting Income and Employment of Marginal and Small Farmers in South-Western Punjab: Journal of Agricultural Development and Policy, 2017,Volume 27, No. 1&2, 37-43.
[125] Balcha, Y. (2013).Prospects of Transforming Subsistence Agriculture into Sustainable Livelihoods: A case-study of the Ribb sub-Catchment, Ethiopia: Master thesis in Sustainable Development at Uppsala University, No. 123, 38 pp. 30.
[126] Agahi et al (2012).Agricultural Graduate Students' Attitudes towards Sustainable Agriculture: A Case of Razi University", Iran Annals of Biological Research, 2012, 3 (8):4007-4011.
[127] Khoram et al(2006).Survey on knowledge, attitude and practice on sustainable agriculture among rural farmers in Hamadan province, Iran", Sarhad J. Agric. Vol.22, No.4, 2006.
[128] Friedrich,T., and Kienzle,J. (2008),Conservation agriculture: impacts on farmers' livelihoods, labor, mechanization and equipment: Pages 25-36 Proceedings of an international workshop, May 7-9, 2007.
[129] Ziervogel, G., and Rebecca.(2003).Climate Variability and Rural Livelihoods Area: Vol. 35, No. 4 (Dec., 2003), pp. 403-417, Wiley, http://www.jstor.org/stable/20004345 .
[130] Carreón et al (2011).A knowledge approach to sustainable agriculture: In M. Behnassi, & S. Draggan (Eds.), *Global food insecurity: Rethinking agricultural and rural development paradigm and policy* Springer.
[131] Cramb et all (2009) .Sweden Transformations and Rural Livelihoods in Southeast Asia: Human Ecology, Vol. 37, No. 3, (Jun, 2009), pp. 323-346.
[132] Hague, T. (2003).Reforms for Agricultural Growth and Rural Development: Economic and Political Weekly, Vol 38, No-48, (Nov.29 - Dec. 5, 2003), PP. 5031-5033.
[133] Ladefoged, T., Hansen, R.B., Worsoe,T.A.,and Fredslund,H,M. (2009).Jatropha and Sustainable Livelihood of Small-scale Farmers:Teksam, K2 – University of Roskilde, Department of Environmental, Social and Spatial Change – ENSPAC

have often improved livelihoods but complete specialization for the market will increase vulnerability. (Crucefix, 1998)[134].

The traditional system of production is still prevalent for centuries without declining productivity but relatively low subsistence yield. In future, crop production will have to produce more from less land by making more efficient use of natural resources and with minimal impact on the environment (Hobbs et al 2008)[135].Farmers livelihood will depend on farmer willingness to adapt and change. The farmers need a well-planned, good partnership, and mixed farming for a future growth (Collison et al., 2002)[136].Since there is a rapid growth of population, unemployment rate, growing regional disparities ,new technology in favour of large farmers, government trade and price policies discriminate against agriculture (Vaidyanathan 2000)[137]. Thus, Sharma (2007),[138] suggested that stabilizing farm income, increasing employment opportunities for small and marginal farmers, boosting exports and conserve and enhancing natural resource base is essential for livelihood sustainability.

Cramb et al. (2009), on "Sweden transformations and rural livelihoods in Southeast Asia", aims to explore the interactions between the transformation of Sweden farming and the pursuit of rural livelihoods in the uplands of Southeast Asia. The paper is based on six case studies from Palawan in the Philippines, East and West Kalimantan in Indonesian, Borneo, Jambi Province in Sumatra, central highlands of Vietnam and the mountains of northern Thailand. The findings shows that increased political and regulatory control, socio-cultural causes, the public and private investment in estate crops and absence of household members for extended periods, especially young people has been a major cause of the decline of Sweden agriculture. Cash crops have often improved livelihoods but complete specialization for the market increases vulnerability .The study suggests active involvement of local people, positive market incentives and supportive government policies are essential in planning, implementing, monitoring and evaluating development and conservation programs in Sweden lands[139].

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[134] Crucefix, D. (1998).Organic Agriculture and Sustainable Rural Livelihoods in Developing Countries: Soil Association, Bristol House, 40-56 Victoria Street, Bristol BS1 6, UK.

[135] Hobbs, et al., (2008) .The Role of Conservation Agriculture in Sustainable Agriculture: Philosophical Transactions: Biological Sciences: Vol. 363, No. 1491, (Feb. 12, 2008), Sustainable Agriculture I, pp. 543-555.

[136] Collison (2002).Agricultural Development in the Eastern Region (ADER): Partnership Business Plan 2002-2012. Unpublished document.

[137] Vaidyanathan, A. (2000).India's agricultural development policy: Economic and Political Weekly, Vol.35, No.20, (May 13-19, 2000), PP. 1715-1741.

[138] Sharma,R. (2007).Agricultural development and crop diversification in Jammu and Kashmir: A district level study, pattern, processes and determinants: Review of Development and Change, 12(2), 217–251.

[139] Cramb, R. A., Carol, P.,Colfer, Dressler.W., Laungaramsri, L., Trang,Q.,Mulyoutami,E., Nancy,L., Peluso, and Wadley, L.R. (2009).Sweden Transformations and Rural Livelihoods in Southeast Asia: Human Ecology, Vol. 37, No. 3, (Jun, 2009), pp. 323-346.

Balcha (2013), in his study assessed the importance of agricultural transformation in achieving sustainable livelihood in rural Ethiopia. The study focuses on the different agricultural transformation components and different farming typologies at household level. The study is based on both primary and secondary data. The primary data was based on the survey conducted during April and May 2012, in the Ribb Sub-Catchment area of the Fogera Woreda. The findings shows that households in the study area belong to four major farm typology i.e., below-subsistence, subsistence, constant improving and commercial level farm typologies. Farm size, land fragmentation, non-farm income, weak institutions, poor access to markets and credit, inadequate infrastructure, poor soil fertility and land degradation have constrained households to transform to smallholder commercialization. The study suggests that if small farmers commercialize their production they can achieve food security and reduce poverty thereby, can attain sustainable livelihood from agriculture[140].

Crucefix (1998), in his study on organic agriculture and sustainable rural livelihoods in developing countries examine the impact of organic agriculture on income of the rural poor. The aim of this study was to evaluate what makes organic agriculture fail to flourish in developing countries. The study found that agriculture in developing and in-transition countries exhibits a complete spectrum of approaches from collection of wild products through small traditional farms towards large commercial estates, from labor intensive to highly mechanized systems and from locally organized farm cooperatives to foreign owned plantations. The study suggests financial incentive, comprehensive monitoring and evaluations to enable farmer's livelihood sustainability[141]

Carswell (1997**)** examines agricultural intensification as a strategy for achieving sustainable livelihoods. The study is based on the cases of Africa and Asia by outlining the key conceptual questions surrounding intensification, setting them within the context of the broader environment and population debate. It aims to demonstrate the complexity of the processes at work and discussed the importance of institutional factors in determining whether intensification is sustainable in the longer term. The study found out that agricultural intensification depend on a number of factors including agro-ecological environment, level of returns in the face of risk and uncertainty, policy environment, agricultural research facilities, access to technology, information etc. The study also found that most societies have

[140] .Cramb, R. A., Carol, P.,Colfer, Dressler.W., Laungaramsri, L., Trang,Q.,Mulyoutami,E., Nancy,L., Peluso, and Wadley, L.R. (2009).Sweden Transformations and Rural Livelihoods in Southeast Asia: Human Ecology, Vol. 37, No. 3, (Jun, 2009), pp. 323-346.
[141] .Crucefix, D. (1998).Organic Agriculture and Sustainable Rural Livelihoods in Developing Countries: Soil Association, Bristol House, 40-56 Victoria Street, Bristol BS1 6, UK.

responded to population growth and increased market demand by intensifying their agricultural systems.[142].

Joneydi (2012) determines factors affecting sustainability of agricultural production systems in Iran .Its objective is to identify factors affecting the sustainability of production systems in Shushtar Township since agricultural production cooperatives have special importance in the region economy. The study was based on the survey conducted in crop year 2011 of about 160 people collected through questionnaires. The finding of the study are most of the farmers are illiterate and old, 66.78 % of production cooperatives lie in the relatively stable group, there is a positive and significant relationship between age, farming experience, type of agriculture, agricultural land area, and area of cultivated land, ecological characteristics, social status, knowledge and attitudes for sustainable agricultural production cooperatives with stability. In multivariable regression analysis for identifying the influencing factors to sustainability has been showed that six variables of total production, attitude to sustainable agriculture, the amount of intake facilities, social association, and relational properties indicate about 81% of dependent variable of production cooperatives[143].

2.13. CONCLUSIONS

To conclude, Sustainable livelihood through agriculture is a multidimensional concept and is an integrated system of productive practices which provides foods, enhance the environmental quality, make the most efficient use of resources, sustain the economic viability of farm operations and improve farmer's livelihood (Agahi, 2012)[144]. The farmers face many types of constraints which are lack of employment opportunities, food insecurity, limited or unutilized natural resources, limited livelihood capabilities restrict the choice of functioning, and few marketable skills. The policies should focus on development of infrastructure in the rural areas and improvement in rural marketing system which needs attention of farmers. The problems of sustainable development are rooted in the issue of resource and use and their pattern of production. In predominantly agricultural economic livelihood of farmers, rural household may be difficult to improve without causing damage to natural resources. Improvement in farmers' vulnerabilities, livelihood assets, and strategies should be implemented for sustainable livelihood. Access to various capital assets, enhancing their livelihood assets and possibly providing alternative livelihood strategies in future and

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[142] . Carswell, G. (1997).Agricultural Intensification and Rural Sustainable Livelihoods: A Think Piece:http://www.ids.ac.uk/ids/research/env/index.html, IDS Working Paper 64

[143] Joneydi,S. (2012).Factors affecting in sustainability of agricultural production systems in Iran: Scholars Research Library Annals of Biological Research, 2012, 3 (9):4578-4583 .

[144] Agahi et al (2012):Agricultural Graduate Students' Attitudes towards Sustainable Agriculture: A Case of Razi University: Iran Annals of Biological Research, 2012, 3 (8):4007-4011 (http://scholarsresearchlibrary.com/archive.html)

improved participation are essential for sustainable livelihood. There is a need to undertake realistic management capacity assessment at system and organization levels in order to ensure that sufficient training, skills and resources are available to support effective implementation of the policies. Proper emphasis is required on improvement in efficiency of livelihood assets and strategies, livelihood diversification, cropping pattern, proper marketing system and appropriate institutional support system for sustainable agriculture. Hence, a proper analysis of agriculture production requires a holistic understanding of all the production capabilities and opportunities and priorities at the grass root level.

CHAPTER-3

SOCIO ECONOMIC PROFILE

3.1 INTRODUCTION

The socio-economic conditions of farmers indicate the status of their livelihood. It is therefore, necessary to assess the socio-economic status, which is a combined measurement of economic and social position of an entity in the society. It influences the accessibility to resources, livelihood pattern, food & nutritional security etc. It often predicts the psychological and behavioral components of a person viz. knowledge, attitude, perception, adoption, change-proneness, level of aspiration, risk bearing ability, economic motivation etc. The farmers in hills are dwelling in a complex, diverse and risk-prone situation and are usually practicing traditional ways of cultivation. A hill farmer who is only dependent on agriculture hardly secures his family food and nutrition. An understanding of the socio-economic status of the hill farmers and its determinants provides a glimpse of socio-economic profile of a sample of hill farmers and ascertains their socio-economic status (Roy et al., 2013)[1].

Capability building activities on resource mobilization and management, and alternative livelihood opportunities must be provided to the farmers in rural area so as to improve their living condition and build strong and sustain partnership among them and with other service providers and stakeholders for better collaboration towards development (Nacario, 2014)[2]. Socio-economic differences in asset ownership, income levels, gender, age, religious affiliation, caste, social or political status etc also have a major impact on the composition of livelihood portfolios (Scoones, 1997)[3]. Socio-economic characteristic of farmers influence decision-making ability, availability and acceptance of improved techniques of production. It is imperative for research to have its focus on the rural societies, with the objective of gathering enough data which will enable effective policies to be put in place for greater and easier production of food (Alfred, 2015)[4]. Farmer's socio-economic and farm characteristics are relevant towards understanding and improving small ruminant production (Yankyera, 2014)[5]. Therefore, to understand the farmers' livelihood, the study on

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[1]Roy et al., (2013),"International Journal of Agriculture and Food Science Technology", ISSN 2249-3050, Volume 4, Number 4 (2013), pp. 353-358 © Research India Publications http://www.ripublication.com

[2] Nacario (2014, "Productivity *and Livelihood Analysis of Selected Areas of Libon",* University of Agriculture, San Jose, Pili, Camarines Sur 4418, Philippines.

[3] Scoones (1997), " Landscapes, Fields and Soils: Understanding the History of Soil Fertility Management in Southern Zimbabwe", Journal of Southern African Studies, 23, 615–634

[4] Alfred (2005), "Measurement of farm households' socio-economic and socio psychological variables: a paradigm for evolving a more appropriate method", Journal of agriculture and social research , vol. 5, no.1, 2005.

[5] Yankyera (2014)," Socio-economic Characteristics of Subsistent Small Ruminant Farmers in Three Regions of Northern Ghana", Asian J. Appl. Sci. Eng. 3:93-106.

socio economic variables is enviable. In this chapter, the physical and climatic conditions, demographic features and infrastructure etc of the State as well as the area of study are highlighted here.

3.2 .PHYSICAL FEATURES OF NAGALAND

Nagaland is the 16th state of the Indian Union, situated in North-Eastern part of India, established on 1st December, 1963. It has an area of 16,579 square kilometres with a population of 1,980,602 as per the 2011 Census of India,it is one of the smallest states of India [6] . It is bordered by the state of Arunachal Pradesh to the north, Assam to the west, Manipur to the south and Myanmar to the east. The capital of Nagaland is Kohima located in the southern part of Nagaland and Dimapur is the largest city which is considered as the commercial hub of Nagaland[7]. The state has 16 administrative districts: Chumukedima, Dimapur, Kiphire, Kohima, Longleng, Mokokchung, Mon, Niuland, Noklak, Peren, Phek, Shamator, Tuensang, Tseminyu, Wokha and Zunheboto. The State is mostly mountainous except those areas bordering Assam valley. The highest peak in Nagaland is Mount Saramati with a height of 3,840 metres and its range forms a natural barrier between Nagaland and Myanmar[8]. The high mountains, deep gorges, green valleys, twisty streams and exotic flora and fauna are the physical features of Nagaland[9].

3.2.1. Climatic conditions of Nagaland

Generally, Nagaland has monsoon climate with high humidity levels. Annual rainfall averages around 1,800–2,500 millimetres (70–100 in), concentrated in the months of May to September. Temperatures range from 21 to 40 °C (70 to 104 °F). In winter, temperatures do not generally drop below 4 °C (39 °F), but frost is common at high elevations. Summer is the shortest season in the state, lasting for only a few months. The temperature during the summer season remains between 16 to 31 °C (61 to 88 °F). Winter often arrives early, with bitter cold and dry weather striking certain regions of the state. The maximum average temperature recorded in the winter season is 24 °C (75 °F). Strong northwest winds blow

[6] https://en.wikipedia.org/wiki/Nagaland

[7] https://nsdma.nagaland.gov.in/geography-of-nagaland

[8] https://www.jagranjosh.com/general-knowledge/nagaland-1292394682

[9] https://www.india-travel-information.com/india-information/indian-states/nagaland/physical-features/

across the state during the months of February and March[10]. The climate in general is controlled by the terrain features, where it is hot to warm in areas with elevations of 1000m to 2000m. Temperature varies from 0°C in winter to about 40°C in summer depending on elevation. The Agro—climatic zone is divide into four zones, viz., hot per-humid climate, hot moist sub-humid climate, warm humid climate and warm per-humid climate[11]

3.2.2. Forest

Based on interpretation of satellite data, the forest area is 12,489 Sq.km which is 75.33% of the State's geographical area. In terms of forest canopy density classes, the State has 1,279 Sq.km areas under very dense forest, 4,587 Sq.km under moderately dense forest and 6,623 Sq.km under open forest[12]. The forest types found in the State are Northern Tropical Wet Evergreen Forest, Northern Tropical Semi Evergreen Forest, Northern Sub-Tropical Broad Leaved Wet Hill Forest, Northern Sub-Tropical Pine Forest, Northern Montane Wet-temperate Forest and Alpine Forest.[13]

3.2.3. Flora and Fauna

According to Annual Administrative Report 2019-2020 of the state department of Environment, Forest and Climate Change, Nagaland "has the finest tropical, subtropical evergreen forests and unique broad leaved moist temperate forests." The state is home to a rich variety of flora and fauna. Rare species of trees and plants are found in the forests of Nagaland. The variety of endangered species of animals and birds also make the forest regions of Nagaland their home. Nagaland lies in the 10th distinct bio-geographic zone under one of the identified 18 mega hot spots in the world with reference to threats to biodiversity. However, human activities like jhum cultivation and deforestation have been endangering many of the state's flora and fauna, as per a government report[14].

3.3. DEMOGRAPHIC FEATURES AND INFRASTRUCTURE

3.3.1. Population

[10] https://en.wikipedia.org/wiki/Nagaland

[11] Nagaland SPSP

[12] Nagaland ISFR 2017

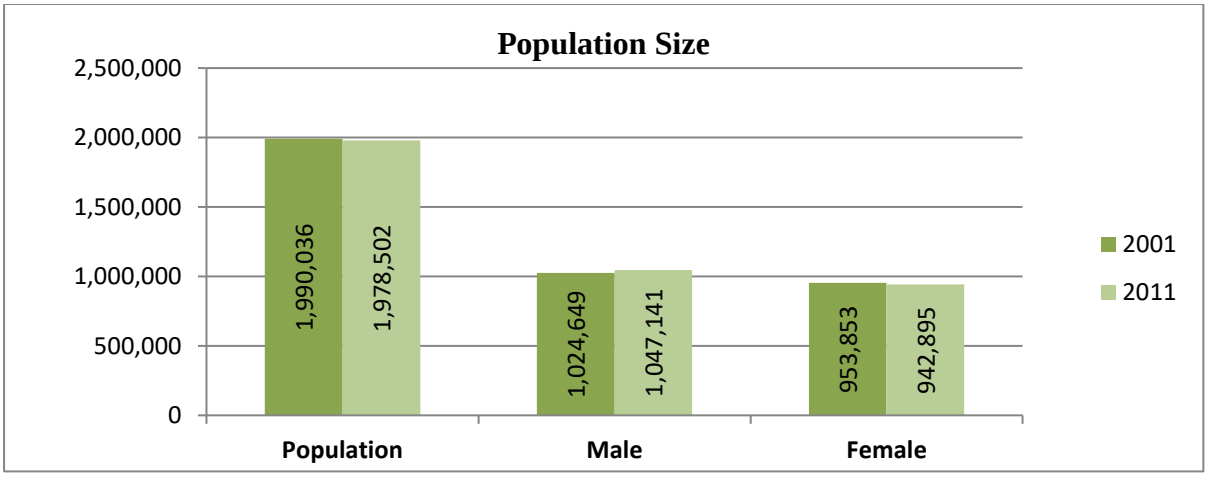
[13] https://nagalandgk.com/forest-types-of-nagaland/

[14] https://www.morungexpress.com/reckless-deforestation-endangering-biodiversity-in-nagaland-govt-report

As per details from Census 2011, Nagaland has population of 1,978,502, a decrease from 19.90 lakhs in 2001 census. Out of total population, male and female are 1,024,649 and 953,853, respectively. The total population shows a negative growth during the decade with -0.58 percent, while in previous decade it was increased by 64.41 percent. The population of Nagaland accounted for 0.16 percent of India in 2011. Nagaland census data 2011 shows 73.81% houses were owned while 21.35% were rented. In all, 77.70% couples in Nagaland lived in single family[15].

The Nagas, an Indo-Asiatic people, form more than 20 tribes, as well as numerous sub tribes, and each one has a specific geographic distribution. The Konyaks are the largest tribe, followed by the Ao's, Semas, and Angamis. The major-recognised tribes of Nagaland are Angami, Chakhesang, Chang, Khiamniungan, Kuki, Konyak, Lotha, Phom, Pochury, Rengma, Sangtam, Sumi, Yimchungru and Zeliang[16]. Each tribe has its own dialect. There are about 60 spoken dialects, all belonging to the Sino-Tibetan language family. Intertribal conversation generally is carried on through broken Nagamese, English is the official language of the state[17].

Figure 3.1: Population Size of Nagaland



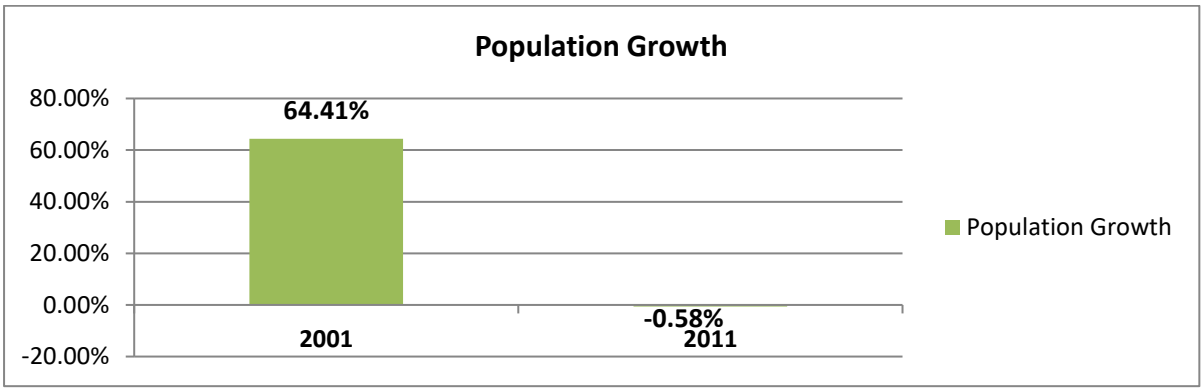
Source: census 2011

[15] https://www.census2011.co.in/census/state/nagaland.html

[16] https://entri.app/blog/nagaland-basic-facts-history-quiz/

[17] https://www.britannica.com/place/Nagaland

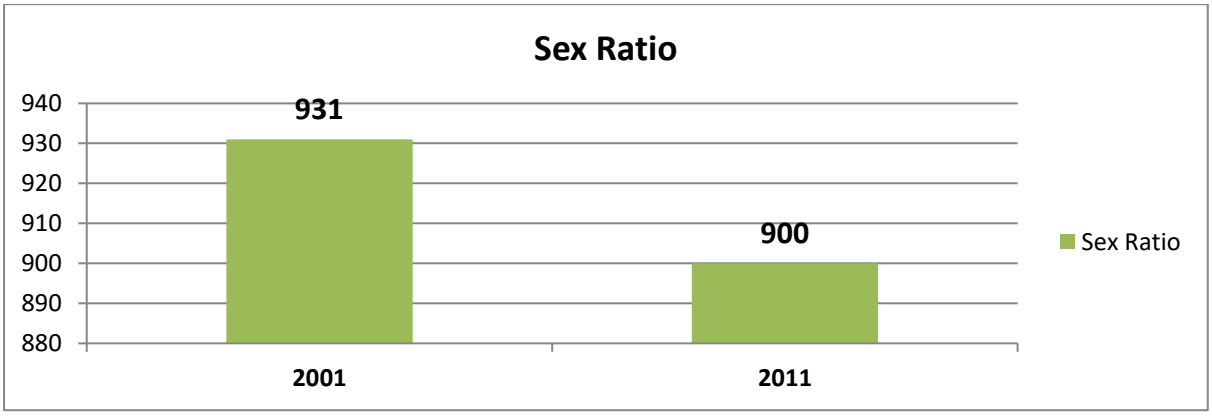
Figure 3.2: Population Growth of Nagaland



Source: Census 2011

As per details from Census 2011, Nagaland is the only Indian state which has witnessed negative growth rate of -0.58% during 2001 to 2011.

Figure 3.3: Sex Ratio of Nagaland

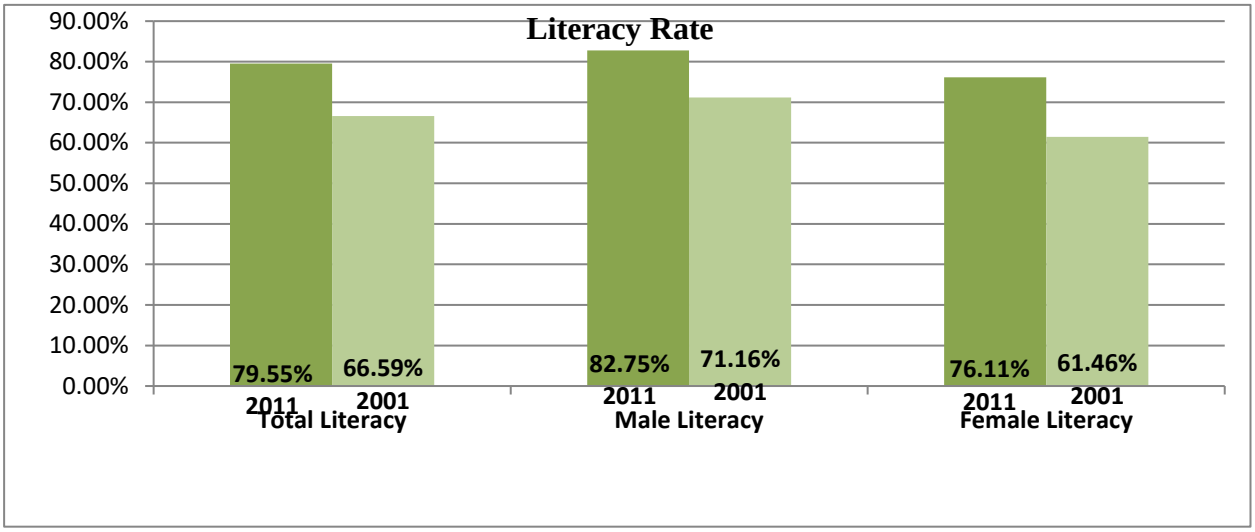


Source: census 2011

As per census 2011, the Sex Ratio in Nagaland was 931 for 1000 male which was increased from 900 per 1000 males in 2001.

3.3.2 Literacy Rate

Figure 3.4: Literacy Rate of Nagaland



Source: Census 2011

According to Census 2011, Nagaland has a literacy rate of 79.55 percent, which has increased from 66.59 percent in 2001,with male literacy of 82.75 percent and female literacy of 76.11 percent in 2011, which were increased from male literacy at 71.16 percent and female literacy at 61.46 percent respectively in 2001 census.

3.3.3. Density

Table 3.1: Density of Population in Nagaland

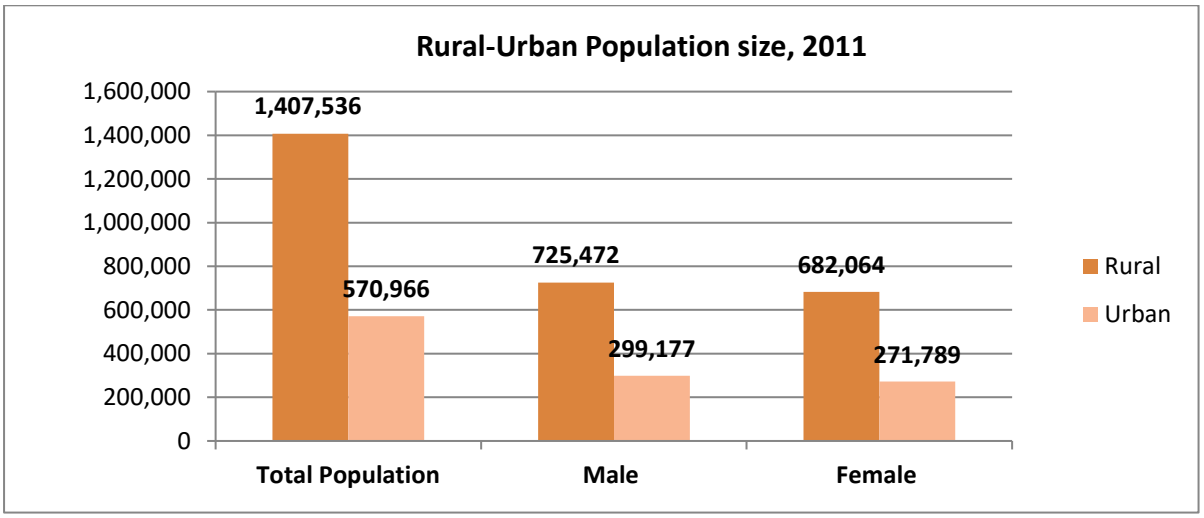
Sl.No	District	Population (2011)	Area (km²)	Density (/km²)
1	Dimapur	3,78,811	926	409
2	Kiphire	74,004	1,255	65
3	Kohima	2,67,988	1,041	183
4	Longleng	50,484	885	90
5	Mokokchung	1,94,622	1,615	121
6	Mon	2,50,260	1,786	140
7	Noklak	59,300	1,152	51
8	Peren	95,219	2,300	58
9	Phek	1,63,418	2,026	81
10	Tuensang	1,37,296	1,728	98
11	Wokha	1,66,343	1,628	120
12	Zunheboto	1,40,757	1,255	112

Source: Census 2011

According to Census 2011, Dimapur has the highest population density with 409 per km² followed by Kohima (183 per km²), Mon (140 per km²), Mokokchung (121 per km²) , Wokha (120per km²), Zunheboto(112 per km²) and the remaining six namely Kiphire, Longleng, Noklak,Peren,Phek and Tuensang districts were below 100 per km². There is no separate data available for newly created districts (Chumukedima, Nuiland, Shamatur and Tseminyu).

3.3.4. Rural-Urban Population Size

Figure 3.5: Rural–Urban Population size of Nagaland



Source: Census 2011

The total population living in urban areas was 570,966, of which, 299,177 were males and while remaining 271,789 were female. Rural population was 1407536, out of which 725472 were male and 682964 were female. In 2011, Nagaland population was comprised of 71.14% of rural and 28.86% of urban population.

3.4. ECONOMY

Table 3.2: Gross State Domestic Product, Nagaland(*Rupees in crores*)

Year	Current Price		Constant (2011-12) Prices	
	(Rs in cr)	% change	(Rs in cr)	% change
2011-2012	12177	-	12177	-
2012-2013	14121	15.96	12868	5.37
2013-2014	16612	17.64	13793	6.71
2014-2015	18401	10.77	14399	4.21
2015-2016	19524	6.10	14660	1.78
2016-2017	21722	11.26	15650	6.33
2017-2018	24492	12.75	16485	5.07
2018-2019	27283	11.40	17647	6.58
CAGR		10.61		4.75

Source: NER Data Bank, *(As on 15-03-2020)*

Table no 3.2 shows the GSDP for the year 2011-12 was same for both current and constant prices at Rs.12177 crores. This was increased to Rs.27283 crores and Rs.17647 crores for current price and constant prices respectively. The Compound Annual Growth Rate (CAGR) for GSDP at current price for the period 2011 to 2019 was 10.61% and the same for constant price (2011-12) was estimated at 4.75% only.

Table 3.3: Net State Domestic Product, Nagaland(*Rupees in crores*)

Year	Current Price		Constant (2011-12) Price	
	(Rs in crores)	% change	(Rs in crores)	% change
2011-2012	10554	-	10554	-
2012-2013	12318	14.32	11163	5.46
2013-2014	14545	15.31	11923	6.37
2014-2015	16104	9.68	12406	3.89
2015-2016	17128	5.98	12600	1.54
2016-2017	19174	10.67	13488	6.58
2017-2018	21742	11.81	14218	5.13
2018-2019	24534	11.38	15381	7.56
CAGR		11.12		4.82

Source: NER Data Bank,*(As on 15-03-2020)*

Table no 3.3 shows the NSDP for the year 2011-12 was also same for both current and constant prices at Rs.10554 crores. In the year 2018-19, it was increased to Rs.24534 crores and Rs.15381 crores for current and constant prices, respectively. The Compound Annual Growth Rate was higher for current price with 11.12%, while for constant price (2011-12) was only 4.82%.

Table 3.4: Per Capita Net State Domestic Product

(Rupees in crores)

Year	**Current Price**		**Constant (2011-12) Price**	
	(Rs in cr.)	% change	(Rs in cr.)	% change
2011-2012	53010	-	53010	-
2012-2013	61225	13.42	55482	4.46
2013-2014	71510	14.38	58619	5.35
2014-2015	78367	8.75	60372	2.90
2015-2016	82466	4.97	60663	0.48
2016-2017	92315	10.67	64939	6.58
2017-2018	104681	11.81	68456	5.14
2018-2019	116882	10.44	73276	6.58
CAGR		10.39		4.13

Source: NER Data Bank, *(As on 15-03-2020)*

Table no 3.4 shows the Per Capita NSDP for the year 2011-12 was also same for both current and constant prices at Rs.53010 crores. In the year 2018-19, it increases to Rs.116882 crores and Rs.73276 crores for current and constant prices respectively. The Compound Annual Growth rate was higher for current price with 10.39%, while for constant price was only 4.13%.

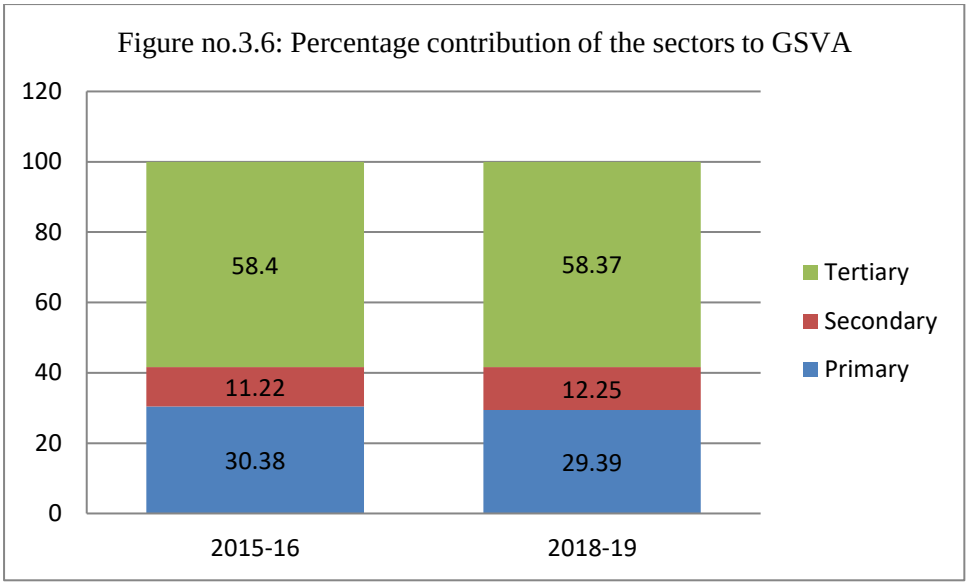
Table 3.5.Percentage contribution of the sector to GSVA at constant prices

Sector	**2015-16**	**2018-19**
Primary	30.38	29.39
Secondary	11.22	12.25
Tertiary	58.40	58.37

Source: Nagaland economic survey 2018-19.

P-Provisional, A. E-Advance Estimates

Figure no.3.6: Percentage contribution of the sectors to GSVA



Source: Table 3.5

Table No 3.5 and figure no 3.6 shows contributions of various sectors to GSVA at constant prices. The share of primary sector in the State's economy is significant, which contributed about 29.39% during 2018-19. However, the tertiary sector has been the most important sector, which share was more than 58% in States' economy during the observed period.

3.5. EMPLOYMENT BY SECTOR WISE

Table 3.6: Workers and Non Workers, Nagaland (in %)

Workers and Non workers	Mokokchung	Zunheboto	Nagaland
Total Workers (Main and Marginal)	51.42	56.46	49.24
Main workers	41.46	35.08	37.46
Marginal workers	9.77	21.37	11.77
Non-Workers	48.58	43.54	50.76

Source: census of 2011, District Census Handbook Mokokchung & Zunheboto

Table no 3.6 shows the total workers (main and marginal) for Nagaland are 49.24% and where main workers are 37.46%, marginal workers are 11.77 %. The non-workers are constitute 50.76% .

For the sample districts, the total workers (main and marginal) for Mokokchung are 51.42% where main workers are 41.46 % and marginal workers are 9.77%. The non-workers

are constitute 48.58% .Similarly for Zunheboto, The total workers (main and marginal) are 56.46% where main workers are 35.08 % and marginal workers are 21.37%.The non-workers are constitute 43.54% .

Table 3.7: Category of workers

Category of(Main and Marginal)	Mokokchung		Zunheboto	Nagaland
Cultivators	48.89		56.28	55.2
Agricultural Labour	9.16		15.04	6.46
Workers in Household Industry	3.80		2.55	2.35
Other workers	38.15		26.13	35.99

Source: census of 2011, District Census Handbook Mokokchung & Zunheboto

Figure no. 3.7. : Sector wise workers (in %)

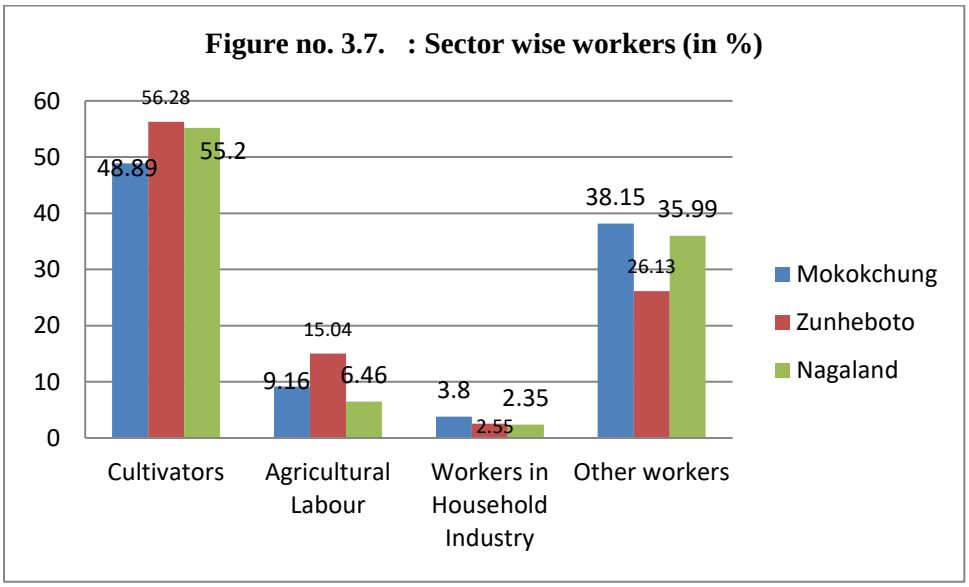


Table no 3.7 shows the cultivators(main and marginal)for Nagaland are 55.2% followed by other workers at 35.99%,agricultural labour at 6.46% and workers in household industry at 2.35% .

The cultivators(main and marginal)for Mokokchung are 48.89 % followed by other workers at 38.15%,agricultural labour at 9.16 % and workers in household industry at 3.80% . For Zunheboto, the cultivators(main and marginal) for Zunheboto are 56.28 % followed by other workers at 26.13%,agricultural labour at 15.04 % and workers in household industry at 2.55% .

3.6. AGRICULTURE IN NAGALAND

Agriculture is the most important economic activity and basically a land of agriculture. The contribution of agricultural sector in the state is very significant in Nagaland. During 2014-15,the primary sector contribution to Gross State Value Added at constant prices is 30.38% and 29.39% during 2018-19. The major agricultural system is slashed and burn cultivation locally known as Jhum. Total cultivable areas are 7, 21,924 hectare. Area under jhum and terraced cultivation is about 1, 01,400 hectare[18].

Farmers in hilly area commonly practice subsistence agricultural which is known as shifting cultivation or Jhum cultivation. In some places, intensive cultivation (terrace and wet rice cultivations) with irrigation is in practiced. Commercial agriculture is not widespread in the state. The major crops in Nagaland are rice, corn, millets, pulses, oilseeds, sugarcane, potato, banana, pineapple, orange, litchi, ginger, yams, cucumber and areca nut. Rice is the dominant crop and also the staple diet of the people. Oil seeds like rapeseed, mustard, and soybean are grown in wide areas. Rubber, coffee, cardamom and tea are grown as plantation crops in Nagaland. The important vegetables are gourds; spinach leaf, squash, mustard, onion, chillies, garlic, spring onion, beans, carrots, tomatoes, brinjal etc., Cash crops like sugarcane; passion fruit and potato are also becoming popular [19] .The unsustainable agricultural practices in the state had led to the loss of fertility due to soil erosion. This has hampered the growth of the economy.

3.6.1. Agriculture System in Nagaland

The agricultural systems followed in the state are as follows:

a. Shifting cultivation

In Nagaland, *Jhum* or slash and burn cultivation is the traditional system of farming generally practice in the hilly region, where roughly 80% of cultivable land is under jhum. Mixed cropping is practised in the jhum fields with rice as the main crop, although in some cases, maize and millet is the staple food. Variety of species of crops can be found in a single jhum field (about 15 to 60). Aside from the staple crop, supplementary crops include maize, millet, Job's tears, legumes, beans, oilseeds, root crops and vegetables. After the harvest of cereals

[18] https://nagalandjournal.wordpress.com/2013/04/26/farming-in-nagaland/

[19] Nagaland SPSP.State perspective and strategic plan (spsp) of Nagaland state level nodal agency for IWMP department of land resources government of Nagaland.

or oil seed, the fields are generally left fallow during the winter months and only a few vegetables like ginger, beans, chillies, colocassia and green vegetables are grown[20].

Majority of farmers in the State depend on shifting cultivation for supporting their livelihood. This farming system is purely of organic, which does not utilise fertilizers or chemicals. A particular plot, after cultivation for two to three years, abandoned the land as fallow and shifts to another area and further proceed to another plot and after some years goes back to the first plot of land, this form of rotation follows a pattern, in that way the nutrients and soil fertility would be replenished. The longer the duration of fallow period is, more fertile the soil becomes and is beneficial for the crops. With the rise in demand for the food due to the increase in population, the period of fallow land has been reduced over the years. With high rainfall intensity on the hilly slopes increases the erosion rate and degrades soil fertility, which is not environmental friendly and reduces productivity. In recent years, traditional *jhum* is in a critical stage, with unresolved issues pertaining to environmental degradation and assuring sustainable livelihood and income for the farmers[21].

b. Wet terrace rice cultivation (WTRC)

Paddy cultivation on irrigated terrace benches on hilly slope is another system of cultivation. Abundant rainfall and/or irrigation are an important factor. Crops like rice, potato, garlic and cabbage are commonly grown. Rice and potato are the two main crops grown in the Angami areas of southern Kohima district. In certain other areas like Kohima, Mon and Tuensang, winter wheat is also grown[22]. The terrace fields are said to be passed on from generation to generation within the family. The terraces are usually cut slopes in hilly areas with water depth of 8-10cm into a series which resemble stairs. For irrigation, it depends on rain or other water channels and streams; where water flows from one terrace to another, along with preventing erosion of soil, maintaining fertility and reduces surface runoff. Small water channels and outlets are constructed, along with bunding at the edges of terrace benches for proper stability[23].

c. Alder tree based farming

On the jhum fields soil erosion being a major threat due to intense rainfall on sloppy topography, the people of Khonoma village has started raising Alder trees alongside major

[20] NEPED and IIRR (1999), "Building upon Traditional Agriculture in Nagaland, India", Nagaland Environmental Protection and Economic Development (NEPED) and International Institute of Rural Reconstruction (IIRR).

[21] Solo and Khikhi (2021), "An overview of the farming systems in Nagaland",Journal of Pharmacognosy and Phytochemistry 2021; Sp 10(1): 238-243.

[22] NEPED and IIRR(1999), "Building Upon Traditional Agriculture in Nagaland, India", Nagaland Environmental Protection and Economic Development(NEPED) and International Institute of Rural Reconstruction (IIRR).

[23] Solo and Khikhi (2021), "An overview of the farming systems in Nagaland",Journal of Pharmacognosy and Phytochemistry 2021; Sp 10(1): 238-243

agricultural crops- rice, maize. The root nodules of the trees are able to fix nitrogen into the soil, hence improving soil fertility, also providing shed and cover for plantation crops like cardamom grown at higher elevation or low elevation like coffee. With this *jhum* is carried out for a longer period of 4-5years, with increase production and also checks erosion. Symbiotic frankia are special structures or nodules present on the roots of the trees for nitrogen fixing and rejuvenating the *jhum* lands. Alder tree species are planted in the jhummed site and allowed to grow as reclamation for the soil fertility.

e. Zabo

This farming system is native of Kikruma village under Phek district, which covers an area of 957.9 ha. The rain water is harvested in ponds for irrigation purpose. It has been reported that the techniques of water harvesting and management practised by the local farmers are so unique. The water from road side and surrounding area is channelled from inlet into the pond to reduce loss from seepage. Silt retention reservoirs are also erected at some places and cleaned at annual period. Then water is released from the base of the pond for irrigation purpose and passed through pipes or bamboo outlets. Paddy is the primary crop cultivated in this system. All the farmers who share the outlets take in charge of cleaning it timely .This type of system follows the integration of livestock- cattle, pig, sheep, poultry and sheep alongside the paddy and vegetable cultivation. The paddy fields are located at lower elevation. Paddy along with fish farming is commonly followed by the farmers. The entire system consists of forest area at the top most, followed by siltation tanks at the bottom with horticultural crops on the edges, consisting with an outlet channel then livestock shed[24].

F.The Home Garden

The home garden is generally located close to the house and is used for growing vegetables, fruits and other food crops for the family and marketing. A wide variety of vegetable crops and fruits are grown throughout the year in home gardens including potato, cabbage, chilli, squash, maize, tree tomato, bean, carrot, onion, garlic, orange, peach, plums, pears etc[25].

[24] Solo and Khikhi (2021), "An overview of the farming systems in Nagaland",Journal of Pharmacognosy and Phytochemistry 2021; Sp 10(1): 238-243.

[25] NEPED and IIRR(1999), "Building Upon Traditional Agriculture in Nagaland, India", Nagaland Environmental Protection and Economic Development(NEPED) and International Institute of Rural Reconstruction(IIRR).

3.6.2. Area, Production and Yield

Table 3.8: Kharif and Rabi Food Grains: Area, Production and Productivity

(Area in Hectare / Production in M.T. Yield - Kg./Hectare)

State	A/P	Kharif Food grains		Rabi Food grains	
		2015-16	2019-20	2015-16	2019-20
Nagaland	A	287.42	303.58	33.77	36.97
	P	468.04	512.18	47.80	53.24
	Y	1628	1687	1415	1440
All India	A	69204.82	708620	54012.86	5613.25
	P	125091.83	13812.15	126449.73	153692.3
	Y	1808	2029	2341	2738

Source: NER Data Bank, 2020

Table no.3.8 shows that during 2015-16 to 2019-20, in all India data, area of production of Kharif food grains increased from 69204.82 to 708620 hectares and the production increased from 125091.83 to 13812.15 million tonnes. The yield increased from 1808 to 2029 kgs/hectare. The area of all India Rabi food grains increases from 54012.86 to 5613.25 hectares, and the production increases from 126449.73 to 153692.3 million tonnes. The yield increases from 2341 to 2738 kgs/hectare during the corresponding period.

The area under Kharif food grains in Nagaland increased from 287.42 to 303.58 during the same period. The production increased from 468.04 to 512.18 million tonnes and yield increased from 1628 to 1687 kgs/hectare. The area of Rabi food grains in Nagaland increases from 33.77 to 36.97 hectare. The production increases from 47.80to 53.24 million tonnes and yield increases from 1415 to 1440 kgs. /hectare.

Table 3.9. Area and Production of Commercial crops, (2014-15 to 2018-19)

(Area in Hectare / Production in M.T.)

Crops	Area/ Production	Mokokchung		Zunheboto		Nagaland	
		2014-15	2018-19	2014-15	2018-19	2014-15	2018-19
Yam	A	180	2000	150	180	4250	4440
	P	1320	1460	1090	1310	1830	193180
Ginger	A	280	320	270	300	1700	1960
	P	2550	2940	2470	2740	12410	14290
Potato	A	740	760	230	240	3620	960
	P	7410	7600	2340	2400	35020	36230
Sugarcane	A	340	340	220	240	7200	7520
	P	14790	14790	9580	10440	73370	75240

Source: NER Data Bank, 2020.

Table no.3.9 shows that during 2014-15 to 2018-19, in Nagaland data, area of production of yam increased from 4250 to 4440 hectares and the production increased from 1830 to 193180 million tonnes. The area of ginger increases from 1700 to 1960 hectares, and the production increases from 12410 to 14290 million tonnes .The area of potato increased from 3620 to 960 and production increased from 35020 to 36230 million tonnes .The area of sugarcane increases from 7200 to 7520 hectare and production increases from 73370 to 75240 million tonnes.

During 2014-15 to 2018-19, in Mokokchung, area of production of yam increased from 180 to 2000 hectares and the production increased from 1320 to 1460 million tonnes. The area of ginger increases from 280 to 320 hectares, and the production increases from 2550 to 2490 million tonnes .The area of potato increased from 740 to 760 and production increased from 7410 to 7600 million tonnes .The area and production of sugarcane increases remain constant during the same period.

For Zunheboto during 2014-15 to 2018-19, the area of production of yam increased from 150 to 180 hectares and the production increased from 1090 to 1310 million tonnes. The area of ginger increases from 270 to 300 hectares, and the production increases from 2470 to 2740 million tonnes .The area of potato increased from 230 to 240 and production increased from 2340 to 2400 million tonnes .The area of sugarcane increases from 220 to 240 hectare and production increases from 9580 to 10440 million tonnes.

Table 3.10. Area and Production of Vegetable Crops, 2014-15 to 2018-19:

(Area in Hectare / Production in M.T.)

Crops	**Area/ Production**	**Mokokchung**		**Zunheboto**		**Nagaland**	
		2016-17	2018-19	2016-17	2018-19	2016-17	2018-19
Green Chilly	A	580	296.00	340	342.00	5884	4797.75
	P	4160	1850	2414	2421.00	43537	33787.50
Cabbage	A	740	410.00	615	500.00	7975	6941.75
	P	14800	5900.00	1259	1014.00	150162	118652.00
Brinjal	A	40	40.00	40	41.00	463	35.50
	P	335	410.00	303	301.00	3696.2	3522.00
Beans	A	160	160.00	141	147.00	2426	2318.00
	P	1400	1200.00	1184	1215.00	19866.4	17699.50
Carrot	A	50	40.00	45	45.00	533	460.75
	P	617	555.00	549	540.00	6223	5380.50
Tomato	A	447	350.00	250	251.00	3080	27.42.25
	P	3647	3600.00	1792	1806.00	22061	19695.50

Source: NER Data Bank, 2020

Table no.3.10 shows that during 2016-17 to 2018-19, in Nagaland data, area of production of green chilly decreased from 5884 to 4797.75 hectares and the production decreased from 43537 to 33787.50 million tonnes. The area of cabbage decreases from 7957 to 6941.75 hectares, and the production decreases from 150162 to 118652.00 million tonnes .The area of brinjal decreased from 463 to 35.50 and production increased from 3696.2 to 3522.00 million tonnes .The area of beans decreases from 2426 to 2318.0 hectare and production decreases from 19866.4 to 17699.50 million tonnes. The area of carrot decreased from 533 to 460.75 and production increased from 6223 to 5380.50 million tonnes .And the area of tomato decreases from 3080 to 2742.25 hectare and production decreases from 22061 to 19695.50 million tonnes.

During 2016-17 to 2018-19, in Mokokchung, area of production of green chilly decreased from 580 to 296 hectares and the production decreased from 4160 to 1850 million tonnes. The area of cabbage decreases from 740 to 410 hectares, and the production decreases from 14800 to 5900.00 million tonnes .The area of brinjal remains constant at 40 and production increased from 335 to 410.00 million tonnes .The area of beans remains constant at 160 and production decreases from 1400 to 1200 million tonnes. The area of carrot decreased from 50 to 40 and production increased from 617 to 555 million tonnes .And the area of tomato decreases from 447 to 350.00 hectare and production decreases from 3647 to 3600 million tonnes.

For Zunheboto, area of production of green chilly increased from 340 to 342.00 hectares and the production increased from 2414 to 2421.00 million tonnes. The area of cabbage decreases from 615 to 500.00 hectares, and the production decreases from 1259 to 1014.00 million tonnes .The area of brinjal increased from 40 to 41.00 and production decreased from 303 to 301.00 million tonnes .The area of beans increases from 141 to 147.00 hectare and production increases from 1184 to 1215.00 million tonnes. The area of carrot remains constant at 45 hectare and production increased from 549 to 540.00 million tonnes .And the area of tomato increases from 250 to 251.00 hectare and production increases from 1792 to 1806.00 million tonnes.

3.7. LAND-USE AND LAND OWNERSHIP PATTERN

3.7.1 Land-use Pattern

Table 3.11: Area under Different Land use in Nagaland, 2017-18 and 2018-19 *(in Hectares)*

District/State	Mokokchung		Zunheboto		Nagaland	
	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19
Reporting area for LUS	160935	160982	124862	124904	1652591	1653110
Forest	81657	81657	61376	61376	862930	862930
Not available for cultivation	10450	12640	6745	7820	95530	112109
Net Sown Area	33724	42628	37593	37839	384802	383594
Net Cropped Area	47802	52052	48573	48828	530102	52894
Fallow land	17605	21885	10002	10013	153188	15558

Source: NER Data Bank,2020

Table no.3.11 shows that during 2017-18 to 2018-19, in Nagaland data, Reporting area for LUS increased from 1652591 to 1653110 hectares. The area of forest remains constant at 86230.The area not available for cultivation increases from 95530 to 11109 hectares. The net sown area decreased from 384802 to 383594.The Net cropped area decreases from 530102 to 52894 hectare and fallow land decreases from 153188 to 15558 million tonnes.

During 2017-18 to 2018-19, in Mokokchung, Reporting area for LUS increased from 160935 to 160982 hectares. The area of forest remains constant at 81657.The area not available for cultivation increases from 10450 to 12640 hectares. The net sown area increased from 33724 to 42628.The Net cropped area increases from 47802 to 52052 hectare and fallow land increases from 17605 to 21885 million tonnes.

For Zunheboto, reporting area for LUS increased from 124862 to 124904 hectares. The area of forest remains constant at 61376.The area not available for cultivation increases from 6745 to 7820 hectares. The net sown area increased from 37593 to 37839.The Net cropped area increases from 48573 to 48828 hectare and fallow land increases from 10002 to 10013 million tonnes.

3.7.2 Land ownership Pattern

The land ownership pattern of the Nagas is unique and different from the rest of the country, where local customary laws govern the land. Such laws are tribe-specific where each tribe or even village has its own unique customary laws and traditions. These customary laws are usually not codified but have the constitutional sanction. The enforcement of these traditional laws and regulations rests on village councils or tribal chiefs. In Nagaland, about

92% of the land is unclassified and are under the community ownership, which may fall under any one of the recognized four categories- Individual land, Clan land, Morung land, and Common land. The state government owns just about 7% of the total land area. Depending upon the tribe, the land either belongs to the tribal chiefs, the community or individual. Except for some tribes where the chief owns the land, the village councils and chiefs are generally mere custodians of the land. In most community land, all members have a right to use it freely but with prior consent of the custodians. There are, however, restrictions on transfer or even use of traditional land by outsiders. Jhum lands are usually owned by the community but regulated by the respective village councils. The respective village councils decide the areas to be cleared for jhum cultivation each year. Long-term holding of land for permanent cultivation, gardens and homesteads are usually undertaken after prior consultation with village authorities, clan elders or with respective owners. Increased privatization and individual ownership, especially of land under permanent cultivation such as wet rice cultivation, terraced lands, orchards, gardens, tree farming, bamboo grooves, etc., are recent noticeable trends in the state. These trends are more so in valley areas and lowlands than in the foothills. However, the practices and trends of land ownership differ from tribe to tribe, and these largely depend on existing traditions, availability of land and interpersonal relationship with the traditional institutions or the headmen[26].

3.8. IRRIGATION.

At present there are no medium or large irrigation projects in the state, however the potential for irrigation is estimated at 165000 Ha. Against the net sown area of 312770 hectare, irrigated area was only 64,490 hectare. The districts with the large area of irrigation are Kohima, Dimapur, Phek, Wokha and Tuensang. Nevertheless, barring few pockets along the foothills, irrigation is by and large surface water which is fully dependent on the monsoon rain, and thus the entire irrigated areas fall under the category of rain fed[27].

The State has so far been constructing minor irrigation to divert small hill streams to the valleys and terraced fields for rice cultivation covering an area of 82,150 hectare. Under

[26] Nagaland SPSP 2004

[27] Ibid

the NEC Programme, The State has also proposed Dziildza Medium Irrigation Project which is under consideration by the Ministry of Water Resources for funding under AIBP Scheme[28]

3.9. INDUSTRIES

Nagaland is industrially backward, where handloom and handicrafts are the traditional cottage industries. Most of the handloom and handicrafts industries are running by the cooperatives. The Nagaland Industrial Development Corporation is the premier promotional organisation in providing guidance and capital assistance to entrepreneurs. A few government initiatives like sugar mill at Dimapur, paper mill at Tuli, plywood factory at Tizit and a mini cement plant at Wazeho which were established during 1970's and 1980's have all became non functional. An Industrial Growth Centre with infrastructure is being set up at Ganeshnagar near Dimapur, [29] but this centre remains underutilized. Key industries in Nagaland are bamboo, floriculture, agriculture, horticulture, food processing, tourism, sericulture, handloom & handicraft and medicinal plants [30]. The Nagaland Industrial Development Corporation (NIDC) is the premier promotional organisation in providing guidance and capital assistance to entrepreneurs. The fruits and vegetables processing and cold storage plant at Dimapur has an installed capacity of processing 5 MT of fruits and vegetables per day and 300 MT cold storage facility. Poor transport and communications and a lack of raw materials, financial resources, and power hindered industrial growth.

3.10. RESOURCES AND POWER

Chromium, nickel, cobalt, iron ore, and limestone are found in Nagaland, but only low-grade coal deposits are mined at present. Boreholes drilled in the western district of Wokha have yielded oil, and seepages in the Dikhu valley, near Assam, suggest the presence of exploitable oil reserves. Power generation depends mainly on diesel plants, though hydroelectric output has increased. More than half of Nagaland's power is generated in Assam state[31]. The State's installed generation capacity is 27.84 MW only from Small Hydro Electric Power Projects against the State's requirement of 95 MW. The State's main source of power is from the Central Sector Power allocation. The total number of consumers is 1, 70,000 (approximately) 90 per cent of which is domestic. The projected demand by the

[28] https://www.onlinegk.com/indian-state-and-ut/nagaland
[29] https://indiawris.gov.in/wiki/doku.php?id=nagaland
[30] https://www.indianembassyjakarta.gov.in/pdf/Brief_oct26-18.pdf
[31] https://www.britannica.com/place/Nagaland

end of the 11th Plan for industrialization, economic development and growth in the State is 200 MW from the existing level of 95 MW. Further, by the end of 12th Plan and 2020 the Department is forecasting load growth of 300 MW and 500 MW respectively. The need to focus on the exploration and harnessing different sources of energy in the State is of utmost importance. The State has therefore identified to take up various Small Potential Hydro Projects[32]

3.11. TRANSPORT

The State of Nagaland is connected to the rest of country with Airport and Railway stations at Dimapur and National Highway 19 which passes through the State from Dimapur via Kohima to Manipur. This NH 39 is soon to be an international route under the Look East Policy of the Government of India. The rest of the State of Nagaland is connected only with roads covering about 23,466 km, these include the NH 61 and State highways. The State is also inter-connected with postal services in all district headquarters, Telephone line and mobile services[33]. Nagaland depends mostly on roads for transportation. A national highway runs from Dimapur to Kohima and then on to Imphal in Manipur. Another main road links Mokokchung with Amguri in Assam state. A short stretch of the Northeast Frontier Railway passing through Dimapur from Assam is the only rail link with the rest of India. Air service is available from Dimapur to Guwahati in Assam and to Kolkata (Calcutta) in West Bengal state[34]

3.12. TOURISM

Nagaland's tourism resources are immense. Its history, culture and the mysticism associated with the customs and ways of its hill tribes has been the source of great curiosity to not only Indians but people all over the world. It is a land of charm, diverse in landscape and culture and offers opportunities for a whole range of tourism activities, which to date has not been fully tapped[35].No doubt, the state has its own constrains due to the general perceptions regarding security and law and order conditions. With the opening of the state to the international tourist by relaxation of Restricted Area Permit (RAP), a good number of foreign tourists, as well as domestic tourists visit Nagaland every year. Travellers venture into the Naga Hills to experience Nagaland tour with exquisiteness and to have unforgettable

[32] Publication division, "India 2016", Publications Division Ministry of Information & Broadcasting ISBN 8123021593, 9788123021591
[33] https://www.onlinegk.com/indian-state-and-ut/nagaland
[34] https://www.britannica.com/place/Nagaland
[35] https://nagalandjournal.wordpress.com/2013/03/24/tourism-policy-2001-government-of-nagaland/

memories of the landscape, people, food, and culture. Even the rich deep forest looks blue because of the reflection of the bright sky with meandering clouds hovering around .it is necessary to recognize the importance of tourism as an activity for socio-economic development for the state[36].

Some of important tourist places are Kohima War Cemetery, Nagaland State Museum, Kohima, Japfu Peak, Kohima, Kachari Ruins, Dimapur, Shilloi Lake, Meluri, Naga Heritage Village, Tourist Village Tuophema, Intanki Wildlife Sanctuary, Doyang River[37].

3.13. SOCIO ECONOMIC PROFILE OF THE STUDY AREA

The study of socio-economic characteristics of the farmers is important to understand the sustainability of farmers. Socio-economic factors like Age, Gender, Education, Household size, Income, Expenditure, and Amenities Assets etc contributes to the farmer's accessibility, availability and satisfaction of their livelihood. This factor also affects the Farmers ability to make Livelihood choices, manage stress and cope with different livelihood strategies. Hence, it was considered important to briefly analyse the socio-economic profile of the farm households in relation to their livelihood sustainability.

3.13.1. Profile of the Mokokchung district

Mokokchung district is the home of the Ao Naga tribe. It covers an area of 1,615 sq km. and bounded by the state of Assam to its north, Tuensang to its east, Zunheboto to its south and Wokha and Assam to its west and lies between 93.53 and 94.53 degrees longitude and 25.56 degrees latitude[38]. The physiographic feature of the district shows six distinct hill ranges. The ranges are more or less parallel to each other and run in the southeast direction. The Ao tribe belong to three dialectical groups, namely, Chungli, Mongsen and Changki . Other communities have also settled in this district[39].

[36] https://www.adventuregiri.com/tours/nagaland-adventure-trip
[37] https://www.thrillophilia.com/tourist-places-in-nagaland
[38] https://entranceindia.com/year-book/mokokchung-district-of-nagaland-at-a-glance/
[39] NER Data Bank.

Table no 3.12: Profile of Mokokchung district

Description	**2001**	**2011**
Actual Population	120929	194622
Male	111156	101092
Female	232085	93530
Population Growth	46.54%	60.94%
Area Sq. Km	1615	1615
Density/km2	75	121
Proportion to Nagaland Population	11.55%	9.84%
Average Literacy	83.92	91.62
Male Literacy	86.03	92.18
Female Literacy	81.61	91.01

Source: Census 2011

Table no 3.12 shows population increases from 120929 to 194622 from 2001 to 2011 respectively. The density of population per km has increased from 75 to 121. The proportion of district's population in the State total has declined from 11.55% to 9.84%, and the average literacy rate increased from 83.92% to 91.62%.

3.13.2. Profile of the Zunheboto district

Zunheboto District is situated in the heart of Nagaland and is bounded by Mokokchung district in the East and Wokha district in the West. Zunheboto is the home of the Sumi tribe. The hills in the district vary from 1000 to 2500 metres. The district headquarter Zunheboto is located at 1874.22 metres above sea level. Most of the population resides in rural areas. Owing to the high altitude, the district enjoys monsoon climate almost throughout the year. Usually, winter is very cold but summer is moderately warm.

There are three important rivers in the district, viz, Tizu River originating in Tuensang district which flows down towards south crossing at the centre of Zunheboto district and joining Chindwin. Doyang river originating in Japfu passes through the west part of the district and joins Dhansiri in Assam. Tsutha river, originating in North East of Zunheboto

flows through the eastern part of the district and joins Tizu below Nihoshe village, where a Mini Hydel Power project is located[40].

Table 3.13: Profile of Zunheboto district

Description	2001	2011
Actual Population	79056	140757
Male	74899	71217
Female	153955	69540
Population Growth	60.15%	78.05%
Area Sq. Km	1255	1255
Density/km2	63	112
Proportion to Nagaland Population	7.55%	7.11%
Average Literacy	69.26	85.26
Male Literacy	73.76	87.85
Female Literacy	64.52	82.62

Table no 3.13 shows population increases from 79056 to 140757 from 2001 to 2011 respectively. The population increases from 60.15% to 78.05% followed by density/km from 63 to 112. The proportion to State's population decreases from 7.55% to 7.11% and average literacy increase from 69.26% to 85.26%.

3.14 PROFILE OF SAMPLE POPULATION

3.14.1 Distribution of Sample Population

In both the districts, the largest proportion of population is the age group below 30 and above 60, those who are mostly students and the older age group, respectively and they represents the less active group for farming. This is because people in the younger age spent time in acquiring education, migrate to urban areas for education and jobs and the older age group become more unproductive due to health problems, difficulty to work, dependent on their children's income, etc. So, the groups of population engaged in agricultural activities are mostly within the age group of 30-60 years, who are in active years of age, predominantly those who do not have alternative source of employment but to work in agriculture for sustaining their livelihood.

[40] Source: Census 2011

Table 3.14: Distribution of sample population by Age group

Age group (in years)	Mokokchung		Zunheboto		Total	
	Frequency	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Below 30	576	53.28	334	52.93	910	53.15
30-40	205	18.96	106	16.80	311	18.16
40-50	135	12.49	77	12.20	212	12.39
50-60	88	8.14	47	7.45	135	7.89
Above 60	77	7.13	67	10.62	144	8.41

Source: Field Survey 2015-16

Table no 3.14 in the sample aggregates shows the age group below 30 is 53.15% and above 60 is 8.41%, who are considered less active group for farming. The population actively engaged in agriculture activities are mostly in the age group of 30-60, which accounted for 38.44% in sample aggregate.

Mokokchung district data reveals that most of the respondents were of below 30 years (53.28%), followed by 30-60 together comprised of 39.59 percent and 60 and above years with 7.13%, respectively. For Zunheboto district, it is revealed that most of the respondents were within the age group of below 30 years (52.93%), followed by age group 30-60 years combined accounted for 36.45% and 60 and above with 10.6% respectively.

3.14.2. Distribution of sample population by Gender

The distribution of the sample population by gender for both the districts indicates that work participation in agricultural operation of both the gender is fairly equal. The male population play a prominent role in cutting and burning of the field, whereas, in planting and weeding women play an active role in Jhum cultivation.

Table 3.15:Distribution of population in the sample household by Gender

Variable	**Mokokchung**		**Zunheboto**		**Total**	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Male	561	51.9	354	52.44	915	52.10
Female	520	48.1	321	47.55	841	47.89

Source: Field Survey 2015-16

Table no 3.15 in the sample aggregates shows the gender distribution of population is 52.10% and 47.89 % for male and female, respectively. Gender distribution in the sample household at Mokokchung district showed 561 male and 520 female, which is 51.9 and 48.1 percent,

respectively. Likewise, for Zunheboto district 354 were male and 321 were female which is 52.44 and 47.55 percents.

3.14.3. Distribution of sample population by Education

Education directly influences the farmer's decision in adopting diverse livelihood strategies to increase their livelihood capabilities in order to cope with the various situations. Education influences the farmers to understand the market condition, which help in proper planning of crop production and management. Hence, the educational attainment of the farmers is an important determinant of agricultural production in sustaining their livelihood.

Table 3.16. Distribution of population in the sample household by Education

Levels of education	**Mokokchung**		**Zunheboto**		**Total**	
	Frequency	%	Frequency	%	Frequency	%
No Education	42	3.9	77	12.2	119	6.95
Primary Education	313	29.0	216	34.2	529	30.89
Elementary Education	498	46.1	220	34.9	718	41.94
Secondary Education	110	10.2	43	6.8	153	8.93
Degree and above	118	10.9	75	11.7	193	11.27

Source: Field Survey 2015-16

Table no 3.16 in the sample aggregates shows the respondents without any education is only 6.95%, primary and elementary level of education is 30.89 % and 41.94 %, secondary education is 8.93% and degree and above is 11.27%. The low level of respondents in higher education attainment may imply that the influence of education on farmer's livelihood may be less in the study area; as it is believed that education directly influences the farmer's decision in adopting diverse livelihood strategies and understands the market condition.

It is revealed that 3.9% have never attended formal education in Mokokchung District. Majority of the respondents are with primary and elementary level of education (29% and 46.1%). Only 10.2 and 10.9 per cent of the respondents had educational level of higher secondary and above. The data for Zunheboto district revealed that 12.2% were illiterate among the farmers. Most of the household educational attainments are primary and elementary level education (34.2% and 34.9%). Only 6.8 and 11.7 per cents of the respondents had education level of higher secondary and above.

3.14.4. Distribution of sample population by Livelihood Status

In order to cope with the increasing expenditure, the farmers have increased their economic activities by crop sale, animal sale, and various other income earning activities, apart from Government job, pension, business, carpenter, agricultural labour etc.

Table 3.17: Distribution of sample household by livelihood status

Variable	Mokokchung		Zunheboto		Total	
	Frequency	%	Frequency	%	Frequency	%
Pension	36	18.2	18	17.3	54	7.06
Government Job	57	28.8	23	22.1	80	10.46
Crop Sale	157	79.3	59	56.7	216	28.23
Animal Sale	141	71.2	83	79.8	224	29.28
Agricultural labour	30	15.2	22	21.2	52	6.79
Business	10	5.1	4	3.8	14	1.83
Carpenter	3	1.5	1	1	4	0.52
Others	23	11.6	6	5.7	29	3.79

Source: Field Survey 2015-16

Table no 3.17 in the sample aggregates shows that the households engaged in animal sale is highest with 29.28%, followed by crop sale with 28.23%, government job (10.46%), pension (7.06%), agricultural labour (6.79%), others (3.79%), business (1.83%) and carpenter (0.52%).

Most of the rural households in Mokokchung district are engaged in Crop and Animal Sales with 79.3% and 71.2%, respectively. This is followed by Government Job 28.2%, pension 18.2%, Agricultural labour 15.2%, Business 5.1%, carpenter 1.5% and others 11.6%. Similarly, in Zunheboto district, most of the households are engaged in Crop and Animal Sales with 56.7% and 79.8%, respectively. This is followed by Government Job 22.1%, Agricultural labour 21.2%, pension 17.3%, Business 3.8%, Carpenter 1% and others 5.7%.

3.14.5. Household Amenities and Assets

Household's amenities are the minimum basic requirements of the farmers to live a decent life. Adequate access to basic amenities such as houses, drinking water, cooking energy etc is primarily necessary for good quality of life. The need to acquire these basic amenities has become a major concern of the farmers in order to improve their livelihood conditions. The

basic household amenities such as decent house, drinking water, cooking energy were determined in order to know the living conditions of the farmers.

3.14.5 (a). Distribution of sample population by types of houses

Generally, the types of house indicate the economic well being of the household. In Mokokchung District, only 4.8% of the sample households live in pucca house, while majority of the households reside in semi-pucca houses (67.67%) and 28.28% reside in kucha houses. Village wise, Longkhum has the highest proportion of households living in pucca house (9.52%), and the same for Chuchuyimpang is only 5.47%. On the other hand, in Sungratsu and Mongsenyimti none of the household in the sample were found residing in pucca house.Semi-Pucca Type of houses was the dominant residential building with Chuchuyimpang at 83.56%, Longkhum at 64.28% and Sungratsu at 65.85% and taking Mongsenyimti as an exception at 45.23%.

Table 3.18: Distribution of sample Household by Types of Houses

Districts	**Village**	**Types of House**					
		Pucca		**Semi-Pucca**		**Kucha**	
		Frequency	%	Frequency	%	Frequency	%
Mokokchung	Chuchuyimpang	4	5.47	61	83.56	8	10.95
	Longkhum	4	9.52	27	64.28	11	26.19
	Mongsenyimti	Nil	Nil	19	45.23	23	52.38
	Sungratsu	Nil	Nil	27	65.85	14	34.14
	Sub Total	**8**	**4.04**	**134**	**67.67**	**56**	**28.28**
Zunheboto	Asukhomi	2	11.76	14	82.35	1	5.88
	Kilo Old	Nil	Nil	4	80	1	20
	Lazami	4	5.63	28	39.43	39	54.92
	Satakha	4	36.36	4	36.36	3	27.27

	Sub Total	**10**	**9.61**	**50**	**48.07**	**44**	**42.30**
Total		**18**	**5.96**	**184**	**60.92**	**100**	**33.11**

Source: Field Survey 2015-16

In Zunheboto, only 9.61 % of the sample households dwelled in pucca house, while majority of the respondents dwelled in semi pucca (48.07%) and kucha houses (42.30%). Village wise, the highest proportion of households residing in pucca house is in Satakha (36.36%), while in Asukhomi and Lazami it is only 11.76% and 5.63%, respectively. More than 80% of sample households reside in semi pucca houses in Asukhomi and Kilomi. In Lazami more than 50 percent of sample households reside in kucha houses.Here, the analysis by types of houses reveals that more than 90% of the sample households reside in semi pucca and kucha houses. This reflects the low level of well-being of the farming households. This calls for attention of the policy makers

3.14.5 (b) Distribution of sample population on the basis of Cooking Energy

The type of cooking energy use by a household determines the living conditions. The cooking energy available to the farmer's households is firewood, LPG and electricity. The usage of cleaner energy like LPG or electricity indicates the improved farmers living status, as they could easily effort it.

Table 3.19: Distribution of sample Household on the basis of Types of Cooking Energy

Districts	**Village**	**Cooking Energy**					
		Gas		**Wood**		**Electrical**	
		Frequency	%	Frequency	%	Frequency	%
	Chuchuyimpang	14	19.17	73	100	10	13.96
Mokokchung	Longkhum	16	38.09	42	100	2	4.76
	Mongsenyimti	2	4.76	41	100	5	12.19
	Sungratsu	4	9.52	42	100	6	14.28
	Sub Total	**36**	**18.18**	**198**	**100**	**23**	**11.61**
	Asukhomi	3	17.64	17	100	2	11.76
Zunheboto	Kilo Old	2	40	5	100	5	Nil

	Lazami	7	9.85	71	100	6	8.45
	Satakha	4	36.36	11	100	2	18.18
	Sub Total	**16**	**15.38**	**104**	**100**	**15**	**14.42**
Total		**52**	**33.56**	**302**	**100**	**38**	**12.58**

Source: Field Survey 2015-16

The above table no.3.19 shows 100% of respondents from both the districts use wood for cooking energy followed by gas and electrical at 18.18% and 11.61% for Mokokchung and 33.56 and 12.58 for Zunheboto respectively.

Based on the level and use of preference, the analysis shows farmers could not effort LPG and electrical appliances. So they mainly use firewood as cooking energy. This preference and use of cooking energy reveals that farmers can hardly meet their ends meet and poses a threat to the environment as well.

3.14.5.(c).Distribution of sample population by availability of safe Drinking Water

Access to safe drinking water is not only important for healthy living but also an indicator of the quality of life .Farmers access to safe and good quality drinking water is the important determinants of a good health. A healthy farmer can engaged in different livelihood activities and enhance their livelihood as it increases ability of a person to work more and earn more income leading to better living conditions.

Table 3.20: Distribution of sample population by availability of safe Drinking Water

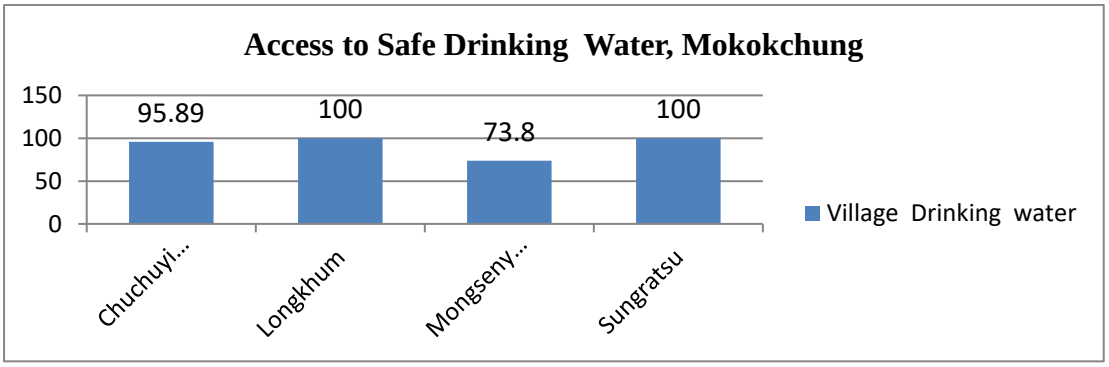
Disricts	**Village**	**Total Households**	
		Total Number	**%**
Mokokchung	Chuchuyimpang	70	95.89
	Longkhum	42	100
	Mongsenyimti	40	73.8
	Sungratsu	41	100
	Sub Total	**193**	**97.47**
Zunheboto	Asukhomi	11	64.7
	Kilo Old	5	100
	Lazami	46	94.36
	Satakha	11	100
	Sub Total	**73**	**70.19**
Total		**266**	**88.07**

Source: Field Survey 2015-16

From the above table, it reveals that access to safe and quality drinking water facilities is good for both the districts, which is 97.47% for Mokokchung and 88.07% for Zunheboto.

This implies good health and better quality of life of the respondents. The distribution of sample population on the basis of types of drinking water for Mokokchung and Zunheboto districts are given below in figure 3.7 and 3.8.

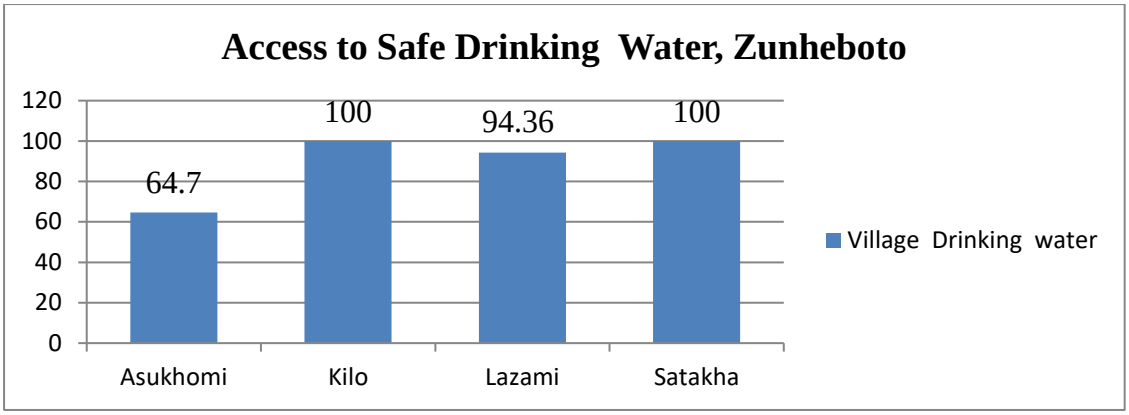
Figure 3.6: Distribution of sample Household access to safe drinking water of Mokokchung District



Source: Field Survey 2015-16

Figure 3.7 indicates Longkhum and Sungratsu have cent percent adequate drinking water facilities, followed by Chuchuyimpang (95.89%) and Mongsenyimti (73.8%).

Figure 3.7: Distribution of sample Household by access to safe drinking water of Zunheboto district



Source: Field Survey 2015-16

Figure 3.8 indicates Satakha and Kilo old has cent percent adequate drinking water facilities followed by Lazami (94.36%) and Asukhomi (64.7%).

Based on the findings, the source of drinking water of the surveyed household was mainly tape water supplied by the State Public Health Engineering Department (PHED). The analysis indicated that access of the surveyed households was exceptionally adequate.

3.14.5 (d). Distribution of sample population by Household Assets

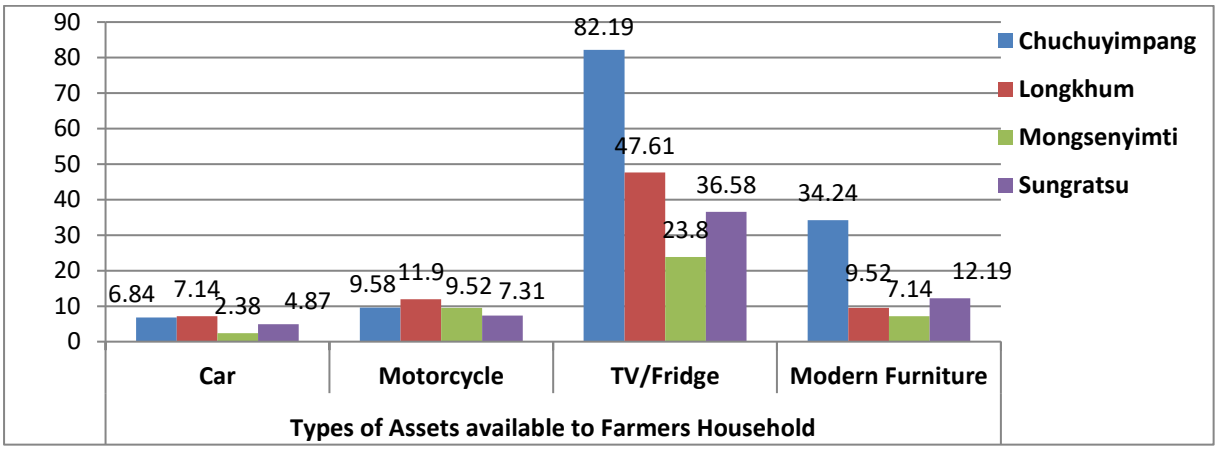
Table 3.21: Distribution of sample population by Household Assets

Districts	Village	Car		Motor Cycle		Television		Modern Furniture	
		Total	%	Total	%	Total	%	Total	%
Mokokchung	Chuchuyimpang	5	6.84	7	9.58	60	82.19	25	34.24
	Longkhum	3	7.14	5	11.9	20	47.16	4	9.52
	Mongsenyimti	1	2.38	4	9.52	10	23.8	3	7.14
	Sungratsu	2	4.87	3	7.31	15	36.58	5	12.19
	Sub Total	**11**	**5.55**	**19**	**9.59**	**105**	**53.03**	**37**	**18.68**
Zunheboto	Asukhomi	1	5.88	2	11.76	12	70.58	4	23.52
	Kilo Old	1	20	1	20	5	100	1	20
	Lazami	2	2.81	4	5.63	26	18.3	1	1.4
	Satakha	0	0	1	9.09	5	45.45	2	18.18
	Sub Total	**4**	**3.84**	**8**	**7.69**	**48**	**46.15**	**8**	**7.69**
Total	Eight(8)	**15**	**4.96**	**27**	**8.94**	**153**	**50.66**	**45**	**14.90**

Source: Field Survey 2015-16

In the above table 3.21, for Mokokchung district household assets for Chuchuyimpang village is relatively better than the other three surveyed villages which is 6.84% for car, 9.58% for Motorcycle, 82.19% for television and 34.24% for modern furniture. Most owned household assets for Mokokchung district is television with 53.03% and least owned asset is car with 5.55%. For Zunheboto , household assets for Asukhomi village is relatively better than the other three surveyed villages which is 5.88% for car, 11.76% for Motorcycle, 70.58% for television and 23.52% for modern furniture. Most owned household assets for Zunheboto district is also television with 46.15% and least owned is car with 3.84%.

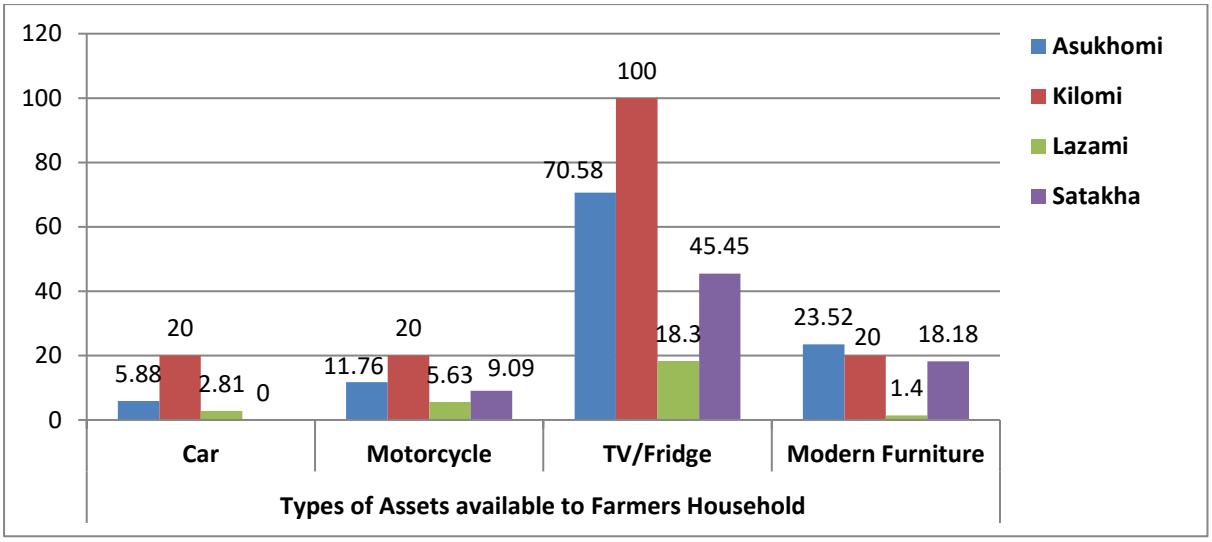
Figure 3.8.Distribution of sample household by assets of Mokokchung district



Source: Field Survey 2015-16

Figure 3.8 indicates most owned household assets of all the four villages are TV/Fridge followed by modern furniture, motorcycle and car.

Figure 3.9: Distribution of sample household by assets of Zunheboto district



Source: Field Survey 2015-16

Figure 3.9 indicates most owned household assets of all the four villages are TV followed by modern furniture, motorcycle and car.

Based on the sample analysis, household assets for car, motorcycle, television and modern furniture were taken into study specifically as household assets determine the living conditions of the farmers. For both the districts, most owned household assets are television with 50.66% and least owned is car with 4.96%. It does not indicate the improved farmers living status, as the farmers' cannot effort basic necessities of life.

3.14.6. Farm size

Table no 3.22. Distribution of household by farm size

Category (Farm size)	Mokokchung		Zunheboto		Total	
	No. Of HH	% in total HH	No. Of HH	% in total HH	No. Of HH	% in total HH
Marginal	17	8.59	13	12.5	30	9.93
Small	31	15.66	27	25.97	58	19.20
Medium	122	61.61	44	42.30	166	54.97
Large	28	14.14	20	19.23	48	15.90
Total	198	100	104	100	302	100

Source: Field survey 2015-16

Table 3.22 in the sample aggregates shows 54.97% households has medium sized farms, followed by small farmers with 19.20%, large at 15.90% and the marginal farmers are 9.93%.

From Mokokchung 61.61% households belongs to medium size, followed by small at 15.66 %, large at 14.14 % and marginal at 8.59 %. Similarly for Zunheboto, 42.30 %

household farm size is medium, followed by small at 25.97 %, large at 19.23 % and marginal at 12.5%. So, majority of the farmers in the sample survey are medium sized farmers.

3.14.7. Households' Monthly Income and Expenditure

Household consumption expenditure are made to meet their everyday needs, such as food, clothing, transport, medical, and education, raising livestock, social events like celebration/funeral/wedding and miscellaneous services. Household income is the income received from Government job, pension, agricultural labour, crop sales, animal sales etc and all other livelihood activities.

Table 3.23.Households Monthly Income and Expenditure

Districts	Average Monthly Income (in Rupees)	Average Monthly consumption Expenditure (in Rupees)
Mokokchung	12355	6347
Zunheboto	8000	5508
Average /Total	10177	5927

Source: Field Survey 2015-16

The above table no.3.22 reveals average monthly income and average monthly expenditure for both districts. The average monthly income of Mokokchung is Rs 12355 while for Zunheboto it is at Rs 8000. The average monthly expenditure of Mokokchung is Rs 6347, whereas for Zunheboto it is Rs 5508. And the average monthly income, for both the districts is Rs 10177 and average monthly expenditure is at Rs 5927.

This reveals the respondents could meet their ends meet even though they could not effort the luxury or enhance livelihood up to their satisfaction. Here, the respondent tries every possible measure to improve their livelihood for sustainability.

3.15.CONCLUSION

The farmers engaged in agriculture activities are mostly in the age group of 30-60 which is 38.44% in aggregate of sample households and work participation in agricultural operation of both the gender is fairly represented. The larger proportions of the households in both districts are engaged in crop and animal sales for their livelihood. Semi Pucca types of houses dominates the types of houses for the surveyed households, which reflects that majority of the farm households in the sample have low level of well-being. The preference and use of firewood as cooking energy reveals that farmers can hardly meet their ends meet and poses a threat to the environment as well. The analysis indicated that access for safe drinking water was exceptionally adequate. For both the districts, most commonly owned household asset is

television with 50.66% and least owned is car with 4.96% households. It does indicate the farmers' poor living condition as they cannot afford basic necessities of life. The average income and expenditure reveals the respondents could meet their ends meet moderately, even though they could not afford the luxury or enhance livelihood up to their satisfaction. The respondent tries every possible measure to improve their livelihood for sustainability.

CHAPTER-4

ASSETS AND LIVELIHOOD STRATEGIES OF FARMERS

4.1. INTRODUCTION

Assets play a crucial role in the livelihoods framework. Those with more assets are most likely to have greater livelihood options with which to pursue their goals and reduce poverty. Traditionally, five categories of assets or capitals i.e., human, social, natural, physical, and financial capitals are identified, although subsequent adaptations have added others. Livelihood strategies are the combination of activities that people choose to undertake in order to achieve their livelihood goals. They include productive activities, investment strategies and reproductive choices. A major influence on people's choice of livelihood strategies is their access to assets and the policies, institutions and processes that affect their ability to use these assets in order to achieve positive livelihood outcomes (Alinovi et al., 2010)[1]. Poor households engage in a variety of livelihood strategies. Livelihood strategies are characterized by the allocation of assets (Santiago and Lopez, 2008)[2]. Livelihood is a means of living, and the capabilities, where assets and activities are required for it (Chambers and Conway, 1992) [3].

Assets or capital endowments are the basic livelihood building blocks, the capacity that people use in striving for their objectives or the livelihood outcomes. Strategies may never be articulated, but they nevertheless influence people's choices of which activities to combine, outcomes to pursue, and assets to invest in. Assets enable the farmers to have strategies in order to gain better livelihood outcomes (Soini E., 2005). [4] Human capital represents the skills, knowledge, ability to labour and good health that together enable people to pursue different livelihood strategies and achieve their livelihood objectives. Natural capital is very important for rural communities because they derive all or part of their livelihoods from resource-based activities. For all these it is important to consider access and quality and how both are changing. The social capital of any society such as mutual trusts and connectedness helps to cope with shocks in any vulnerability context particularly for the poor

[1] Alinovi et al. (2010).Livelihoods Strategies and Household Resilience to Food Insecurity: An Empirical Analysis to Kenya: Agricultural Development Economic Division FAO, Livelihoods Strategies and Household Resilience to Food Insecurity: An Empirical Analysis to Kenya.

[2] Santiago and Lopez (2008).Livelihood strategies of farmers in Bolivar, Ecuador: asset distribution, activity selection and income generation decisions in rural households: Thesis submitted to the faculty of the Virginia Polytechnic Institute and State University.

[3] Chambers and Conway (1992).Sustainable Rural Livelihoods: Practical Concepts for the 21st Century: IDS Discussion Paper 296, Brighton: IDS.

[4] Soini, E. (2005).Livelihood, land use and environment interactions in the highlands of East Africa: ISBN 952-10-3413-0 (PDF) ISSN 0300-2934.

such as at the time of death, provide informal safety nets and group actions such as shared labour at the time of sowing and harvesting seasons. Physical capital plays a vital role for the development of the society, as it comprises the basic infrastructure and producer goods needed to support livelihoods. The financial capital is the availability of cash or equivalent that enables people to adopt different livelihood strategies[5]. The analysis of the assets and Strategies of the farming households determining the status of livelihood is presented in this section of the chapter.

4.2. CAPITAL ASSETS AND ITS IMPLICATIONS ON FARMER'S LIVELIHOOD

The selected variables of the five capital assets for the study are as follows:-

Table no 4.1. Capital Assets and Livelihood

Five capital Assets	**Variables**
Natural	Investment on Land Forest Conservation Water Availability Availability of NTFP
Human	Training for skill development Skill Health Education
Physical	Transport and communication Soil Fertility Investment on Irrigation
Financial	Bank Account Saving Loan
Social	VDB/VC Access to public schemes Right to vote
Total	**Seventeen (17)**

Source: Field Survey 2015-16

4.2.1. Natural Capital and Livelihood

Natural capital means natural resource stocks such as land, forest, water etc from which flow resources and services, useful for livelihoods (Goldman et al., 2000)[6]. Natural

[5] Shah et al., (2005).Livelihood assets and livelihood strategies of small farmers in salt range: A case study of Pind Dadan Khan District Jhelum, Pakistan: Pak. J. Agric. Sci., 42(1-2): 82-88.

[6] Goldman et al. (2000).Institutional Support for Sustainable Rural Livelihoods in Southern Africa: Framework and Methodology, Natural Resource Perspectives: Number 49, March 2000, Overseas Development Institute.

capitals are those types of resource where people particularly in rural areas depend for their livelihood activities of survival. It is the nature's best gift for human existence but is vulnerable to natural calamities like earthquake, drought, storms etc which adversely affects the livelihood of the rural farmers. The natural resources should be utilised carefully because the destruction of it results in negative impact on the rural farmers' livelihood activities.

In the sample area, all the farmers have access to cultivable land, either own individual or common land. But, often it is not been utilized to its maximum potential. Generally, the Village Council decides on the site to be cultivated every year and the common land in the village is distributed by the Council or Clan for cultivation, but the size of cultivable land is often decided by the individual farmer depending on availability of labour, finances etc. In recent years farmers have reduced the size of cultivated land due to shortage of labour. As for the availability of NTFP and timber products, the respondents in the survey stated that it is declining over the past years, i.e., the availability of timber, firewood, forest products like fruits, leaves, livestock foods etc are dwindling. In many villages, collective efforts have been undertaken by the Village Councils by declaring some areas as reserve forest areas or protected forest areas and imposed restrictions on extraction of resources from these areas.

4.2. Natural capital and its implications on farmer's livelihood

Districts	**Deforestations**		**Dependency on seasonal rain**		**Increase in Plantation activities**	
	number	%	number	%	number	%
Mokokchung	65	32.82	104	100	98	49.50
Zunheboto	54	51.92	198	100	74	71.15
Total	119	39.40	302	100	172	56.95

Source: Field Survey 2015-16

Table no. 4.2 shows that 39.40% in sample aggregate and 32.82% and 51.92 % of the respondents from Mokokchung and Zunheboto districts, respectively opined that deforestation is taking place rapidly for purpose like collection of firewood, materials for building, furniture etc and Jhum cultivation, which will cause adverse impact on agriculture sustainability in future. The respondents from both the districts reveal 100% dependency on seasonal rain for cultivation. The potential for creating irrigation facility is very limited due to sharp topography. This is the reason why farmers cultivate crops only during kharif season, where rainfall is erratic (either excess rainfall, insufficient rain or delayed rainfall), which makes the farmer's livelihood unsustainable. Hence, there is little or no scopes for farmers to practice

double cropping, which not only adversely affects farmer's income but reduce their livelihood sustainability. In the sample aggregate 56.95% expressed that there is increase in plantation activities and 49.50% and 71.15% from Mokokchung and Zunheboto districts, respectively undertake plantation activities.

4.2.1.1. Analysis of access to Natural Capital and Livelihood

Mokokchung and Zunheboto districts are endowed with rich agro-climatic conditions and natural resources which are suitable for agricultural production. But the natural capital is not been utilised with full potential, instead rampant destruction of natural resources is taking place. However in recent years, some positive measures have been taken by the village council to conserve certain proportion of forest land as reserve areas. The non timber forest products (NTFP) are dwindling not only for human consumption, but for livestock's as well. Moreover availability of water is decreasing due to the deforestation by the farmers. The four major variables i.e. investment on land, forest conservation, water availability and availability of NTFP were taken to study the effect of variables on the livelihood of the farmers.

4.3. Binary logistic regression analysis of Natural Capital

Variables	**Mokokchung**		**Zunheboto**		**Total**	
	(B) Coefficient	(S.E) Standard Error	(B) Coefficient	(S.E) Standard Error	(B) Coefficient	(S.E) Standard Error
Investment on Land	.026 (.954)	.454	.962 (.458)	1.296	1.208 (.001***)	.360
Forest Conservation	1.484 (.001***)	.443	.153 (.778)	.542	-.099 (.734)	.291
Water Availability	-2.300 (.000***)	.433	1.054 (.121)	.866	-.150 (.642)	.323
Availability of NTFP	.056 (.928)	.622	-.138 (.850)	.679	-1.881 (.000***)	.310

Note: *Significant variables influencing agricultural participation at 0.01 (***)*

The result of the regression estimate in the sample total shows investment on land is positively related to livelihood and statistically significant at 1%. The increase in investment for plantations, horticultures, irrigation for terrace fields has resulted in positive impact on farmers' livelihood. Availability of NTFP was found to have negative relation to farmer's livelihood, which was statistically significant at 1 %. This means increase in deforestations for firewood, timber for furniture and buildings, jhum cultivations etc have decreased the availability of NTFP. However these activities have increased the livelihood sustainability.

Forest conservation and water availability were found to have negative relations with livelihood but statistically not significant.

Table no.4.3 further shows that two of the explanatory variables for Mokokchung are found to have significant influence on the Livelihood of the farmers. As part of the natural capital, water availability was negatively related to farmer's livelihood, which was statistically significant at 1 %. These results suggest that due to early rainfall during sowing season, and excess or erratic rainfall have negatively affects crop production especially for jhum farmers, making their livelihood through agriculture more vulnerable.

Forest conservation was positive and significant at 1 % to farmer's livelihood. The results suggest that as measures of forest conservation increases, the agricultural production is likely to increase, thus the increase in farmers livelihood based on agriculture is thus predicted. The investment on land and availability of NTFP are positively related to livelihood but statistically insignificant, suggests that investment on land and availability of NTFP do not have significant impact on the current livelihood.

For Zunheboto, only availability of NTFP was found to have negative relation to farmers' livelihood. This reveals that the non–timber forest product do not have noticeable impact on farmers' livelihood as it is statistically insignificant. On the other hand, investment on land, forest conservation and water availability was found to have positive relations to livelihood but also statistically not significant so they do not have noticeable impact on farmers' livelihood.

4.2.2. Human Capital and Livelihood

Human capital means the skills, knowledge, and the ability to work that enables people to pursue different livelihood strategies and achieve livelihood objectives (Roberts and Yang, 2003).[7] The skills of the rural farmers can be enhanced by motivating them through training and support from government or village organisation in order to pursue different livelihood strategies and achieve livelihood objectives.

Human capital is found as one of the most undeveloped assets. The farmers feel that no change has taken place for improving their human capital. Traditional skills like handicrafts, weavings have lost its importance. There is hardly any training organized for skill development of the farmers that helps in earning a livelihood. A few training were given by KVK, ATMA etc, to farmers, but due to lack of financial assistance it did not make much

[7] Roberts and Yang (2003).The international progress of sustainable development research: A comparison of vulnerability analysis and the Sustainable livelihoods approach:Advance in Earth Science, 22(1):11–21.

impact on promotion of livelihood. Farmers are not satisfied with the health care service provided in their villages, for which reason they go to town making health care services much more expensive.

4.4. Human capital and its implications on farmer's livelihood

Districts	Access to Health care facilities		Food secured		Knowledge of modern farming		Girls enrolled in school		Income reinvested in education	
	Yes	%	Yes	%	Yes	%	Yes	%	Yes	%
Mokokchung	26	25	45	43.26	14	7.07	102	51.51	43	21.71
Zunheboto	48	24.24	60	30.30	23	22.11	38	19.19	28	26.92
Total	74	24.50	105	34.76	37	12.25	140	46.35	71	23.50

Source: Field Survey 2015-16

The above table no 4.4 reveals that only 24.50% in the sample aggregate are satisfied with the village health facilities. The same for Mokokchung and Zunheboto districts are 25% and 24.24%, respectively. In sample aggregate 34.76% of the farmers are confident that there is no threat to food security. Similarly, from Mokokchung and Zunheboto districts 43.26% and 30.30%, respectively felt no threat to food security in the community. If the present pattern of cultivation continues, there is a threat to rice production, which is considerably declined in the recent years. Regarding the knowledge of modern farming, 12.25% from sample aggregate and 7.07% and 22.11%, respectively from Mokokchung and Zunheboto districts reveal that they are aware of the modern farming, but due to the manifold constraints they are unable to adopt, or put into practise. This reveals that the proportion of households with knowledge of modern farming is low. The sample aggregate of girls enrolled in school is 46.35%, here the percentage increase in girls enrolled in school is higher in Mokokchung (51.51%) than Zunheboto (19.19%) and the household income reinvested in education in the sample aggregate is 23.50%. For Mokokchung and Zunheboto districts, it is 21.71% and 26.92% respectively, which is considerably high.

4.2.2.1. Analysis of access to Human Capital and Livelihood

Man by nature are blessed with different skills, if utilised fully can pursue different livelihood strategies and achieve livelihood objectives. The livelihood skills like traditional basket making, carpenters, bee keeping, weaving, poultry, piggery, diary, local pickle making etc were found among the farmers but hardly there are any success stories due to absence of motivation among themselves, training for skill development is seldom and above all, the government is least concerned to put sincere effort. The farmers are faced with health problems which affect their livelihood adversely. The immediate medical facilities in the

village is poor, hence the farmers have to go to hospital in the nearest town, which makes health care quite expensive to the farmers. The four variables taken for study are training for skill development, skill, health care facilities and Education which are below.

4.5. Binary logistic regression analysis of Human capital

Variables	Mokokchung		Zunheboto		Total	
	(B) Coefficient	(S.E) Standard Error	(B) Coefficient	(S.E) Standard Error	(B) Coefficient	(S.E) Standard Error
Training for skill Development	-2.809 (.010***)	. 1.094	-1.372 (.027**)	.618	-.189 (.000***)	.050
Skill	-20.142 (.997)	5.100	-2.530 (.019**)	1.080	-.265 (.000***)	.049
Health care facilities	(.319 (.566)	.556	-.178 (.881)	1.188	.012 (.857)	.067
Education	1.134 (.273)	1.035	.228 (.856)	1.255	.037 (.711)	.020

Note: *Significant variables influencing agricultural participation at 1% (***) , 5%(**) and 10% (*)*

Training for skill development for Mokokchung was found to be negatively related to livelihood, which is statistically significant at 1 %. The results simply mean that the training given to the farmers for skill development does negatively impact on livelihood of the farmers. The skill of the farmers was also found to be negatively related to farmer's livelihood. This means farmer's inherent skill is unutilized and there seems negative contribution towards the improvement on farmer's livelihood. Health care and education were found to be positively related to livelihood although statistically not significant. This result may suggest improvement in health care facilities and household head need to be educated about farming techniques as they are the decision makers in the family. Hence, the better the health facilities and education provided to the farmers, the higher contribution will be made in improving livelihood and vice-versa.

For Zunheboto, training for skill development and skill was found to be negatively related to livelihoods which are statistically significant at 5% level. The results simply mean that the training given to the farmers for skill development did not yield positive livelihood outcome as there were no success stories so far. The skill of the farmers is not satisfactorily utilized to have impact on farmers' livelihood. The health facilities do not have influence on livelihood of the farmers as it is found statistically not significant. The higher education is

provided to the farmers their contribution will be higher towards improving livelihood and vice-versa.

Skill development is found to have negative impact on livelihood of the farmer, which is statistically significant, and education and health facilities are positive but statistically not significant. Which result is in contrast to what was assumed. Thus, the null hypotheses is accepted.

4.2.3. Physical Capital and Livelihood

Physical capital is the basic infrastructure and producer goods required to support livelihoods that helps people meet their basic needs and to become more productive[8]. The physical assets for the rural farmers are related to connectivity such as roads, transport, machines/tools used for production etc which have direct influence on the livelihood of the farmers.Access to Physical capital such as means of communication and transport for example, mobile phones, taxi etc has improved over the years. Hence, direct contact between the farmers and traders as well as agricultural traders is on the rise, leading to positive impact on marketing of farm produces. Lack of irrigation facilities hampers agricultural growth as according to some farmer respondents. Access to proper canal, tank, well etc will enhance growth of agricultural sector, where farmers can take up double cropping, enable to grow crops during the off season too instead of simply staying idle at home. This will ensure fuller utilization of farm resources and labour force thereby progress livelihood of the farmers. Production method is traditional in the existing agricultural system; no mechanized technique is being implemented for production process which leads to low productivity. The farmers do not use fertilizers or any form of chemical due to which incur losses in cases when the crops are infested with insects and pests. All these adversely affect farmers' livelihood sustainability.

4.6. Physical capital and its implications on farmer's livelihood

Physical capitals	**Mokokchung**		**Zunheboto**		**Total**	
	Yes	%	Yes	%	Yes	%
Secure shelter and buildings	55	27.77	37	35.57	92	30.46
Adequate water and sanitation	193	97.47	73	72.57	266	88.07
Access to improved machines and equipments	8	4.04	4	3.84	12	3.97

[8] Jonathan (2000).Sustainable livelihoods: International Social Science Journal, vol. 17, pp. 77–86.

Communication	96	48.3	71	68.3	167	55.29
Soil fertility	59	29.3	21	20.3	80	26.49
Access to irrigation	21	10.6	10	9.6	31	10.26
Access to transportation (Car/ Motorcycles / taxi/ bus etc.)	30	15.15	12	11.54	42	13.90

Source: Field Survey 2015-16

The above table no 4.6 reveals that in the sample aggregate, majority of the farming households are satisfied with adequate water and sanitation (88.07%), followed by Communication (55.29%), secured shelter and buildings (30.46%), Soil fertility (26.49%), access to means of transportation car/motorcycles/taxi etc (13.90%), access to irrigation (10.26%) and access to improved machines and equipments (3.97%).

The table also show that in rural area of Mokokchung, 97.47% of farming households are satisfied with access to water and sanitation, followed by Communication (55.29%). Moreover, 27.77% of the respondents have revealed they have secure shelter and buildings, and 15.15 % transport facilities but only 4.04% have access to improved machines and equipments. Whereas, for Zunheboto, 35.57% have secure shelter and buildings, 72.57 % have adequate water and sanitation, 11.54% have transport facilities, 9.6% have irrigation and only 3.84% have access to improved machines and equipments.

4.2.3.1. Analysis of access to physical capital and Livelihood

The physical asset related to the connectivity of road to town and communication seems to be improved considerably under Mokokchung district but the cost of transportation and proper transportation of agricultural goods to town is not well maintained which hampers farmers livelihood adversely. Whereas for Zunheboto, connectivity of road to town is in deplorable condition as well as absence of proper transportation of agricultural goods to town is not available which hampers farmers' livelihood but communication seems to have improved.

Soil erosion is taking place in both the districts because both practices jhum cultivation on the hilly slopes, but no measure has been undertaken by farmers or by government or other institutions so far. Investment on physical assets like modern equipments and tools, modern techniques are not present. Moreover, investment on irrigation is at the lowest point for Mokokchung whereas in Zunheboto, it is increasing due to the increase in cultivation of terrace fields for rice production. The following three major

variables were taken for the study i.e, Transport and communication, Soil Fertility and Investment on irrigation, which is analysed on the table 4.7.

4.7. Binary logistic regression analysis of Physical capital

Variables	Mokokchung		Zunheboto		Total	
	(B) Coefficient	**(S.E) Standard Error**	**(B) Coefficient**	**(S.E) Standard Error**	**(B) Coefficient**	**(S.E) Standard Error**
Transport and communication	3.046 (000***)	.554	2.152 (.041**)	1.056	2.757 (.000***)	.486
Soil fertility	-.522 (.281)	.484	.536 (.386)	.618	-.179 (.632)	.373
Investment on irrigation	1.095 (.139)	.740	2.358 (.006***)	.859	1.970 (.007***)	.727

Note: *Significant at 1 %(***), 5% (**) and 10% (*)*

The results of the binary logistic regression estimate in the sample aggregates for transport and communication and investment on irrigation were found to be positive to farmer's livelihood and statistically significant at 1 %. The results indicate the improvement of transport and communication and irrigation have strong influence on livelihood. However, Soil fertility was found to be positively related to farmer's livelihood but statistically not significant.

The means of transport and communication for Mokokchung has positive influence on farmer's livelihood and highly significant at 1%. These results reveal the improvement in transport and communication increased farmer's income through sale of agricultural production in the market. However investment in Soil fertility was found to be negatively related but statistically insignificant; which means the fertility of soil does not have impact on the livelihood. The investment on irrigation is positive yet insignificant. For Zunheboto, means of transport and communication and investment on irrigation were found to be positively related to farmers' livelihood and significant at 5% and 1%, respectively. The results suggest that the improved means of transport and communication resulted in enhancing farmer's income through sale of agricultural goods in the market. The increase in investment on irrigation has also resulted in positive impact on the livelihood of the farmers. However, Soil fertility was found to be positively related but insignificant statistically.

4.2.4. Financial Capital and Livelihood

Financial capital implies the financial resources people utilised in order to improve their livelihood objectives[9]. Financial capital is one of the most important capitals which enable people to adapt to different livelihood strategies. The people in the rural areas accumulate financial capital in the form of crop sale, animal sale, Livestock etc., or in the form of income from other types of financial assets. The livelihood of the farmers who are engaged in diverse livelihood strategies is better than the livelihood of the farmers who are engaged in farming alone. Access to financial capital is one of the major components of input in the process of agricultural production and to adopt a portfolio of livelihoods. But, the debt of farmers has increased over the past years. Most of the farmers have immense burden with rising costs on education, social events, household consumption etc. After meeting those needs, many farmers are left with nothing to make investments on farm, except their own labour. Apart from borrowing from friends, relatives and neighbours, SHGs etc no others source exist as banks and other financial institutional loans are difficult to access for the poor farmers. Most of the farmers borrows to pay school fees, consumption, health care etc, but not for agricultural purpose. According to the farmers' opinion, due to insufficient cash for buying seeds, pesticides, chemicals, for hiring labour during peak season etc, increasing their production remains an impossible task.

Table no.4.8. Financial capital and its implications on farmer's livelihood

Districts	**Remittances and its contribution**						
	Family members who remit		Average monthly remitted (Rs./household)	Who controls the remitted money		Is it invested	
	no.	%		M (%)	F (%)	Yes	%
Mokokchung	56	28.28	5500	0	100	16	8.08
Zunheboto	12	11.53	4200	0	100	3	2.88

[9] Lasse (2001).The Sustainable Livelihood Approach to Poverty Reduction: International Development Cooperation Agency, Sweden

Total/average	68	22.51	4850	0	200	19	6.29

Source: Field Survey 2015-16

Cont: table no. 4.8. Financial Capital and its implications on farmer's livelihood

Districts	**Pension**			**Saving & borrowing**				**Types of Saving**					
	Source		Average amount in Rs./hh	Saving		Loans		Livestock		Cash		Bank Deposits	
	Yes	%		Yes	%	Yes	%	Yes	%	Yes	%	Yes	%
Mokokchung	36	18.18	6200	35	17.67	26	13.13	65	32.82	15	7.57	25	12.62
Zunheboto	18	17.30	5800	13	12.5	11	10.57	33	31.73	3	2.88	45	43.26
Total/average	54	17.88	6000	48	15.89	37	12.25	98	32.45	18	5.96	70	23.17

Source: Field Survey 2015-16

The above table no 4.8 shows 22.51% in the sample aggregates receives remittance from their children who are either working in government sector or private sector in the towns and cities. Female members of the family controls the remitted money, the average monthly amount remitted are Rs 4850 per household and only 19% of the respondents utilize the remittance money for investment. The percentage of respondents receiving pension are 17.88% and average amount saved per annum is Rs 6000 per household. A very few households save and get loan which is 15.89% and 12.25%, respectively. The farmer's saves in three different ways which are Livestock, cash and Bank deposits which are 32.45%, 5.96% and 23.17%, respectively.

The above table also shows 28.28% from Mokokchung and 11.53% from Zunheboto receives remittance money from their children who are either working in government sector or private sector or in cities .The female members of the family controls the remitted money, the average monthly remittance are Rs 5500 and Rs 4200, respectively for both districts and only 8.08% and 2.88% of the respondents utilize the remitted money for investment .The percentage of respondents receiving pension are 18.18% from Mokokchung and 17.30% from Zunheboto districts. Households that saves is very few which is 17.67% of households saves and 13.13% of households got loan for Mokokchung and 12.5% of households saves and 10.57% received loan for Zunheboto districts. The farmers save in three different ways which are Livestock, cash and Bank deposits. For Mokokchung the respondents save 32.82%, 7.5%

& 12.62% in Livestock, cash and Bank deposits and for Zunheboto district, the respondents save 31.73%, 2.88% &43.26% in Livestock, cash and Bank deposits, respectively.

4.2.4.1. Analysis on access to financial capital and Livelihood

Financial asset is one of the essential elements to improve the livelihood conditions of the farmers. Many of the farmers are faced with severe financial constraints and often struggle to make both ends meet with the increase in expenditure on education, household commodities, medical, clothes, transportation cost, raising livestock and crops, social events like marriage, funerals, festivals etc. Poor farmers puts great effort to meet their basic needs, thus it becomes impossible to invest in agricultural production or any other related livelihood activities. Hence their livelihood condition remains stagnant or deteriorates. The three variables were taken into account i.e., Bank Account, saving and loans which is analysed on the table below.

Table no. 4.9: Binary logistic regression analysis of financial capital

Variables	**Mokokchung**		**Zunheboto**		**Total**	
	(B) Coefficient	**(S.E) Standard Error**	**(B) Coefficient**	**(S.E) Standard Error**	**(B) Coefficient**	**(S.E) Standard Error**
Bank Account Deposit	18.651 (.997)	5.753	19.961 (.998)	7.729	18.846 (.997)	4.698
Saving	2.908 (.000***)	.570	3.967 (.000***)	.897	2.940 (.000***)	.427
Loan	1.174 (.188)	.891	-.936 (.520)	1.453	.507 (.482)	.721

Note: *Significant variables influencing agricultural participation at 1% (***)*

The results of the Binary logistic regression estimate in Table no.4.9, the sample aggregates for saving was found to be positively related to farmer's livelihood, and statistically significant at 1 %. This result reveals household savings for both district has influenced livelihood of the farmers positively. The influence of Bank account deposit and loan were found to be positive to the farmer's livelihood, yet statistically not significant. Moreover, access to loan is considerably low and statistically not significant.

The result shows that savings was found to be positively related to farmer's livelihood at 1 % level of significant for both districts. This means farmer's household's savings have positive impact or improving farmers livelihood, which is highly significant at 1%. Bank account and

loan were found to be positive to farmer's livelihood for both the districts, yet statistically not significant.

4.2.5. Social Capital and Livelihood

Social capital in Sustainable Livelihoods Framework indicates social resources in which people draw from pursuit of livelihood objectives (Moser, 1998)[10]. The nature of social capital is often determined and influenced by gender or by the stake holders. The farmers in the rural areas need to actively participate in the working of the local, state or central policies to gain information and support of various schemes, so they get benefit from them and enrich their livelihood.

In regard to social capital, only a few farmers express their views and grievances on decision making process, policies of village panchayats or village councils and individual decision of right to vote. Whereas, majority of farmers are unaware of central and state government policies, schemes, grants-in-aid, nor share their views or interact with political leaders about their grievances, except for those working in VCs and VDBs. There is lack of transparency in governance of village panchayats, specifically in regards to finance which discourages farmers to take part in the affairs of village community development due to lack of trust.

Table no. 4.10: Social capital and its implications on farmer's livelihood

Districts	**SHG membership**		**Membership of VDB**		**Membership of VC**		**Beneficiary of Government schemes APL/BPL/ AAY**		**Right to Vote**		**Awareness of the Government policies**	
	Yes	%	Yes	%	Yes	%	Yes	%	Yes	%	Yes	%
Mokokchung	64	32.32	68	34.34	83	41.91	40	20.20	188	94.94	67	33.83
Zunheboto	43	41.34	42	40.38	36	34.61	50	48.07	80	76.92	19	18.26
Total	107	35.43	110	36.42	119	39.40	90	29.80	268	88.74	86	28.47

Source: Field Survey 2015-16

The above table no 4.10 shows 35.43% in the sample aggregates are members of SHG, which is regarded as one of the most dependable economic association in rural area,

[10] Moser (1998).The asset vulnerability framework: reassessing urban poverty strategies: World Development, 26(1), pp. 1-19.

where the members help each other in times of need. The membership of VDB and VC are 36.42% & 39.40%, respectively and 29.80% of the respondents were beneficiary of government Schemes like APL/BPL/AAY. Further, 88.74% of the respondent's exercise their voting right without any pressure or restraint and the percentage of awareness of the government policies is 28.47%.

The above table also indicates that 32.32 % & 41.34% of Mokokchung and Zunheboto are members of SHG, which is regarded as the most dependable economic activities at present; The membership of VDB and VC are 34.34% & 41.91% for Mokokchung and 40.38% & 34.61% for Zunheboto district. The beneficiary of government Schemes like APL/BPL/AAY are 20.20% and 48.07% for Mokokchung and Zunheboto district, respectively. The percentage of individual who exercise voting right without any pressure or suppression is high for both the districts which are 94.94% and 76.92% respectively. The percentage of awareness of the government policies are 33.83% for Mokokchung district and 18.26% for Zunheboto district.

4.2.5.1. Analysis on access to Social Capital and Livelihood

Social assets is the social resources in which people gain information, knowledge, guidance and support from various schemes and policies of centre, state, local government and village councils, etc. However, due to low level of awareness of such schemes or programmes many needy farmers are unable to benefit. The predicament of farmers to exercise right to vote, they are easily swayed by the powerful forces based on politics of clan, village, relatives etc.The three variables taken for the study are awareness or participation in Village development Board (VDB)/Village councils, access to public schemes and right to vote.

Table no. 4.11: Binary Logistic Regression Analysis of Social Capital

Variables	**Mokokchung**		**Zunheboto**		**Total**	
	(B) Coefficient	**(S.E) Standard Error**	**(B) Coefficient**	**(S.E) Standard Error**	**(B) Coefficient**	**(S.E) Standard Error**
Village Development Board/Village Councils	-1.774 (.000***)	.447	2.441 (.000***)	.565	1.978 (.000***)	.328
Access to public schemes	3.145 (.000***)	.447	.824 (.229)	.685	2.378 (.000***)	.342

Right to vote	1.421 (.299)	1.367	-.720 (.240)	.613	-.553 (.482)	.500

Note: *Significant variables influencing agricultural participation at 1% (***)*

The results of binary logistic regression estimate in the sample aggregate, the Village Development Board /Village Councils and Access to public schemes were found to have positive influenced on farmer's livelihood and statistically significant at 1%. These reveal that increase in membership and active participation in VDB/VC and access to public schemes has resulted in the benefits of the farmers and thus improving farmers' livelihood.

Table no.4.11 also shows Village Development Board and Village Council for Mokokchung was found to be negatively influencing farmers Livelihood with significant level at 1 %. The access to public schemes was positive and significant at 1 %, to farmers Livelihood. This result implies that farmers who actively participate and access the various public schemes and policies of the government, the farmers gets benefits and improve their livelihood. Right to vote is positively influencing farmer's livelihood, but not significant means that it does not contribute on the current livelihood conditions of the farmers.

For Zunheboto, Village Development Board and Village Council have positively influenced the farmers Livelihood, which is statistically significant at 1 %. This result implies that farmers who actively participate gets the information, knowledge of the various government schemes and gets benefits, positively impacting livelihood condition. The access to public schemes has positively relation to the farmers' Livelihood but statistically insignificant. This result implies active participation of the farmers do not influence livelihood of the farmers in the state. Right to vote is negatively related to livelihood and insignificant means that it does not have any significant impact on farmer's livelihood.

From the above, it is observed that an undeveloped capital asset not only leads to slow growth of agricultural production but also decrease it thereby having a negative impact on farmers' livelihood. Proper utilization of capital assets will not only increase production but also simultaneously generate benefits to increase their livelihood status and thus enhancing their income. Hence, proper access to capital assets is necessary to boost farmer's livelihood.

4.3. The five Capital Assets Pentagon

Table no. 4.12: The Improvement of five Capital Assets over the last five years prior to the survey.

Capital Assets	**Mokokchung**				**Zunheboto**				**Total**			
	Yes	%	No	%	Yes	%	No	%	Yes	%	No	%

Physical	70	35.4	128	64.6	47	45.2	57	54.8	117	38.48	185	60.85
Financial	19	9.6	179	90.4	19	18.3	85	81.7	38	12.5	264	86.84
Natural	70	35.4	128	64.6	41	39.4	63	60.6	111	36.51	191	62.82
Human	42	21.2	156	78.8	26	25.0	78	75.0	68	22.36	234	76.97
Social	74	37.4	124	62.6	35	33.7	69	66.3	109	35.85	193	63.48

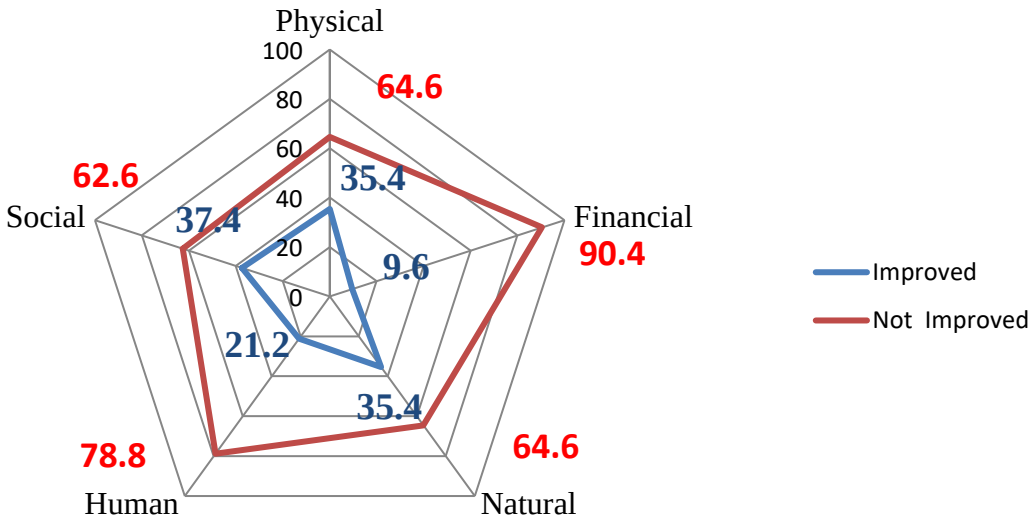
Source: Field Survey 2015-16

Table no. 4.12 shows, among the types of capital assets in the sample aggregates, more farmers have experienced improvement in physical capital (38.48 percent), followed by natural capital (36.51 percent) and social capital (35.85 percent),while increase in human and financial capital assets were the least (22.36 and 12.5 percent, respectively).

This is evident from the table no. 4.12 that in Mokokchung district, more farmers have experienced improvement in social capital (37.4%), followed by Physical and natural capital (35.4 % each) while the increase in human capital was moderate (21.2%) but only a few farmers experienced improvement in financial capital (9.6%).

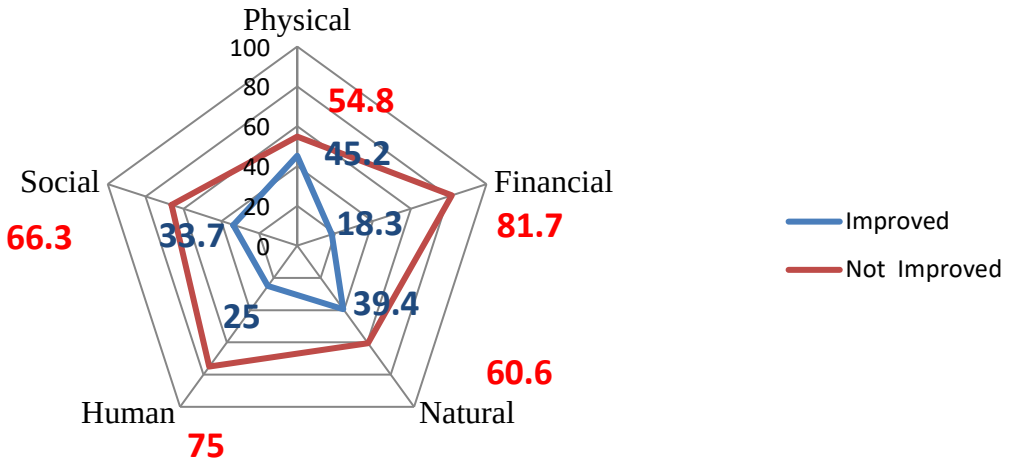
Zunheboto district also had similar scenario, but the proportions of farmers who experience increase in each type of capital asset were relatively lower than in Mokokchung district. A larger proportion of farmers experienced increase in Physical capital (45.21%), which was followed by natural capital (39.4%), social capital (33.7%), human capital (25%) and financial capital (18.3%), respectively.

Figure 4.1. Asset Pentagon of Mokokchung district over the last five years.



Source: Field Survey 2015-16

Figure. 4.2. Asset Pentagon of Zunheboto district over the last five years



Source: Field Survey 2015-16

The above two asset pentagons clearly reveal the improvement of Capital assets for the farmers over the last five years prior to the survey. Among all assets, a few farmers had improvement in financial and human capitals in both the districts, but more farmers have improvement in physical, social and natural capitals, respectively.

The reasons for low capital assets are, lack of credit facilities (financial capital), lack of Skill improvement, access to health facilities (human capital), lack of information on Grants-in-Aids, central/State policies & schemes, decision making on panchayats, lack of interaction with political leader or parties, extension services (social capital), inadequate marketing facilities, deforestation, unpredictable rainfall and climatic conditions, lack of irrigation facilities which hampers double cropping, lack of agriculture machinery and modern inputs etc (physical and natural capitals).

4.4. LIVELIHOOD STRATEGY AND TYPES OF HOUSEHOLDS

On the basis of the sources of household income, farmer's households are divided into two types' viz., full-time agricultural households and part-time agricultural households. Full-time agricultural households are those households who earn their livelihood mainly through crop productions, which combined with crop sale, animal sale, agricultural labor, plantations etc. The part time agricultural households are those households who earn their livelihood through a portfolio of activities and services such as Government Jobs, pensions, carpenters, business, private jobs combined with animal sale, crop sale and also produce crops only for self consumption.

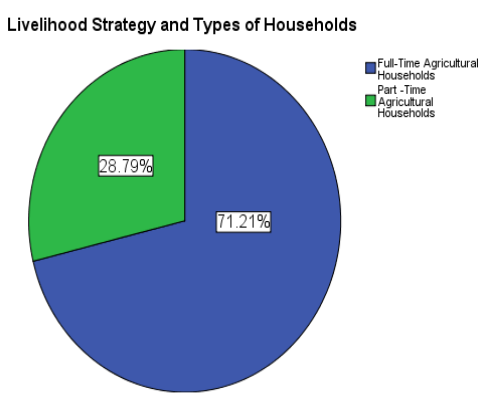
Table no. 4.13: Full-Time Agricultural Households and Part-Time Agricultural Households

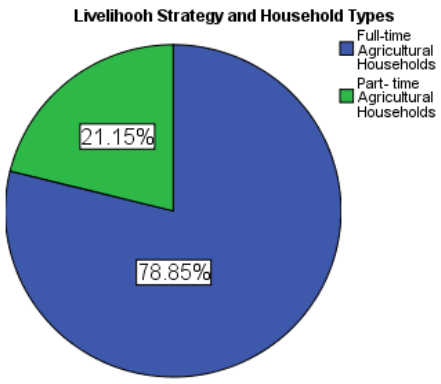
Districts	Full-Time Agricultural Households		Part-Time Agricultural Households	
	Total No. of HH	% age	Total No. of HH	% age
Mokokchung	141	71.21	57	28.79
Zunheboto	82	78.85	22	21.15
Total	**223**	**73.84**	**79**	**26.16**

Source: Field Survey 2015-16

The above table no. 4.13 shows that in the sample aggregates, full-time agricultural household consists of 73.84% and part time agricultural household consist of 26.16% (i.e. 223 households and 79 households, respectively). It also indicates that 71.21% full-time agricultural household and 28.79% part- time agricultural household for Mokokchung district. Whereas for Zunheboto district, the full-time agricultural households was constituted by 78.85% and part time agricultural household with 21.15% of the total sample households in the study area.

Figure 4.3. Livelihood Strategy and Types of Households in Mokokchung & Zunheboto districts





Mokokchung *Zunheboto*

Source: Field Survey 2015-16

The pie chart reveals that more than 70% of the farmers are pure/full time agricultural households for both the districts. Pure/full time agricultural households are those households, who sustain their livelihood through agricultural productions supplemented with crop sale, animal sale and agricultural labor.

4.5.LIVELIHOOD STRATEGIES OF FULL-TIME AND PART-TIME AGRICULTURAL HOUSEHOLDS

Livelihood strategies are the sum of all the different activities that people are doing in the context of their livelihood (Chambers and Conway 1992)[11]. Livelihood strategies are the combination of activities that people choose to undertake in order to achieve their livelihood goals. They include productive activities, investment strategies and reproductive choices (Alinovi et al 2010)[12]. DFID, (2001) [13]attributes relationships between assets and their accessibility are very important for livelihood strategies of the people. Poverty analyses have shown that people's ability to escape from poverty is critically dependent upon their access to assets. Different assets are required to achieve different livelihood outcomes. The farmers choose different types of activities in order to meet the increasing expenditure. They diversify livelihood activities according to their capabilities. The livelihood strategies adopted are classified into full-time agricultural household and part-time agricultural household which are explained below.

Table no. 4.14: Livelihood strategies of full-time agricultural household (income in Rs.)

Full- Time agricultural Households	**Mokokchung**		**Zunheboto**		**Total**	
	No. of HH	Average Monthly Income	No. of HH	Average Monthly Income	No. of HH	Average Monthly Income
Crops sale	4	1850	6	1620	10	1735
Crops +Animal sale	61	6030	47	5650	108	5840
Crops + Animal sale +Agri. Labour + Business	59	8200	19	7100	78	7650
Crops + Animal sale + Agri. Labour / Business + Others	21	10250	10	8800	31	9525
Total/Average	**145**	6583	**82**	5793	**227**	6188

Source: Field Survey 2015-16

The above table no 4.14 shows the sample aggregates of full-time agricultural households' monthly income in average is Rs.6188. the average monthly income from crop sale alone is Rs. 1735, combination of Crops sale + Animal sale is Rs. 5840, Crops sale+

[11] Chambers and Conway (1992).Sustainable Rural Livelihoods: Practical Concepts for the 21st Century:IDS Discussion Paper 296, Brighton: IDS

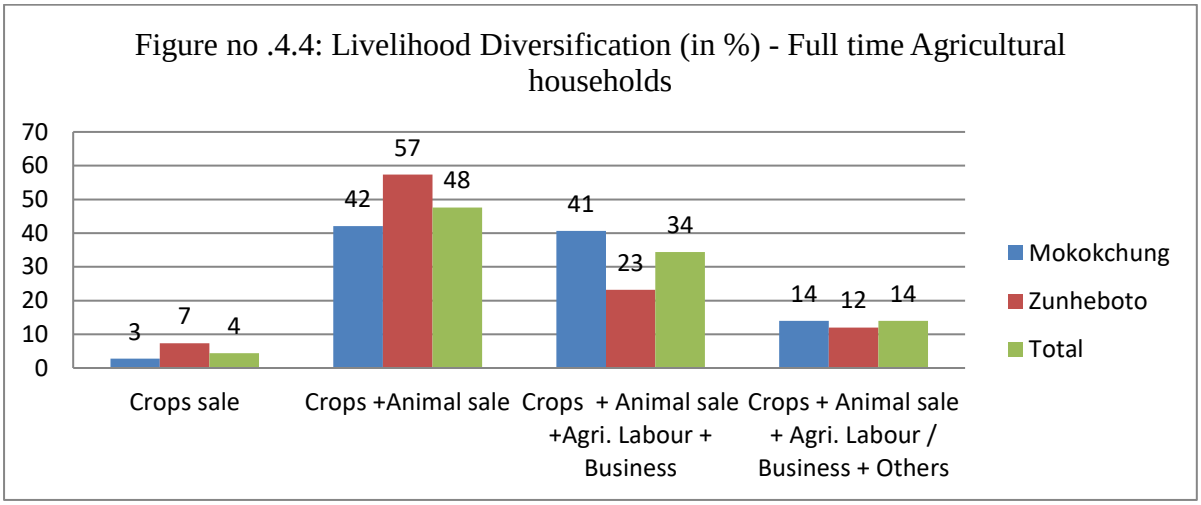
[12] Alinovi et al. (2010).Livelihoods Strategies and Household Resilience to Food Insecurity: An Empirical Analysis to Kenya: Agricultural Development Economic Division FAO.

[13] DFID (2001).Making government work for poor people building state capacity: London.

Animal sale + Agri. Labour/Business is Rs. 7650 and Crops sale + Animal sale + Agri Labour/ Business + Others is Rs. 9525.

The table also shows for Mokokchung with an average monthly income of crop sale alone is Rs.1,850, combination of Crops sale + Animal sale is Rs.6,030, Crops sale+ Animal sale+Agri. Labour/Business is Rs.8,200 and Crops sale+ Animal sale+ Agri Labour/ Business +Others is Rs.10.250. For Zunheboto, average monthly income of crop sale alone is Rs.1,620, combination of Crops sale +Animal sale is Rs.5,650, Crops sale+ Animal sale+Agri Labor/Business is Rs.7,100 and Crops sale+ Animal sale+ Agri. Labor/ Business +Others is Rs.8,800. It is observed that for all the categories of livelihood strategy, the average monthly income per household is higher in Mokokchung than that of Zunheboto. Moreover, the more diversified is livelihood activities, the higher is average income.

Figure no .4.4: Livelihood Diversification (in %) - Full time Agricultural households



Source: Table no. 4.14

Figure no. 4.4 shows that in sample total, as well as Mokokchung and Zunheboto, majority of farming households diversify livelihood into two portfolios i.e., crop and animal sales. Generally, each household rears animal (pig and chicken) which is widespread and a form of saving/investment for the farming households. In times of distress, the animal can be sold and converted into cash without difficulty. The second most livelihood strategy is crops sale, animal sale, render agricultural labour when not engaged in his field, small business and others. In all the districts, very few farmers depend on crop alone, which is the lowest. So, farmers try to diversify economic activities to achieve their livelihood goals by earning higher income from a diverse portfolio of activities.

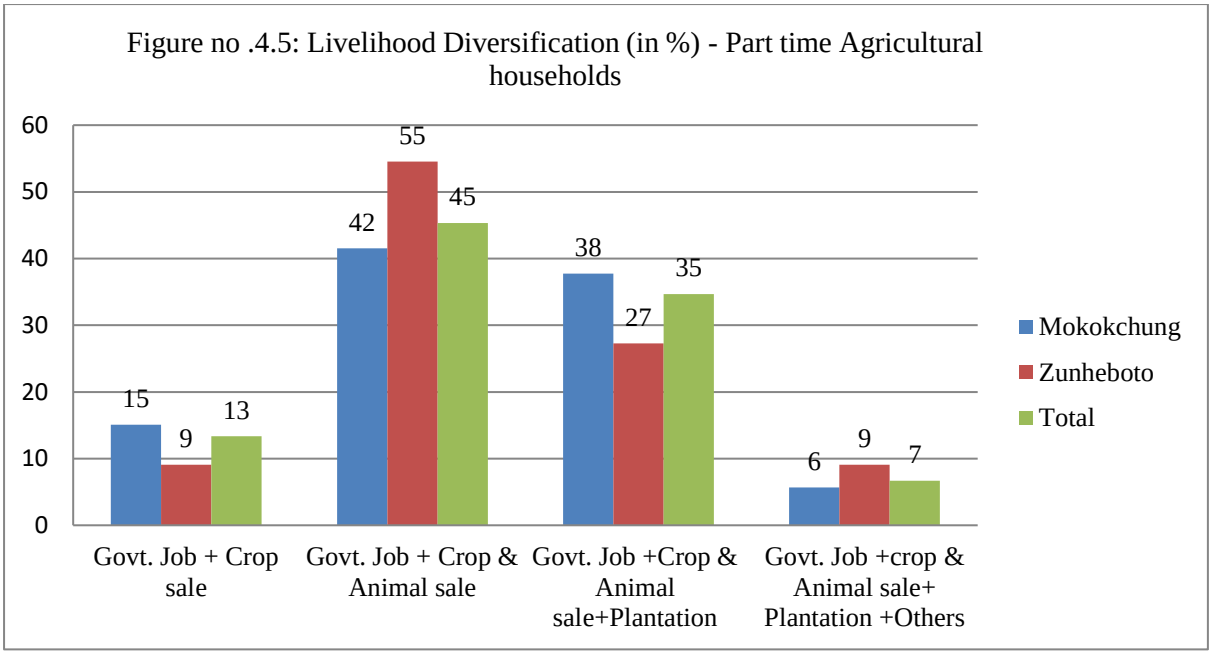
Table no.4.15: Livelihood strategies of part-time agricultural household

Part - Time agricultural Households	Mokokchung		Zunheboto		Total	
	No of HH	Average Monthly Income (in Rs.)	No of HH	Average Monthly Income (in Rs.)	No of HH	Average Monthly Income (in Rs.)
Govt. Job + crop sale	8	15000	2	13000	10	14000
Govt. Job + Crop & Animal sales	22	17500	12	16250	34	16875
Govt. Job + Crop & Animal sales + Plantation	20	20850	6	18000	26	19425
Govt. Job + Crop sale & Animal sale + Plantation +Others	3	22520	2	21220	5	21870
Total/Average	53	18,968	22	17,118	75	18,043

Source: Field Survey 2015-16

The above table no 4.15 shows the sample aggregates, the average monthly income of part-time agricultural household is Rs. 18,043, out of which the average monthly income of Govt. Job and crop sale alone is Rs. 14,000, combination of Govt. Job + Crop sale +Animal sale is Rs.16875, combination of Govt. Job + Crop & Animal sale +Agri. Labour/Business is Rs.19425 and Govt. Job + Crop & Animal sale+ Agri. Labor/ Business +Others is Rs.21,870.

The table also shows for Mokokchung, average monthly income from Govt. Job and crop sale alone is Rs. 15,000,combination of Govt. Job + Crops sale +Animal sale is Rs.17500, Govt. Job + Animal sale+Agri Labour/Business is Rs.20,850 and Govt. Job + Animal sale+ Agri Labor/ Business +Others is Rs.22,520. For Zunheboto, average monthly income of Govt. Job + crop sale alone is Rs.13, 000, combination of Govt. Job + Animal sale is Rs.16,250, Crops sale+ Animal sale+Agri Labor/Business is Rs.18,000 and Govt. Job + Animal sale+ Agri Labour/ Business +Others is Rs. 21,220.



Source: Table no.4.15

Figure no 4.5 shows that larger proportion of part time agricultural households, whose main source of income is from government service, are also engaged in diverse economic activities of crop and animal production and sales. This is followed by Govt. Job + Crop & Animal sales + plantations. Subsequently follows Govt. Job + Crop sales. On the other hand, the smallest proportion of households was of Govt. Job + Crop sale & Animal sale + Plantation +Others, although income from this combination is found higher than other strategies.

The above analysis indicates that the average monthly income of the full time agricultural household is lower than the part time agricultural household. Moreover, a single livelihood activity alone cannot sustain farmers' livelihood, either it's for full-time or part-time agricultural households. Thus, in order to sustain their livelihood, farmers take up diverse portfolios of livelihood activities by combining to a maximum of four livelihood activities in the sample. The outcome is the more diversified livelihood activities of the farmers are; the higher is the sustainability of the farmers' livelihood. Henceforth, the most suitable livelihood strategies for the farmers are the combination of different livelihood activities according to their capabilities and access to capital assets.

4.6. EXTENT OF LIVELIHOOD DIVERSIFICATION OF FARMING HOUSEHOLDS

In the process of rapid urban- rural social and economic transformation, farmers' livelihood strategies have undergone fundamental changes. The dependence of the

agricultural labor force on subsistence farming has weakened, and changes in livelihood strategies have promoted agricultural diversification (Zhu et al., 2022)[14].

Livelihood Diversification is "the process through which rural families builds a diverse portfolio of activities and social support capacities in their struggle for survival and improving their living standards" (Ellis,1997)[15]. Diversifying Livelihood is an essential Livelihood strategy for the rural farmers to improve their living standard and make both ends meet. The more diversified of livelihood activities, the better their income and ultimately increase their living standard and sustainability. Supplementary livelihood activities are a popular strategy for sustaining farmers' livelihood living in rural areas especially in Nagaland where agriculture remains underdeveloped. At present, if a supplementary livelihood activity is reduced then farmers livelihood also reduced and vice-versa. In order to sustain their livelihood, farmers diversify their Livelihood activities for additional source of income. The Simpson Index of diversity[16] was used for measuring the extent of diversification among different diversifier's households in the study area.

The formula is as follows:

SDI=1- $\sum_{i=1}^{N} P^2$

Where SDI is the Simpson Diversification Index, N is the total number of revenue sources and Pi is the proportion of revenue that comes from source i. The index values vary from 0 to 1. The index value is 0 when there is a complete specialization and 1 as the level of diversification increases.

Table no 4.16. Distribution of diversification index among diversifiers farming households

Diversification Index		**Mokokchung**		**Zunheboto**		**Total**	
		Frequency	%	Frequency	%	Frequency	%
Low	(<0.38)	102	51.51	54	51.92	156	51.66
Medium	(0.38-0.63)	92	46.47	50	48.08	142	47.02
High	(>.0.63)	4	2.02	0	0	4	1.32
Total household		198	100	104	100	302	100

Source: Field Survey 2015-16

[14] Zhu, J.; Sun, Y.; Song, Y. (2022).Household Livelihood Strategy Changes and Agricultural Diversification: A Correlation and Mechanism Analysis Based on Data from the China Family Panel: Land 2022, 11, 685.

[15] Ellis, F. (1998).Survey article: Household strategies and rural livelihood diversification: The Journal of Development Studies. Vol.35, No.1, pp.1–38.

[16] Fekadu, A.G., Megento, T.L., and Kussa, F.G., (2021).The extent of livelihood diversification on the determinants of livelihood diversification in Assosa Wereda, Western Ethiopia:GeoJournal, https://doi.org/10.1007/s10708-021-10379-5 .

In table no 4.16, the sample aggregates shows that majority of farming households were under low level of diversification index (51.66%), followed by medium level which is 47.02% and only 1.32% were of high level diversification index.

For Mokokchung district, 51.51% were under low level of diversification index as against 46.47% of medium level and only 2.02% of high level of diversification index. Similarly for Zunheboto, 51.92% were under low level of diversification index as against 48.08% of medium level and 0% of diversifiers for high level of diversification index. Thus, farming households in Nagaland are unable to diversify their livelihood to improve their living conditions.

4.7. DETERMINANTS OF LIVELIHOOD DIVERSIFICATIONS OF FARMERS

Ellis (1998)[17]describes livelihood diversification is a process by which households build a portfolio of different activities and assets in order to survive and improve their standards of living. Also Sekumade & Osundare (2014),[18] refers livelihood diversification to the ways by which households raise income and reduce environmental risks. Diversification makes smooth flow of income to the household by reducing both predictable and unpredictable fluctuations. Purna and Nath (2011),[19] stated that farmers engage themselves in wage earning in agriculture and non-agriculture sectors and seasonal labour migrants to supplement their earning, also engage in cutting and sale of fire wood. Khatun and Roy (2014)[20], identified the determinants and constraints to livelihood diversification among different livelihood groups. It was found out that household-head experience and educational level, social status, training, asset position, access to credit, rural infrastructure, agro climatic condition and the overall level of economic development of a region are the main driving force towards livelihood diversification. The main constraints faced by the households in diversified area are asset base, lack of credit facilities, lack of awareness and training facilities, fear of taking risk, lack of rural infrastructure, and lack of opportunities in non-farm sector, while the main constraints in less diversified area are poor transport facilities, poor asset base, unfavourable agro-climate, lack of credit facilities, lack of awareness and training, and lack of basic infrastructure. The adequately trained human resources are the need of the

[17] Ellis, F. (1998).Survey article: Household strategies and rural livelihood diversification: The Journal of Development Studies. Vol.35, No.1, pp.1–38.
[18] Sekumade & Osundare (2014).Determinant and effects of livelihood diversification on farm households in Ekiti State, Nigeria: Journal of Economics and Sustainable Development, 5(5), 1-2.
[19] Purna and Nath (2011).Livelihood options for landless and marginalized communities in an agrarian society: A case study from far western Nepal: pak. j. agri. sci., vol. 48(1), 1-10.
[20] Khatun, and Roy, B.C.(2014).Rural Livelihood Diversification in West Bengal: Determinants and Constraints, Agricultural Economics Research Review, Vol. 25(No.1) January-June 2012 pp 115-124.

hour in agricultural sector. Therefore, the provision of training and skill-formation should be arranged on a larger scale for the agriculturalists (Mithiya et al., 2018)[21].

The variables selected for analyzing the determinants of livelihood diversifications for the study are: age of household head, household size, education level, dependency ratio, diversified livelihood, road distance, livestock holding size, extension contact, access to irrigation, access to mass media, access to credit, urban linkages, cooperatives, training and total Income.

Table no 4.17. Descriptions of explanatory variables used in multiple regression analysis.

Variables	**Nature**	**Value**
LDI	Continuous	Livelihood Diversification Index(Simpson)*100
Age of Household head	Dummy	Actual age in the year
Household Size	Continuous	In number
Education level	Continuous	1 if literate and 0 otherwise
Dependency Ratio	Continuous	The ratio of dependent and independent
Diversified livelihood	Dummy	1 if diversified and 0 otherwise
Road distance	Continuous	Distance to nearest road in km
Livestock holding size	Continuous	Livestock holding size in number
Extension contact	Continuous	Total number of contacts in a year
Access to irrigation	Dummy	1 if yes and 0 otherwise
Access to Mass media	Dummy	1 if yes and 0 otherwise
Access to credit	Dummy	1 if have and 0 otherwise
Urban Linkages	Dummy	1 if yes and 0 otherwise
Cooperatives	Dummy	1 if yes and 0 otherwise
Training	Dummy	1 if yes and 0 otherwise
Annual Income	Continuous	Annual Income of the households in Rs.

Source: Field survey 2015-16

Among these determinants of livelihood diversifications, education level, extension contacts, diversified livelihood, urban linkages, cooperatives, training and total income, access to irrigation, livestock holding size, access to credit and media are hypothesized as statistically significant predictors of livelihood diversifications. This means with better education level, more diversified livelihood, better urban linkages, better cooperatives, better training and

[21] Mithiya et al., (2018).Trend, pattern and determinants of crop diversification of small holders in West Bengal: A district-wise panel data analysis: Journal of Development and Agricultural Economics Vol. 10(4), pp. 110-119, April 2018, ISSN2006- 9774.

high annual income, better interaction with extension agents, training, access to credit and media in the study area are expected to influence to diversify the farmers' livelihood positively. Lack of irrigation facilities, smaller sized livestock, low or no access to credit and mass media etc are expected to have less influence on diversification.

On the contrary, age of household head, household size, dependency ratio, road distance are hypothesized as statistically insignificant predictors of livelihood diversifications. As age of households are younger, they lacked experiences and assets and when older they may not make effort to diversify, the households dependency ratio is higher it is expected to be less diversified, the longer is the distance from house to all weather road more hardship and farther away from market.

Table no. 4.19. : Multiple Regression Analysis of determinants of Livelihood Diversification

Variables	**Mokokchung**	**Zunheboto**
Intercept	-0.767	-0.378
	(4.382)	(2.589)
Age of Household head	0.002*	0.002**
	(1.56)	(1.737)
Household Size	0.003	0.002
	(0.61)	(0.27)
Education level	0.084*	0.06
	(1.369)	(1.42)
Dependency Ratio	-0.003	-0.019
	(0.88)	(0.487)
Diversifications of livelihood	0.131***	0.153***
	(8.187)	(7.65)
Road distance	0.007**	0.001
	(2.333)	(1.077)
Livestock holding size	0.017*	-0.040**
	(1.399)	(2.506)
Extension contact	0.002	-0.108***
	(0.52)	(3.22)
Access to irrigation	0.016	-0.002
	(0.367)	(0.035)

Access to Mass media	0.024	-0.036
	(0.889)	(1.125)
Access to credit	0.032	0.065
	(0.941)	(1.275)
Urban Linkages	0.059***	0.065***
	(2.681)	(2.708)
Cooperatives	0.057**	0.100***
	(2.28)	(3.225)
Training	-0.040**	-0.097***
	(2.283)	(2.852)
Household Annual Income	0.090***	0.067***
	(7.51)	(3.526)
Adjusted R^2	0.447	0.52
F-value	11.054	11.547
No. of observations	198	104

*Note: Significance at the 10%, 5% and 1% levels are indicated by *, ** and ***, respectively*

(Figure in the brackets represents 't' value);

Source: Field survey 2015-16

The results of multiple regression estimates for Mokokchung and Zunheboto are presented in Table no 4.19. In the regression estimates of Mokokchung district, the adjusted R^2 is 0.44 and r = 0.63, this implies there is positive relations among the variables and the explanatory variables fairly explains the variations of the dependent variable in the model. The regression coefficients of age of household head (10%), education level (10%), livelihood diversification (1%), road distance (5%), live stock size (10%), urban linkages (1%), cooperatives membership (5%), and households' total income (1%) were all found to have positive impact on the livelihood diversification and were statistically significant as shown in the brackets. These are in conformity of the hypothesis, except for age of the household head. The regression coefficient values reveal that one unit increase in each of the respective independent variable will result in increase in livelihood diversification as given. Out of the given determinants, the impact of livelihood diversification (0.13) is higher, followed by household annual income (0.09), education level of head (0.08), urban linkages (0.05),

cooperative membership (0.05), live stock size (0.01), road distance (0.007), and age of household head (.002).

Further, it is reveal that the influence on livelihood diversity by access to credit (0.03), media (0.02), irrigation (0.01), extension contacts (0.002) and household size (0.003) were all positive, but statistically not significant so they do not have influence on the dependent variable. On the other hand, access to training (statistically significant at 5%) has negative influence on livelihood diversity. Whereas dependency ratio, with coefficient value of -0.003, but statistically not significant and thus no influence.

Similarly, for Zunheboto district, the multiple regression result is shown in the table no 4.19, where r = 0.72 and adjusted R^2 is 0.52, which implies that there is positive relationship between the variables and the explanatory variables explains about 52 percent of the variation in the model. Those explanatory variables with regression coefficient value in the brackets viz., total income (0.067), cooperative membership (0.10) urban linkages (0.06), diversification of livelihood (0.15) and age of household head (0.002) were found to have positive impact on livelihood diversity, and all are statistically significant.

On the other hand training (-0.097), extension contacts (-0.108) and livestock size (-0.04) are statistically significant, having negative influence on livelihood diversity.

Other factors such as household size, education level, road distance, access to credit have positive influence on livelihood diversification but statistically not significant. Likewise, the statistically insignificant and negative relation is shown by variables like access to mass media and dependency ratio in Zunheboto.

The multiple regression analysis result shows in line with the hypothesis of the study, the annual income of the farming household is one of the major determinants of livelihood diversity for both the sample districts. Higher income enables the household to take up diverse economic activities. Also, there was significant contribution of the determinants of livelihood diversification for livelihood diversification, this implies diversification leads to further diversity of livelihood. It is been observed in both the districts that membership in cooperative activities in the village is essential for livelihood diversification. Local institutions and organizations at village level play important role in the event of crises, supply in-cash or in-kind, or lends support by taking part in labour, provide transportation and so on. These forms of social and economic cooperation are well organized amongst the people in

both the districts, contributing positively in livelihood diversification, which conform the hypothesis.

Moreover, the result indicates that proximity to urban centre and linkages is another factor that gives positive impact on diversifying farmers' livelihood. The sample villages are located at the radius of 2 to 20 kms. away from the nearest urban centre. Thus, farmers have regular contact in the urban centre, often selling their produce and buying their needs and farm inputs. Also acquires knowledge and information, engage in small business, that improves their livelihood. Hence the urban linkage of household was significant as it converge to the hypothesis.

Education is found to be another important determinant, having positive impact on livelihood diversification, which is found significant only in Mokokchung district. As educational attainment of head of household increases, there would be a corresponding increase in livelihood diversification, like employment in government service, business etc. Education is a socio economic factor affecting individual attitude and capabilities, allowing households to access to mass media, where the impact of mass media on livelihood diversity was positive and significant in Mokokchung, however not significant in Zunheboto district. Moreover, age of head of family has significant and positive influence on livelihood diversity which is in contrast to hypothesis that as elder farmers gain more experience than younger population, and thus diversify more.

Livestock is a form of saving and insurance for the farmers' family, a source of cash or income in-kind. It provides immediate cash to cover unforeseen expenses and it is also a social status for the family. More livestock size leads to increase in cash flow of the farmers, this has been helping the farmers to diversify livelihood by 1.7 % which is statistically significant in Mokokchung. Nevertheless, farmers in Zunheboto district were not fortunate, where livestock size has reduced the farmers' ability to diversify livelihood. The high mortality rate of livestock with no proper health care services in place and minimum extension contacts are hindrances towards livelihood diversification through livestock.

Households' extension contacts is expected to increase the extent of diversification of farmers' livelihood, helping the community to engage in more income-generating activities, adopt improved technologies in crop and livestock production etc. Farmers in Mokokchung district might have marginal contact (0.2%) but has no influence on livelihood diversification of the household. While for Zunheboto, the result show negative impact of this (-10%) ,

which is statistically significant at 1 % , which is divergent to the hypothesis. The result further reveals that trainings have negative impact on diversification of livelihood in both the districts, which is statistically significant, which is not in line of the hypothesis.

Household access to credit and household size were statistically not significant so they have no influence on livelihood diversity. Moreover, access to irrigation had shown no influence on the livelihood diversification that access to irrigation is negligible in the study area. The dependency ratio is found to have negative influence on diversity of livelihood in both the districts, but was statistically not significant and hence contrary to the hypothesis, it does not influence the outcome.

4.8. CONCLUSION

The policy makers need to make deliberate effort on developing capital assets for improving and sustaining farmer's livelihood. The unfavourable livelihood outcome in recent years is due to poor accessibility of the five capital assets. Since, the relationship between the capital assets and their accessibility are very important for livelihood strategies of the people. The improvement on capital assets like skills of farmers, NTFP, education, health facilities, transportation, soil fertility, credit facilities, saving, loan, Grants-in-Aids, central/State policies& schemes, interaction with political leader or parties, extension services, marketing facilities, deforestation, climatic condition, irrigation facilities, dependence on monsoonal rain, water for double cropping, agriculture machinery etc need to be developed for farmers livelihood sustainability.

In conclusion, the rural households are likely to have a diversified livelihood when they higher education level, high crop diversification, proper linkage of rural and urban areas ,increased membership of active participation in cooperatives and improved transport and communication. The scope for livelihood diversification can also be improved with more experience (age) and less household size, better irrigation facilities , better access to mass media and access to credit. Finally, farmer's high income level has a strong influence on the rural livelihood diversification.

CHAPTER-5
LIVELIHOOD VULNERABILITY AND SUSTAINABILITY OF THE FARMERS

5.1. INTRODUCTION

The first section of this chapter presents the analysis of livelihood vulnerability of the farmers in the study area. The subsequent sections comprise of the analysis of changes in cropping pattern, which reflects the sustainability of livelihood in agriculture. Further, discussion on production of important crops in sample villages is highlighted in this chapter.

5.2. LIVELIHOOD VULNERABILITY OF THE FARMERS

Vulnerability is one of the factors that determine whether people have risks to their livelihoods or not. According to IPCC (2007), the vulnerability assessment indicates the ability of the community to respond to hazards or variability in natural conditions and or secure their livelihood[1]. For farming community, any climatic change has direct impact on crop production and thus livelihood based on agriculture becomes vulnerable (Suryanto and Rahman, 1996)[2]. It changes time and seasons of planting and growing period, cropping patterns; also increases soil erosion, land-slides, land degradation, and destruction of crops. It reduces productivity, planted and harvested acreage, biodiversity loss, especially affects crops those are relatively sensitive to water availability and temperature change (Runtunuwu & Syahbuddin, 2007)[3].

Marshall et al., (2009)[4] described vulnerability as an outcome of three different elements: sensitivity, exposure and adaptive capacity. Many factors contribute to social and economic vulnerability including rapid population growth, poverty and hunger, poor health, low levels of educations, gender inequality, social exclusion, fragile, marginal and/or hazardous location, resource degradation, and lack of access to infrastructure, resources and services, including knowledge and technological means (Devi et al., 2016)[5]. The rural population being primarily depend on agricultural activities for their survival, have been facing

[1] Parry,M.L., Canziani,O.F., Palutikof,J.P.,Linden,V., & Hanson,C.E. (eds.) IPCC(2007).Climate change 2007:Impacts,adaptation and vulnerability, contribution of working group II to the fourth assessment report of the intergovernmental panel on climate change (IPCC), pp. 73–133, Cambridge University Press, Cambridge.

[2] Suryanto, S., and Rahman, A. (1996).Application of livelihood vulnerability index to assess risks for farmers in the Sukoharjo, Regency and Klaten Regency, Indonesia, Jàmbá:Journal of Disaster Risk Studies 11(1), 739.

[3] Runtunuwu, E. & Syahbuddin,H. (2007).The alteration of precipitation and its impact on planting period: Journal of Land and Climate 26(1), 1-12.

[4] Marshall,N.A., Marshall,P.A.,Tamelander,J., Obuura,D., Malleret-King,D., Cinner,J.E.(2009).A Framework for Social Adaptation to Climate change. Sustaining Tropical Coastal Communities and Industries: IUCN Climate Change and Coral Reefs Working Group. (International Union for Conservation of Nature IUCN), Switzerland, 2009

[5] Devi G,L., Varma,D., Kataktalware,M.A. (2016).The Livelihood Vulnerability Analysis: A Pragmatic Approach to Assessing Risks from Climate Variability and Change—a Case Study Of Livestock Farming In Karnataka,India:3*IOSR* Journal of Agriculture and Veterinary Science (IOSR-JAVS) e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 9, Issue 2 Ver. II (Feb. 2016), PP 15-www.iosrjournals.org.

various adverse impacts threatening their livelihoods (Martin and Lorenzen, 2016)[6].Vulnerability assessment examines the integrated interconnection of human being with the physical environment and social surroundings. A tool for vulnerability assessment, the Livelihood Vulnerability Index (LVI), has been proposed by Hahn, Riederer and Foster (Hahn et al., 2009)[7].

The LVI uses multiple indicators to assess exposure to natural disasters and climate variability, social and economic characteristics of households that affect their adaptive capacity, and current health, food, and water resource characteristics that determine their sensitivity to climate change impacts. Two approaches are presented: the first expresses the LVI as a composite index comprised of seven major components while the second aggregates the seven into IPCC's three contributing factors to vulnerability— exposure, sensitivity, and adaptive capacity. The LVI is designed to provide development organizations, policy makers, and public health practitioners with a practical tool to understand demographic, social, and health factors contributing to climate vulnerability at the district or community level.(Hahn et al., 2009)[8]. The LVI indicators are developed into several sub-components based on the literature review of its main component (Gravitiani et al. , 2018)[9].

In the hilly areas of Nagaland, farmers generally practice Jhum cultivation, which depends entirely on nature and use only traditional tools and implements. The system is labour intensive and do not have much scope for introduction of modern techniques. Excessive rain causes losses as it washes away the top soil along with the natural nutrients and thus affects the productivity adversely. Accordingly, the conditions of drought and cyclone have negative effect on production, making the livelihood of farmers much more vulnerable and unsustainable. In this section, using Livelihood Vulnerability Index (LVI), the study aims to understand the vulnerability of livelihood of far1mers in the hilly areas of Mokokchung and Zunheboto districts of Nagaland. This analysis enables to show whether areas that are exposed to similar level of risks and the same level of dependence on agriculture will have same level of livelihood vulnerability.

5.2.1 Livelihood Vulnerability Index (Composite Index Approach)

[6] Martin, S.M., Lorenzen, K. (2016).Livelihood diversification in rural Laos: World Development, 83, 231-243.
[7] Hahn, Micah B., Riederer,A.M., Foster,S.O.(2009).The Livelihood Vulnerability Index: A pragmatic approach to assessing risks from climate variability and change—A case study in Mozambique: Global Environmental Change 19 (2009) 74–88.
[8] Ibid., p. 74–88 .
[9] Gravitiani, E., Fitriana,S.N., and Suryanto,S. (2018).Community livelihood vulnerability level in northern and southern coastal area of Java, Indonesia, IOP Conference Series: Earth and Environmental Science 202(1):012050, November 2018

In the Sustainable Livelihoods framework, vulnerability context is the major determinant as it directly influences assets, livelihood strategies, institutional process and the livelihood outcomes of the community (Chambers and Conway, 1992)[10]. The level of vulnerability of the community determines the impacts of climatic conditions on peoples' livelihood assets, strategies and outcomes. The study adopted the measure of Livelihood Vulnerability Index (LVI) developed by Hahn et al. (2009)[11], which consist of seven major components, viz., (i) Socio-demographic profile (SDP), (ii) Livelihood Strategies (LS), (iii) Health (H), (iv) Food (F), (v) Water (W), (vi) Social Networks (SN), (vii) Natural Disasters and climate variability (ND). In addition, the study adopted the modification made by Sujakhu et al., (2019)[12] by adding two more components, viz. (viii) Finance (FA) and (ix) Knowledge and Communication (KC). So, a total of nine major components and 33 sub components (indicators of major components) are included in the measure of LVI. The details of the components and sub components are indicated in table no. 5.1.

Each of these sub-components is calculated with different scales; therefore, to calculate all the components as a whole, the composite index approach was used to convert the scale of each sub-component derived from The Life Expectancy Index (UNDP 2007)[13], which is calculated as follows:

$$\text{Index } S_d = \frac{Sd - Smin}{Smax - Smin}$$

where, S_d is the value of the sub-components of the area d, and S_{min} and S_{max} indicate the minimum and maximum values of each sub-components that is determined by the data from the study area.

Once standardized, the sub-components are averaged by using the following formula, and then calculate the value of its main components.

$$M_d = \frac{\sum_{i=1}^{n} index\, s_{di}}{n}$$

The value of M_d is equal to one of the main components in the area *d* (SDP, LS, H, F, W, SN, FA, KC and ND). The *di* index reflects the value of the sub-components that are

[10] Chambers and Conway, 1992, op. Cit.
[11] Hahn, Micah B., Riederer,A.M., Foster,S.O. (2009).The Livelihood Vulnerability Index: A pragmatic approach to assessing risks from climate variability and change—A case study in Mozambique. Journal of Global Environmental Change, 19 (2009) 74–82008 Elsevier Ltd. Doi:10.1016/j.gloenvcha.2008.11.002
[12] Sujakhu, Nai Maiya, Sailesh Ranjitkar, Jun He, Dietrich Schmidt-vogt, Yufang Su and Jianchu Xu (2009), Assessing the Livelihood Vulnerability of Rural Indigenous Households to climate Changes in Central Nepal, Himalaya, Sustainability, 11, 2977; doi: 10.3390/su11102977
[13] UNDP Annual report 2007

indexed by *i*. Based on these equations, the LVI grades can be obtained by using the following equation:

$$LVI_d = \frac{\sum_{i=1}^{9} w_{Mi} M_{di}}{\sum_{i=1}^{9} w_{Mi}}$$

Or

$$LVI_d = \frac{W_{SDP} SDP_d + W_{LS} LS_d + W_{FA} FA_d + W_{KC} KC_d + W_{SN} SN_d + W_H H_d + W_F F_d + W_W W_d + W_{NDC} NDC_d}{W_{SDP} + W_{LS} + W_{FA} + W_{KC} + W_{SN} + W_H + W_F + W_W + W_{NDC}}$$

Where, LVI_d represents the index value for the susceptibility in area, *d*, measured by nine major components. W_{Mi} represents the number of sub-components that reflect to the main component, which is equally contributed to the overall LVI (Sullivan, Meigh & Fediw 2002)[14]. The scale of LVI ranges from not vulnerable to very vulnerable, where:

(1) 0 to 0.2 = not vulnerable
(2) 0.21 to 0.4 = vulnerable
(3) 0:41 to 0.5 = very vulnerable

Source: Hahn et al., (2009)

5.2.2 LVI-IPCC Approach (LVI-Intergovernmental Panel on Climate Change)

Livelihood Vulnerability Index-Intergovernmental Panel on Climate Change (IPCC) index is an alternative method used when calculating LVI according to the IPCC definition of vulnerability.

Categorization of major components into contributing factors from the IPCC (Intergovernmental Panel on Climate Change) vulnerability definition for calculation of the LVI–IPCC.

IPCC contributing factors to vulnerability	Major components
Exposure	Natural disasters and climate variability
Adaptive capacity	Socio-demographic profile, financial assets, knowledge and communication, Livelihood strategies, Social networks
Sensitivity	Health Food Water

Source: Hahn et al. (2008)

[14] Sullivan, C., Meigh, J.R. & Fediw, T.S., (2002), 'Derivation and testing of the water poverty index phase 1', Final report, Department for International Development, UK.

$$CF_d = \frac{\sum_{i=1}^{n} w_{Mi} M_{di}}{\sum_{i=1}^{n} w_{Mi}}$$

Where CF_d is an IPCC-defined contributing factor (exposure, sensitivity, or adaptive capacity) for district d, M_{di} are the major components for district *d* indexed by *i*, w_{Mi} is the weight of each major component, and *n* is the number of major components in each contributing factor. Once exposure, sensitivity, and adaptive capacity are calculated, the three contributing factors are combined using the following equation:

$$LVI - IPCC_d = (ed - ad) * sd$$

Where $LVI–IPCC_d$ is the LVI for district *d*, which is expressed using the IPCC vulnerability framework, *e* is the calculated exposure score for district *d* (equivalent to the Natural Disaster and Climate Variability of major component), *a* is the calculated adaptive capacity score for district *d* (weighted average of the Socio-Demographic, Livelihood Strategies, financial asset, knowledge and communication and Social Networks of major components), and *s* is the calculated sensitivity score for district *d* (weighted average of the Heath, Food, and Water of major components). The score is scaled for LVI–IPCC from -1 to +1 (least vulnerable to most vulnerable) as measure of livelihood vulnerability developed by Hahn et al. (2008).[15]

5.2. 3. Analysis of Livelihood Vulnerability

To analysis livelihood vulnerability, nine main components were selected namely socio-demographic profile, livelihood strategies, social networks, finance, knowledge and communication, health, food water and natural disaster and climate variability. Each of these components consists of several sub-components (or indicators). Each sub-component is measured by different scales, therefore standardised to convert it into an index and combine it as a whole with the composite index. The result of the standardisation of each sub-component, which is obtained from a survey of 198 families in Mokokchung district and 104 households in Zunheboto district, is presented below in table no. 5.1.

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[15] Hahn et al. (2008). Op cit.

Table no 5.1. Livelihood vulnerability index (LVI) sub-components values and minimum and maximum sub- components values for Mokokchung and Zunheboto Districts , Nagaland

Major Component	Sub-component	Units	Mokokchung	Zunheboto	*Maximum value	*Minimum value
Socio-demographic profile	Dependency ratio	Ratio	0.23	0.21	12.0	0
	Percentage of female-head of household	Percent	11.11	13.46	100	0
	Average age of female headed household	1/years	0.022	0.019	0.05	0.01
	Percentage of households where head of household has not attended school	Percent	21.21	74.03	100	0
	Percent of household with orphans	Percent	4.54	6.73	100	0
Livelihood strategies	Percentage of households with family members working in different community	Percent	28.28	11.53	100	0
	Percentage of households dependent solely on agriculture as a source of income	Percent	32.82	50.96	100	0
	Average agricultural livelihood diversification index (LDI)	1/LDI	0.33	0.33	1	0.2
Social networks	Average help receive: given ratio	Ratio	1.53	1.32	8	0.3
	Average borrow: lend money ratio	Ratio	1.08	0.97	2	0.5
	Percentage of households who has not gone to their local government for assistance in the past 12 months.	Percent	28.78	22.11	100	0
Finance	Annual expenditures of HH	Percent	91.25	96.75	100	0
	Annual saving of HH	Percent	8.75	3.25	100	0
	Percentage of households that do not cash crop	Percent	0.20	0.43	100	0
	Livestock owned by households	Percent	0.28	0.20	100	0
Knowledge and Communication	Percentage of households without TV and ratio					
	Percentage of households without modern furniture	Percent	46.37	53.85	100	0
		Percent	81.32	92.31	100	0
	Average years of schooling of households heads	Percent	7.5	3.5	100	0
Health	Average time to health facility	Minutes	39.25	61.5	403	1
	Percentage of households with family member with chronic illness	Percent	13.13	18.26	100	0
	Percentage of households where a family had missed work or school in the last work week due to illness	Percent	9.09	26.92	100	0
Food	Percentage of households dependent solely on family farm for food	Percent	79.29	56.73	100	0
	Average crop diversity index (ACDI)	1/ACDI	0.31	0.29	1	0.1
	Percentage of households that do not save crops	Percent	57.32	40.67	100	0
	Percentage of households that do not save seeds	Percent	5.73	13.55	100	0
Water	Percentage of households reporting water conflicts	Percent	7.57	18.26	100	0
	Percentage of households that utilise natural water source	Percent	38.82	54.80	100	0
	Average time to water source	Minutes	6.25	8	57	0
	Percentage of households that do not have consistent water supply	Percent	7.07	31.73	100	0
Natural disasters and climate variability	Average number events of excess rain, drought, cyclone and pest attack during the last 6 years, prior to the survey.	Percent	1.33	1.67	100	0
		Percent	84.5	80.5	100	0
	Percentage of households that do not receive a warning about pending natural disaster.	Celsius	21.2	18.4	39.6	16
	Mean Standard deviation to annual average of average maximum daily temperature.	Celsius	18.8	16	33.8	15.5
	Mean Standard deviation to annual average of average minimum daily temperature.	Millimetres	2103.58	1198.03	2675.1	68.0

Source: Field survey 2015-16

**(Minimum and Maximum values are of both the districts)*

Table no.5.2. Livelihood Vulnerability Index (LVI) Sub-components, Major components and Overall LVI for Mokokchung and Zunheboto districts, Nagaland

Sub-component	Mokokchung	Zunheboto	Major Component	Mokokchung	Zunheboto
Dependency ratio	0.019	0.017	Socio-demographic profile	0.106	0.209
Percent of female-head of household	0.112	0.013			
Percent of households where head of household has no attended school	0.212	0.740			
Percent of household with orphans	0.045	0.067			
Percent of households with family members working in different community.	0.282	0.115	Livelihood Strategies	0.257	0.262
Percent of households dependent solely on agriculture as a source of income.	0.328	0.509			
Average agricultural livelihood diversification index	0.162	0.162			
Average help received: given ratio	0.159	0.127	Social networks	0.277	0.220
Average borrow: lend money ratio	0.386	0.313			
Percent of households have not gone to their local government for assistance in the past 12 months.	0.287	0.221			
Annual expenditures of HH	0.912	0.967	Finance	0.250	0.426
Annual saving of HH	0.087	0.032			
Percent of households that do not cash crop	0.002	0.704			
Livestock owned by households	0.002	0.002			
Percent of households without TV and radio	0.463	0.538	Knowledge and Communication	0.450	0.498
Percent of households without modern furniture	0.813	0.923			
Average years of schooling of households heads	0.075	0.035			
Average time to health facility	0.095	0.150	Health	0.105	0.200
Percent of households with family member with chronic illness	0.131	0.182			
Percent of households where a family had to miss work or school in the last work week due to illness	0.090	0.269			
Percent of households dependent solely on family farm for food	0.792	0.567	Food	0.413	0.329
Average crop diversity index	0.233	0.211			
Percent of households that do not save crops	0.573	0.406			
Percent of households that do not save seeds	0.057	0.135			
Percent of households reporting water conflicts	0.075	0.182	Water	0.160	0.335
Percent of households that utilise natural water source	0.388	0.548			
Average time to water source	0.109	0.140			
Percent of households that do not have consistent water supply	0.070	0.137			
Average number of events of excess rain, drought cyclone, and pest attack in the past 6 years, prior to the survey.	0.013	0.016	Natural disasters and climate variability	0.403	0.276
Percentage of households that do not receive a warning about pending natural disaster.	0.845	0.805			
Mean Standard deviation to monthly average of average maximum daily temperature.	0.220	0.101			
Mean Standard deviation to monthly average of average minimum daily temperature.	0.157	0.028			
Mean Standard deviation of annual average rainfall	0.780	0.433			
Over all LVI				**0.269**	**0.306**

Source: Field survey 2015-16

The results in table no. 5.2 show that the LVI of major components ranges from 0.105 to 0.450 in Mokokchung district, and from 0.200 to 0.498 in Zunheboto, which means health is least vulnerable while knowledge & communication is highly vulnerable, in both the districts. The overall LVIs of major component for Mokokchung and Zunheboto districts were 0.269 and 0.306, respectively. This implies that the livelihood of farmers in both the districts is vulnerable, but the degree of vulnerability is relatively higher in Zunheboto district than that in Mokokchung district.

5.2.4. Determinants of Livelihood Vulnerability of the Farmers

The tables 5.1 presents the scores of sub-component values for each district as well as the minimum and maximum values for both combined. In table no.5.2, the major and sub components and the composite LVI for each district are presented.

(i) Socio-demographic profile comprised of four sub-components. Overall, Zunheboto showed greater vulnerability on the Socio-Demographic Profile index than Mokokchung which is 0.209 and, 0.106 respectively. The dependency ratio index was higher for Mokokchung (0.019) than Zunheboto (0.017), which indicates that the proportion of working or active population is lower in Mokokchung than that in Zunheboto district. Mokokchung reported a higher proportion of female-headed household (0.112) than in Zunheboto (0.013). The proportion of household heads who has not attended school is higher in Zunheboto (0.740) than Mokokchung (0.212). Education tends to improve the ability of the farming households to better response to various challenges and shocks, while illiteracy limits the farmers' access to information and technology. Those farmers in Zunheboto are in greater vulnerability. Over 4.54% of farming households in Mokokchung reported to be raising an orphan while the same is 6.73% in Zunheboto.

(ii) Livelihoods strategies consisted of three sub-components that includes household members working outside the community, depends solely on agriculture and livelihood diversification. Overall, Mokokchung (0.257) is relatively less vulnerable than Zunheboto (0.262). A higher proportion of households in Zunheboto than in Mokokchung relying solely on agriculture for income which reveals high dependency on agriculture for livelihood sustainability (0.509) and (0.328), respectively. Further, percentage of households with family members working in different community is higher in Mokokchung (0.282) than in Zunheboto (0.115) implies that more family members migrates for supplementing their livelihood. The average livelihood diversification index value is same for both districts which are 0.162 each; it reveals that both districts follow

similar livelihood strategies by diversifying mainly to two and three types of livelihood activities.

(iii) Social networks components show that the percentage of households that had not approached their local government for assistance in the past 12 months are 28.7% from Mokokchung and 22.11% from Zunheboto. The ratio of average borrow to lend money for Mokokchung and Zunheboto are 0.386 and 0.313, respectively and average receive: give ratio is 0.287 and 0.22, indicating that in regard to borrowing and lending money they either receive or lend in cash or in kind from family, friends, neighbor, relatives or from different SHGs from among themselves. Overall, households in Mokokchung were more vulnerable than Zunheboto on the Social Networks component which is 0.277 and 0.220, respectively.

(iv) Finance components included four sub components. The annual expenditure of households for Mokokchung is 0.912 and Zunheboto is 0.967, indicates the annual household expenditures for both districts are very high (91.25% and 96.75%). On the other hand, annual saving of households is 0.087 and 0.032, respectively; it indicates the annual household saving for both districts is 8.75% and 3.25%, respectively which is relatively low. Percentage of households that do not grow cash crops is 0.002 and 0.704, respectively; it implies that more households are resorting to cultivation of cash crops for additional source of income in Mokokchung than Zunheboto. Crops and livestock owned by households are same for both the districts. Overall, the finance component vulnerability for Zunheboto is much higher than Mokokchung which are 0.250 and 0.426, respectively.

(v) Knowledge and Communication has three indicators. It is revealed that the overall knowledge and communication component vulnerability is higher in Zunheboto (0.498) than for Mokokchung (0.450). The percentage of households without a TV and a radio is 46.37% and 53.85% for Mokokchung and Zunheboto, respectively. The percentage of households without modern furniture is 81.32% and 92.31% in Mokokchung and Zunheboto, respectively. These households do not show improved livelihood as modern furniture is one of the major determinant of households' assets which describes livelihood status. Lastly, the average years of schooling for household's heads are 0.075 for Mokokchung and 0.035 for Zunheboto, indicating higher livelihood vulnerability due to low level of education among household heads in both the districts.

(vi) Health with three sub-components shows greater vulnerability for Zunheboto with overall vulnerability score of 0.200 as compared to Mokokchung district (0.105). Zunheboto with higher average time taken for travelling to health care facilities (0.150 minutes) as

compared the same for Mokokchung (0.095 minutes), has more Chronic illness in the households at Zunheboto (0.182) as compared with Mokokchung (0.131). Similarly, more family members at Zunheboto (0.269) missed work due to illness as compared to Mokokchung (0.090).

(vii) Food vulnerability with four sub-components shows that the overall vulnerability is higher in Mokokchung district with 0.413 as against 0.329 for Zunheboto. The percentage of households dependent solely on family farm for food is 79.2% for Mokokchung and 56.7% for Zunheboto. The average crop diversity index is 0.233 for Mokokchung as compared to Zunheboto with 0.211. This implies households at Mokokchung grow relatively more variety of crops. More households at Mokokchung than Zunheboto do not save crops (0.573 and 0.406, respectively), and the percentages of households that do not saving seeds are 0.057 and 0.135, respectively.

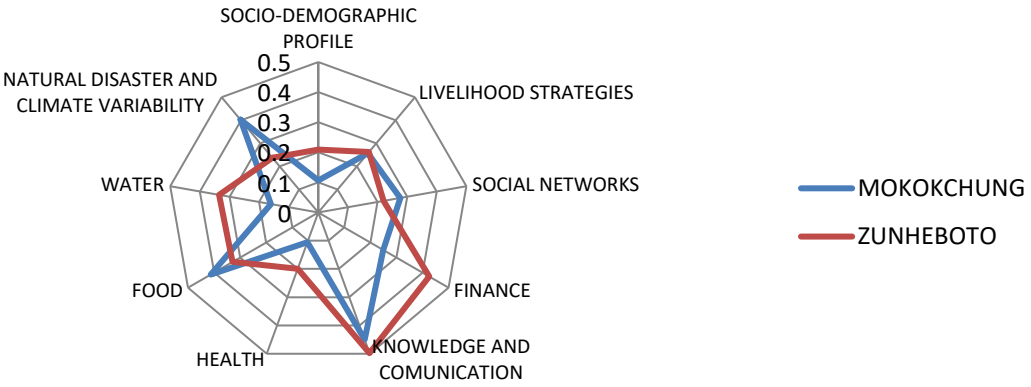
(viii) Water with four sub-components, the result shows Mokokchung (0.160) is comparatively less vulnerable than that in Zunheboto district (0.335). More households in Zunheboto (54.8%) reported using a natural water source than in Mokokchung (38.8%). Similarly, more farming households in Zunheboto (13.7%) do not have a consistent water supply and have to walk longer distance to fetch water (14 minutes) as compared to that in Mokokchung district (7% and 10 minutes, respectively). As a result, conflicts over water are more in Zunheboto (13.7%) than in Mokokchung (7.5%).

(ix) Natural Disaster and Climate Variability with five sub-components, the overall vulnerability is higher in Mokokchung (0.403) than in Zunheboto (0.276). Both districts had similar Natural Disaster vulnerability scores, based on the average reported number of cyclones and excess rainfall, pests etc. which is 0.013 in Mokokchung and 0.016 for Zunheboto in the past 6 years, prior to the survey. The percentage of households who received no warning is 84.5 and 80.5, respectively. The information is required especially during sowing and harvesting season, lack of which inflicts huge loses to the farmers due to unpredictable weather conditions. Mean Standard deviations to average maximum and minimum temperature and the rainfall are higher in Mokokchung than in Zunheboto district, indicating greater vulnerability for Mokokchung district.

Overall, the farming households in both the districts are found to be vulnerable, however Zunheboto exhibits a greater LVI than Mokokchung (0.301 versus 0.258, respectively), indicating relatively greater vulnerability. The results of the major component calculations are presented collectively in a spider diagram (Fig.5.1.). The scale of the diagram ranges from 0 (less vulnerable) at the centre of the web, increasing to 0.5 (more vulnerable) at

the outside edge in 0.1 unit increments. Fig.5.1 shows that farming households in Mokokchung district are more vulnerable in terms of major components such as social networks, food, natural disaster, than those in Zunheboto district. On the other hand, Zunheboto farming households are more vulnerable in terms of socio-demographic profile, livelihood strategies, finance, knowledge and communication and health. It is found that knowledge and communication, food, natural disasters and climate variability and social networks are the major components affecting livelihood sustainability of the farming households, which need greater and immediate attention to reduce the vulnerability and bring about improvement of farmers' livelihood sustainability.

Fig 5.1: Major components of the Livelihood Vulnerability Index for Mokokchung and Zunheboto districts.



***0=Least vulnerable, 0.5=Most vulnerable

Source: Field survey 2015-16

5.2.5. Livelihood Vulnerability Index-Intergovernmental Panel Approach

LVI-IPCC is a measure of vulnerability of farmer's household with three indicators, namely exposure, sensitivity and adaptive capacity.

Table no 5.3. The LVI-IPCC assessment: Mokokchung versus Zunheboto

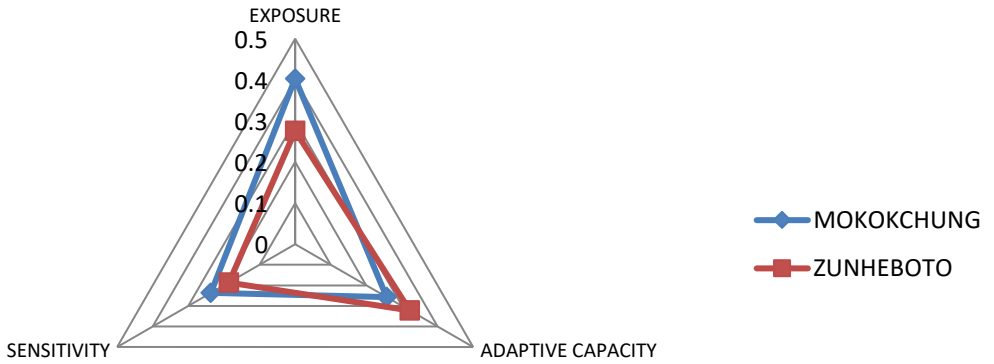
IPCC contributing factors to vulnerability	**Major Components**	**Mokokchung**	**Zunheboto**
Exposure	Natural disasters and climate variability	0.403	0.276
Adaptive capacity	Socio-demographic profile, finance, knowledge and	0.257	0.322
Sensitivity	communication, Livelihood strategies, Social networks.	0.237	0.186
LVI-IPCC	Health, Food &Water	0.012	-0.015

Source: Field survey 2015-16

[LVI-IPCC is on a scale from -1(least vulnerable) to 1 (most vulnerable) according to Hahn et al. (2009, p.84)]

In table 5.3., the overall value of LVI-IPCC do not show high vulnerability of farmer's livelihood to climate change in both the districts, which are 0.012 for Mokokchung and -0.015 for Zunheboto. The results also show that Zunheboto has a lower score than Mokokchung in the LVI-IPCC index. This implies that farmers in Zunheboto are less vulnerable to climate change than that in Mokokchung.

Fig 5.2: Livelihood Vulnerability Index (LVI-IPCC) for Mokokchung and Zunheboto.



***Low contributing factor, 0.6= High contributing factor

Source: Field survey 2015-16

Fig 5.2 shows a vulnerability triangle, which plots the contributing factor scores for exposure, adaptive capacity, and sensitivity. The triangle illustrates that Mokokchung may be more exposed (0.403) to climate change impacts than Zunheboto (0.276). Moreover,

Mokokchung (0.237) is more sensitive to climate variability than Zunheboto (0.186); whereas, the adaptive capacity is higher for Zunheboto (0.305) than Mokokchung (0.257), thus farming households in Zunheboto are less exposed and vulnerable to climate change.

Using the lens of various livelihood vulnerability frameworks, this empirical analysis contributes towards understanding of farmers' vulnerability not only to climate change, but also other livelihood factor variability such as (i) Socio-demographic profile (ii) Livelihood Strategies (iii) access to health , (iv) Food , (v) Water , (vi) Social Networks , (vii) finance and (viii) Knowledge and Communication in Mokokchung and Zunheboto districts, which also contribute towards the understanding of the issues of livelihood vulnerability of the farming households in hilly areas of Nagaland state.

5.3. CROPPING PATTERN

Accelerated agricultural growth through crop diversification offers considerable opportunity for expanding income and employment of rural people. The farmers' livelihood status can be significantly improved from adaptation of new cropping patterns (Pervez et al., 2015)[16]. Crop diversification had positive and significant impact on farm income. Hence, it can be inferred that farmers who are more diversified have more income than the others. Thus, crop diversification should be promoted for improving the wellbeing of the farmers, for which government needs to play a proactive role by providing required inputs and disseminating knowledge on improved practices by strengthen extension services (Paul et al., (2020)[17]. This would facilitate the change from the subsistence production to the market mode by providing finance, better inputs, marketing infrastructure, cold storage and means of transportation and support prices. All this will go a long way in promoting agriculture and rural development (Lama, 2019)[18].

5.3.1. Cropping Pattern of Mokokchung District

The traditional agricultural production in Mokokchung district is dominated by Rice, which is followed by maize, cultivated inter-mixed with other 28-30 varieties of crops during kharif season only. Traditionally, the hilly farmers in the district do not practice double cropping

[16] Ferdush Pervez A. S., M. Fergus Pervez M. Saidur Rahman., A. K. M. Abdullah Al-Amin.(2015), "Change in cropping patterns and its impacts on farmers' livelihood in some selected areas of mymensingh district",, Department of Agricultural Economics, Bangladesh Agricultural University

[17] Atreya Paul, Amartya Pani, Arup Bhandary (2020), "Analysis the Pattern and Role of Crop Concentration and Diversification in Different Blocks of South 24 Pargana District, West Bengal ",SSRG International Journal of Agriculture & Environmental Science (SSRG-IJAES) – Volume 7 Issue.

[18] Lama, Maila (2019), "Crop Diversification and Farm Income in the Hills of North-East India: A Case Study of Arunachal Pradesh", Working Paper No. CDS/02/.

due to lack of irrigation. The cropping pattern has undergone a significant change during the past years from the traditional rice, maize intercropping with other crops has moved towards vegetable production.The farmers felt that shifting to vegetable crops generates additional income and helps in improving their livelihood.

The allocation of area under a crop indicates the amount the farmer intents to produce during the cropped year. The changes in cropped area under some important crops are indicated here below.

Table no. 5.4. Change in area under important crops among sample households in Mokokchung District (area in acres).

Sl.no	**Major Crops**	**Year**				**% Change 2011-12 to 2015-16**
		2011-12		**2015-16**		
		area	% share in total area	area	% share in total area	
1	Rice	42.16	55.73	31.86	40.83	-10.3
2	Maize	15.24	20.15	17.15	21.98	1.95
3	Chilli	3.92	5.18	6.22	7.97	2.3
4	Garlic	1.19	1.57	3.18	4.07	1.99
5	Yam	6.52	8.62	9.55	12.24	3.03
6	Beans	2.04	2.70	3.18	4.07	1.14
7	Ginger	1.92	2.54	2.94	3.77	1.02
8	Green Leaves	0.78	1.03	1.42	1.82	0.64
9	Potato	1.88	2.49	2.54	3.25	0.66
	TOTAL	75.65	100	78.04	100	

Source: Field Survey, 2015-16

The average Crop Diversity Index in 2015-16 for Mokokchung is estimated at 0.31. The above table 5.4 shows percentage change in area of important crops during the last five years prior to the survey under Mokokchung districts. The change in cropping pattern is observed in the study area, where the cultivation of rice has been losing its importance in crop acreage allocation, which was reduced by -10.3%. During the same period, all the other crops have gained in cropped area, among which, Yam had the highest increased (3.03%), followed by Chilli (2.3%), Garlic and Maize (1.99 and 1.95 percents, respectively). Crops like beans, Ginger, Green leaves and potatoes have also gained in cropped area marginally. The change in cropping pattern is evident where traditional rice cultivation is declining as the other crops are gaining importance in cropped area, because farmers under traditional

farming system are also encouraged by urban market opportunities, which enable to earn additional income with the aim to improve the livelihood status.

5.3.2. Cropping Pattern of Zunheboto District

The traditional agricultural production in Zunheboto district is also dominated by production of Rice, followed by maize which is cultivated intermixed with other 24-26 varieties of crops during kharif season. The cropping pattern has undergone slight change over the last five years, moving from traditional rice and maize intercropping with other crops to vegetable production.The farmers reduce the production of rice in order to cultivate vegetable as the cost of production is lower as well as it generates additional income, thereby improving their livelihood conditions.

Table no.5.5: Change in area for important crops among sample households in Zunheboto District (area in acres).

Sl.no	Crops	Year				% Change 2011-12 to 2015-16
		2011-12		2015-16		
		area	% share in total area	area	% share in total area	
1	Rice	45.66	59.20	37.55	49.06	-8.11
2	Maize	19.5	25.28	24.11	31.50	4.61
3	Potato	2.9	3.76	3.2	4.18	0.3
4	Beans	1.19	1.54	2.12	2.77	0.94
5	Chilli	3.2	4.15	4.1	5.36	2.4
6	Ginger	1.7	2.20	2.3	3.00	0.6
7	Yam	2.98	3.86	3.16	4.13	0.18
	Total	77.13	100.00	76.54	100.00	

Source: Field Survey 2014-15

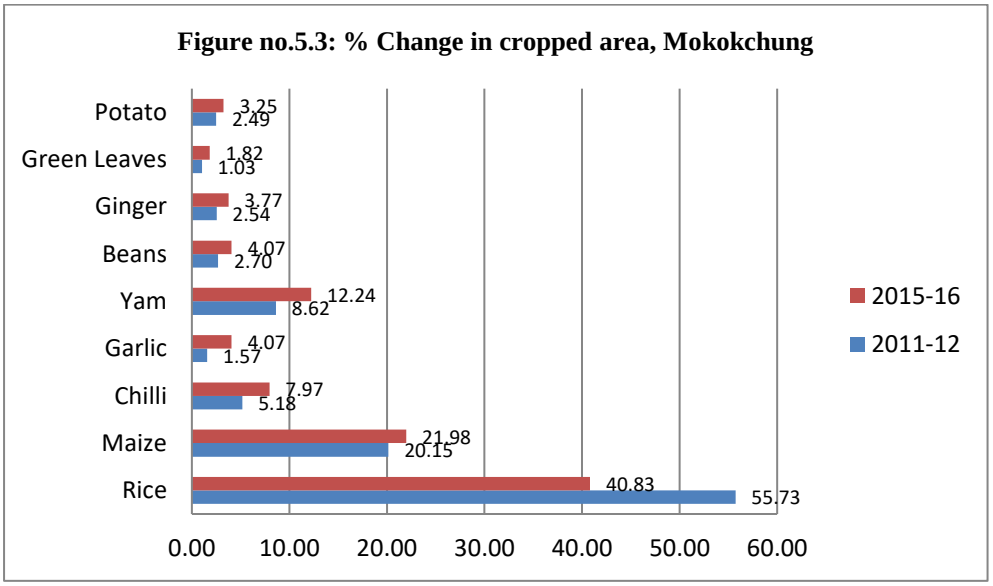
The average Crop Diversity Index in Zunheboto in 2015-16 is estimated at 0.29. Table no. 5.5 shows crop-wise percentage change in area of important crops during the last five years prior to the survey in Zunheboto District. The data reveals that area under rice cultivation was reduced by 8.11%. During the period of observation, all other crops have gained in cropped area, among which, Maize has witnessed the highest gain 4.61%, followed by Chilli (2.4%) and Beans (0.94%). The crops like potato, ginger and yam have also gained in cropped area although marginal. The change in cropping pattern is evident that traditional rice area is declining, while other crops are gaining importance, encouraged by urban market

opportunity to earn additional income from crop sale that brings improvement in their livelihood status.

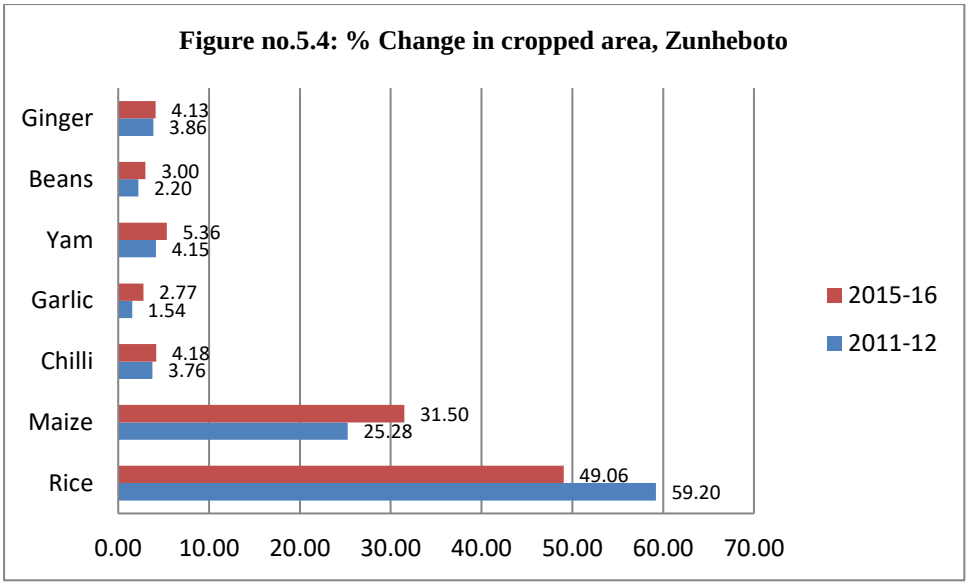
Table no 5.6. Change in area under important crops among sample households in Mokokchung and Zunheboto Districts (area in acres).

Districts	**Crops**	**Year**		**% Change** 2011-12 to 2015-16
		2011-12	**2015-16**	
Mokokchung	Rice	42.16	31.86	-10.3
	Maize	15.24	17.15	1.95
	Vegetable crops	16.28	24.43	8.15
Zunheboto	Rice	45.66	37.55	-8.11
	Maize	19.5	24.11	4.61
	Vegetable crops	11.97	14.88	2.91

Source: Field Survey 2015-16



Source: Table no 5.4



Source: Table no 5.5

The percentage change in cropping area indicates that traditional rice production is on the decline while Maize has increased as this is being used as feeds for livestock production. Other crops such as chilli, potato, ginger, garlic and yam have also increased due to its potential demand in the urban market for earning additional income.

From the above analysis, the shift from traditional rice cultivation to vegetable crops is taking place due to its capabilities to generate additional income which has increased considerably for both the districts. So, the null hypothesis is rejected and accepts the hypothesis that the farmers in traditional agriculture adopt changes in cropping pattern, shifting away from rice to other crops and vegetables to improve livelihood status.

5.4. RICE PRODUCTION

Rice being the staple food plays an important role in sustaining farmers' livelihood. The farmers have been growing paddy in Jhum fields, which is the traditional system of cultivation carried out on the hilly slopes all over the State. This is done by clearing a patch of forest land for cultivation and paddy is planted intermixed with variety of other crops (28-30 varieties of crops). The traditional paddy variety is cultivated entirely under rain-fed condition. The cultivation of rice in Mokokchung and Zunheboto districts follow monsoon rain due to lack of proper irrigation facilities, challenging the farmers to achieve self sufficiency in the rice production in the wake of monsoon uncertainty and in the absence of irrigation facilities. Above all, no measures have been adopted to restore degraded soil or to enhance soil fertility, due to which the production of rice is very low and unpredictable and making livelihood in agriculture unsustainable.

5.4.1. Rice Production in Mokokchung District

Table no.5.7: Area, Production and Yield of Rice in Mokokchung District.

Sample Villages	Year	Area		Production		Yield	
		(in Acre)	% Change	(Tonnes)	% Change	(Kg/Acre)	% Change
Chuchuyimpang	2011-12	10.23	-	5.04	-	497	
	2012-13	9.89	-3.32	4.92	-2.3	498	-0.20
	2013-14	9.12	-7.78	4.16	-15.44	506	-1.60
	2014-15	8.98	-1.53	4.47	7.45	498	1.58
	2015-16	8.85	-1.44	4.45	-0.44	503	-1.00
Longkhum	2011-12	120.2	--	78.61	-	654	-
	2012-13	96.78	-19.48	63.63	-19.05	655	0.15
	2013-14	96.12	-0.68	62.76	-1.36	653	-0.30
	2014-15	95.06	-1.0	62.16	-1.01	654	0.15
	2015-16	94.54	0.50	55.77	-10.27	590	-9.7
Mongsenyimti	2011-12	96.5	-	43.53	-	451	-
	2012-13	90.52	-6.19	39.41	-9.46	435	-3.5
	2013-14	70.45	-22.17	30.78	-21.89	436	0.22
	2014-15	80.96	14.91	35.26	14.55	436	0.22
	2015-16	80.29	-0.82	35.31	0.14	439	0.68
Sungratsu	2011-12	56.87	-	35.63	-	626	-
	2012-13	59.58	5.24	36.19	1.65	607	-3.06
	2013-14	45.06	-24.37	26.49	-26.80	588	-3.13
	2014-15	44.32	-1.64	25.41	-4.07	573	-2.55
	2015-16	41.72	-0.05	25.19	-0.86	603	5.23

Source: Field Survey 2015-16

To have sufficient production of rice is very vital for farming households as rice being the staple food, but in recent years, the farmers start to move towards cash crop cultivation. They felt that continuing in traditional rice production is not rewarding, and thus pose a serious threat to meet their ends meet in the wake of increasing family cash needs and rising prices. The area, production and yield of rice for five years, prior to the survey are shown in the table number 5.8.

The percentage change in area has been negative in all the four sample villages, except in Mongsenyimti during 2014-15 (increased by 14.91%). Correspondingly, the percentage change in production was also negative, except for Mongsenyimti with 14.55% increase. In Chuchuyimpang the cultivated area was declined, but the production was increased by 7.45% during the same year.

The percentage change of yield was almost negative for Sungratsu, except during 2015-16 which increase by 5.23%. Whereas for Mongsenyimti it remained positive, except during 2012-13 (decline by -3.5%). In Chuchuyimpang, it was negative, except during 2014-45 which increase by 1.58% and lastly for Longkhum it shows positive change in yield during 2012-13 and 2014-15 both at 0.15% each.

Hence from the above analysis, one can understand the dilemma of rice production in the district, which has been declining considerably and the paradigm shift is taking place moving from traditional rice production towards vegetable production, encouraged by potential additional income from the vegetable sell.

5.4.2. Rice Production in Zunheboto District

Table no. 5.8: Area, Production and Yield of Rice in Zunheboto District

Village	Year	Area		Production		Yield	
		(Acre)	% Change	(Tonnes)	% Change	(Kg/Acre)	% Change
Asukhomi	2011-12	50.13	-	28.23	-	563	-
	2012-13	49.66	-0.93	27.05	-4.53	545	-3.19
	2013-14	45.33	-8.71	22.54	-16.67	497	-8.80
	2014-15	44	-2.93	20.59	-8.65	467	-6.03
	2015-16	44.81	1.80	21.25	3.20	474	1.49
Kilo Old	2011-12	20.87	-	16.03	-	768	--
	2012-13	19	-8.96	13.44	-16.15	707	-7.94
	2013-14	16.75	-11.84	10.98	-18.30	655	-7.35
	2014-15	16.45	-1.79	10.41	-5.19	632	-3.51
	2015-16	16.49	0.24	9.61	-7.68	582	-7.91
Lazami	2011-12	300	-	127.81	-	426	-
	2012-13	278	-7.33	116.76	-0.086	420	-1.40
	2013-14	262	-5.75	108.73	-6.87	415	-1.19
	2014-15	270	3.05	106.38	-2.32	394	-5.06
	2015-16	259.88	-3.74	71.12	-32.99	386	-2.03
Satakha	2011-12	19.88	-	8.98	-	452	-
	2012-13	18.03	-9.03	7.69	-14.36	427	-5.53
	2013-14	18	-0.16	6.17	-0.19	343	-19.67
	2014-15	17.64	-2	5.6	-9.23	318	-7.28
	2015-16	16.43	-6.85	4.89	-0.12	298	-6.28

Source: Field Survey 2014-15

The farmers in Zunheboto District have been shifting to vegetable crops as they felt that continuing in traditional rice production is unprofitable. The area, production and yield for rice are shown in above table.

The percentage change in area is negative for all the four villages, except in Kilo old and Lazami villages during 2014-15, which show increase of 0.24% and 3.05 %, respectively. The percentage change in production is also negative, except for Asukhomi increase by 3.20 % during 2015-16. The percentage change in Yield is negative for all the three villages, except Asukhomi that increase by 1.4% during 2015-2016.

Hence, from the above analysis, we can understand the condition of rice production in Zunheboto district has been worsening. So the farmers felt that instead of cultivating rice, it is better to go for vegetable cultivation as it compensates the loss incurred in the cultivation of Rice.

Figure no. 5.5 : Rice production for sample households in Mokokchung district

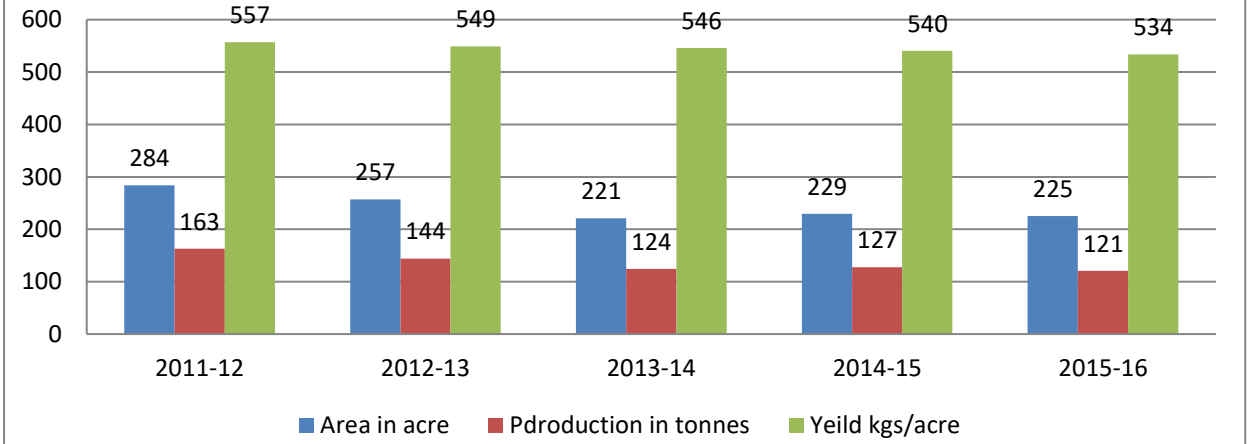
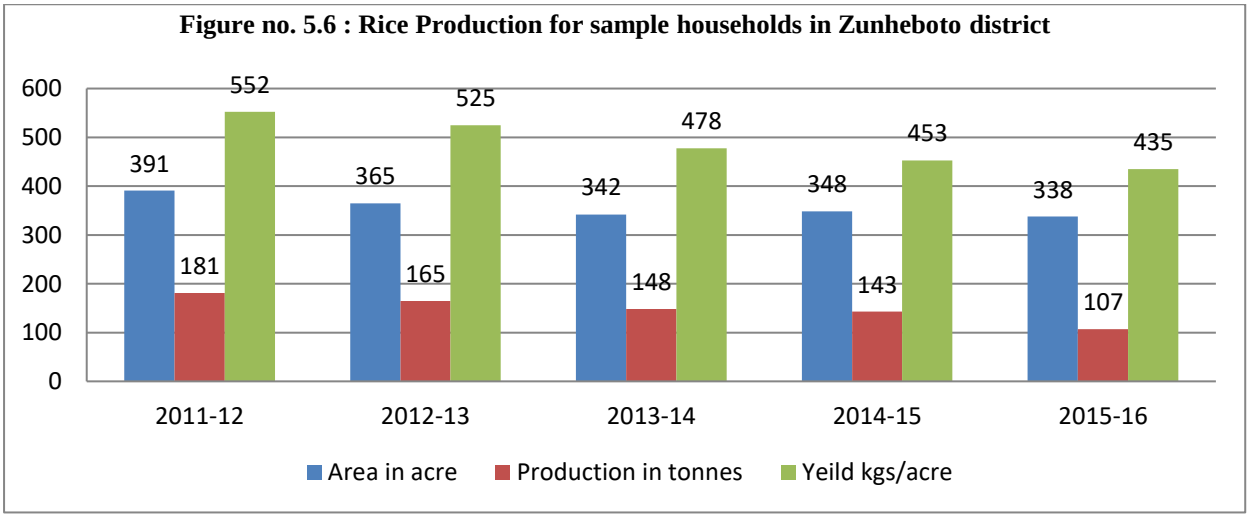


Figure no. 5.6 : Rice Production for sample households in Zunheboto district



Source: Field Survey 2015-16

Rice is the staple food, but due to low productivity the farmers are reducing its cultivation and shifting towards cash and vegetable crops. During the observed period, area in both the districts Mokokchung and Zunheboto has declined (58.4% and 53.27%, respectively), production declined by 26% and 40%, respectively and yield by 4% and 21%, respectively. The productivity is determined by soil fertility, rainfall and temperature. The farmers felt that continuing in traditional rice production is not profitable, which pose a serious threat to meet their ends meet as the cost of living is increasingly expensive. Based on the above analysis, it is clearly evident that rice production is declining significantly.

5.5. MAIZE PRODUCTION

Maize is one of the important crops in sustaining farmers' livelihood. It is an important source of livelihood, in the sense that it is used for home consumption, sells in the market and a produce for livestock feed, which is a predictable source of income for the farmers. Maize is inter-cropped with rice and other crops in jhum fields. The traditional maize varieties are still in use along with hybrid verity and cover mainly rain fed areas. The production takes place only during kharif season under monsoon rain due to lack of irrigation facilities. Its production is increasing in recent years as it is becoming one of the major sources of income and animal feeds which is contributing in sustaining farmers' livelihood.

5.5.1. Maize production in Mokokchung District

Table no.5.9: Area, Production and Yield of Maize in Mokokchung District

Village	**Year**	**Area**		**Production**		**Yield**	
		(Acre)	% Change	(Tonnes)	% Change	(Kg/Acre)	% Change
Chuchuyimpang	2011-12	24.13	-	12.78	-	529	-
	2012-13	25.26	4.68	12.54	-1.87	496	-6.23
	2013-14	26.17	3.60	13.08	4.30	499	0.60
	2014-15	25.4	-2.94	13.2	0.91	519	4.00
	2015-16	27.6	8.66	14.75	11.74	534	2.89
Longkhum	2011-12	10.25	-	5.38	-	524	-
	2012-13	10.25	0	5.36	-0.37	522	-0.38
	2013-14	12.36	20.58	6.59	22.94	533	2.10
	2014-15	11.65	-5.78	6.26	-5.15	537	0.75
	2015-16	13.53	16.13	6.96	11.18	514	-4.28
	2011-12	20.2	-	7.67	-	379	-
	2012-13	23.12	14.45	8.09	5.47	349	-7.91

Mongsenyimti	2013-14	23.98	3.71	9.11	12.60	379	8.59
	2014-15	25.05	4.46	9.26	1.64	369	-2.63
	2015-16	25.05	0	9.74	5.18	388	5.14
Sungratsu	2011-12	21.85	-	7.64	-	346	-
	2012-13	22.64	3.61	8.6	12.56	379	9.53
	2013-14	21.55	-4.81	8.83	2.67	409	7.33
	2014-15	20.87	-3.15	8.34	-5.54	399	-2.44
	2015-16	23.76	3.84	10.15	21.70	427	7.01

Source: Field Survey, 2015-16.

In the above table, the percentage change in area under maize, during 2011-12 to 2015-16, was found positive for Mongsenyimti village during the same period. Similarly,in Chuchuyimpang and Longkhum it was positive, except in 2014-15 it was marginally decline. While for Sungratsu, it was declined during 2013-14 and 2014-15.

During the period, the production of maize was increased in Chuchuyimpang, Longkhum, and Sungratsu, except for 2014-15 (decline by -2.94%, -5.78%, and -5.54, respectively). In Mongsenyimti village, it was increased during the entire period.

The average yield in Mokokchung district (Kgs/acre) was 452 kgs. Among the sample villages, Longkhum has the highest yield (526 kgs.), followed by Chuchuyimpang (515 kgs.), Sungratsu (392 kgs.) while Mongsenyimti has the lowest productivity with 373 kgs.

The percentage change in yield is positive in Chuchuyimpang and Sungratsu except for one year during 2012-13 at -6.23% and during 2014-15 at -2.44%, respectively. The percentage change in yield in both Longkhum and Mongsenyimti is negative for two years.

The result shows that as area under the crop increases there have been increase in production and yield of maize in Mokokchung district.But the yield is low because the cultivation fully depends on monsoon rain. It is felt that the production will increase in the future, as it is a livestock fodder crop which is regarded as one of the important source of additional income for the farmers, sustaining their livelihood.

5.5.2. Maize production in Zunheboto District

Table no.5.10: Area, Production and yield of Maize in Zunheboto District

Village	**Year**	**Area**		**Production**		**Yield**	
		(Acre)	% Change	(Tonnes)	% Change	(Kg/Acre)	% Change
Asukhomi	2011-12	7.56	-	2.94	-	388	-
	2012-13	6.52	-13.57	2.6	-11.56	398	2.83
	2013-14	5.31	-18.55	2.23	-14.23	419	5.01
	2014-15	5.69	7.15	2.56	14.79	449	7.15
	2015-16	5.94	4.39	2.94	14.84	494	10.02
Kilo Old	2011-12	3.12	-	1.24	-	397	-
	2012-13	2.56	-17.94	1.15	-7.25	449	13.09
	2013-14	2.44	-4.68	1.07	-6.95	438	-2.44
	2014-15	2.38	-2.45	1.02	-4.67	428	-2.28
	2015-16	2.56	7.56	1.01	-0.98	394	-7.94
Lazami	2011-12	58.9	-	23.56	-	400	-
	2012-13	53.6	-8.99	20.36	-13.58	379	-5.25
	2013-14	51.13	-4.60	19.42	-4.61	379	0
	2014-15	50.16	-1.89	20.06	3.29	399	5.27
	2015-16	50.16	0	20.14	0.39	401	0.50
Satakha	2011-12	20.36	-	9.84	-	483	-
	2012-13	18.58	-8.74	7.21	-36.47	388	-19.66
	2013-14	17.14	-7.75	6.08	-15.67	354	-8.76
	2014-15	17.69	3.20	5.68	-6.57	321	-9.32
	2015-16	18.48	4.46	5.61	-1.23	303	-5.60

Source: Field Survey 2015-16

The above table shows that the percentage change in area in Asukhomi and Satakha was positive for the last two years of observation period (7.15%, 4.39% and 3.20%, 4.46% respectively). Whereas, in Kilo old it was positive only for 2015-16 at 7.56% and in Lazami it was negative, except for 2015-16, which remained the same.

The percentage change in production for Satakha and Kilo old were negative during the entire observed years due to low soil fertility. Also, for Asukhomi and Lazami it was negative for the earlier two years, but shown increase during the latter years.

The average yield of five years in Zunheboto district (Kgs/acre) was 403.05 kgs. per acre, which is slightly lower than that of Mokokchung (452 kgs) . Among the sample districts, the yield was highest in Asukhomi (429.6), followed by Kilo Old (421.2), Lazami (391.6) and Lazami with the lowest yield (369.8). Further, the percentage change in yield

was positive for Asukhomi but negative in Satakha. For Lazami it was positive, except for 2012-13 at -5.25% and for Kilo Old was negative, except during 2013-13 at 13.09%.

Based on the above analysis, the production of maize in Zunheboto district was declined by -20.90%, and also the average yield dropped from 417 kgs to 398 kgs, (by 4.56%). At the same time, the area under Maize cultivation was also declined by -14.23%. The decline in productivity of the crop may be attributable to low soil fertility and adverse affect of the weather condition. In spite of all the challenges in cultivation of Maize, it is regarded as one of the important source of livelihood for the farmers to meet their ends meet.

Figure no. 5.7 : Area, Production & Yeild of Maize for sample households in Zunheboto district

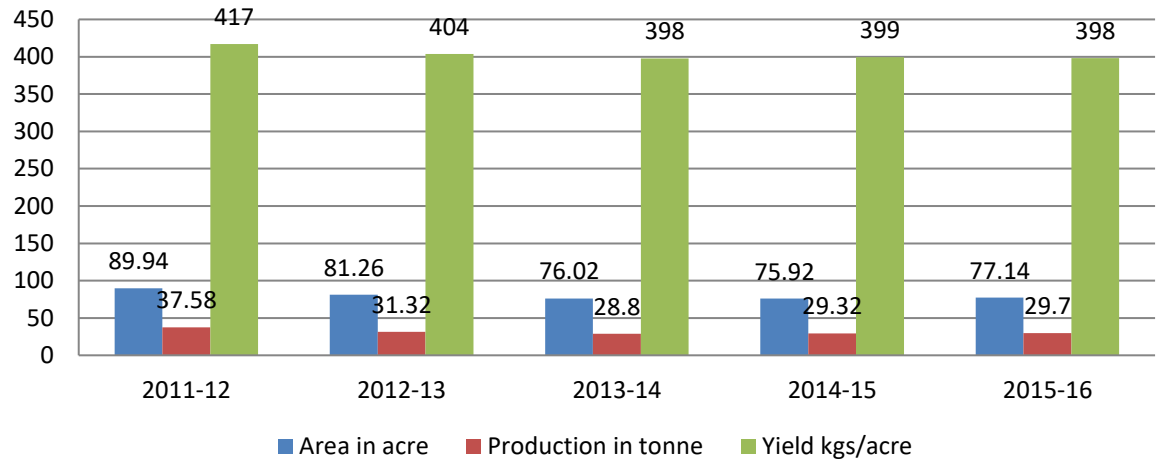
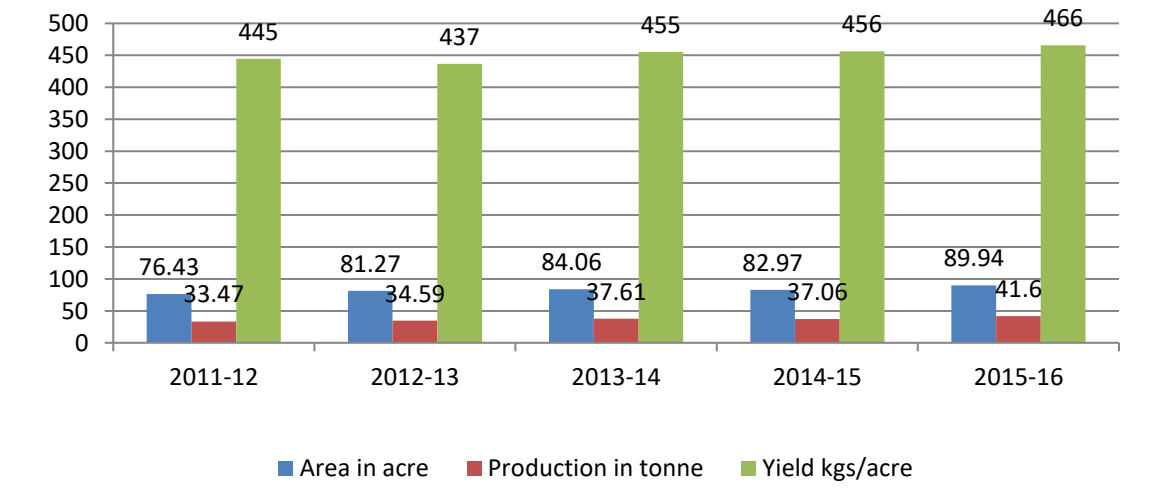


Figure no.5.8 : Area, Production & Yeild of Maize for sample households in Mokokchung district



Source: Field Survey 2015-16

Unlike in Zunheboto district, the yield of maize crop in Mokokchung district was increased by 4.78%, production by 24% and area by 15.70% during the observed period. Maize is an important source of livelihood in the sense that it is consume by farmers, and a source of income as it is sold in the market and use as feeds for their livestock. It is a fodder crop for livestock which is regarded as one of the important source of livelihood for the farmers in sustaining their livelihood.

5.6. PRODUCTION OF OTHER MAJOR CROPS

Under the traditional farming system a variety of crops are cultivated following mixed cropping pattern. The number of crops cultivated by an individual farmer, inter-mixed with rice and maize is approximately a maximum of 28-30 varieties and a minimum number of crops are 12-15 varieties. The famers mostly used local varieties of seeds, except for some specific crop like Tomato, Cabbage, Chilli, Coriander, Carrot, Green Pea etc. Out of the numerous crops cultivated, only five major crops from each village are taken here. The crops were selected according to the popularity and speciality having better market value.

5.6.1. Production of Other Major Crops in Mokokchung District

Table no.5.11: Area and Production of other Major Crops in Mokokchung District

			2011-12		2015-16		% change in production over the last five years
Village	**Sl. no**	**Crops**	**Area (Acre)**	**Production (Tonnes)**	**Area (Acre)**	**Production (Tonnes)**	
Chuchuyimpang	1	Mustard Leaves	0.027	6	0.045	9.95	65.84
	2	Beans	0.031	1.02	0.036	1.21	18.62
	3	Ginger	0.025	1.66	0.036	2.4	44.57
	4	Chilli	0.034	0.68	0.050	1.07	57.35
	5	Yam	0.042	5.14	0.061	7.6	47.85
Longkhum	1	Tomato	0.20	12.76	0.069	25.09	96.63
	2	Chilli	0.028	1.85	0.049	14.20	73.51
	3	Cabbage	0.012	7.96	0.043	27.25	84.65
	4	Potato	0.025	3.40	0.032	4.29	26.17
	5	Garlic	0.01	0.36	0.019	0.59	63.88
	1	Bitter Gourd	0.20	5.32	0.028	7.41	39.28

Mongsenyimti	2	*Repchi* (Allium hookeri)	0.015	0.50	0.025	0.83	66
	3	Garlic	0.013	0.44	0.024	0.81	84.09
	4	*Aochisang* leave	0.014	0.59	0.030	1.13	91.52
	5	Yam	0.044	6.25	0.055	7.86	25.76
Sungratsu	1	Yam	0.068	10.19	0.078	11.88	16.58
	2	Ginger	0.022	1.47	0.023	1.53	4.08
	3	Chilli	0.019	0.55	0.027	0.87	58.18
	4	Beans	0.022	0.64	0.031	1.02	59.37
	5	Garlic	0.013	0.34	0.021	0.65	91.17

Source: Field Survey 2015-16

The above table shows the area and production of five major crops in each village and the percentage change in production over the last five year which is as follows:

Chuchuyimpang: The five major crops taken for study are Mustard Leaves, Beans, Ginger, Chilli and Yam. The percentage change in production over the last five years, prior to the survey for mustard leaves and Chilli are remarkable with 65.84% and 57.35%, respectively. The percentage change in production for Ginger and yam are 44.57% and 47.85% and the lowest is 18.62% for Beans.

Longkhum*:*The five major crops taken for study are Tomato, Chilli, Cabbage, Potato and Garlic (*Alulasang*). The percentage change in production over the last five years prior to the survey is at 96.63% for tomato, cabbage at 84.65%, Chilli 73.51%, Alulasang at 63.88% and potato at 26.17%. The percentage change in production for Ginger and yam are 44.57% and 47.85% and the lowest is 18.62% for Beans.

The reason for high percentage increase in production of Tomato, Chilli and cabbage is that these three crops are produced on a commercial scale. In this village, most of the farming households produce for urban market, meanwhile reducing the cultivation of rice. With the current production scenario, it is expected that the production will continue to increase, also it will influence farmers in other villages to change cropping pattern in favour of vegetables, as the return value is higher and providing additional income to the farmers which has never been expected from traditional rice cultivation. It is the only village which produce vegetable crops on a large scale and the government has declared this as '*vegetable*

village'. The livelihood of the farmers has improved since adoption change in cropping pattern.

Mongsenyimti: The five major crops identified are Bitter Gourd, *Repchi*, Garlic, *Aochisang* leaves and Yam. The crops with highest percentage increase in production are Alulasang and Aochisang at 91.52% and 84.095, respectively. The increase in production of Bitter Gourd, *Repchi* and yam are 39.28%, 66% and 25.76%, respectively.

Sungratsu: The five major crops taken for study are Yam, Ginger, Chilli, Beans and Garlic. The percentage change in production over the last five years for Ginger, Chilli, Beans and garlic are 4.08%, 58.18%, 59.37% and 91.17%. The percentage change in production of yam is only 16.58%, in spite the area is higher than other crops. Cultivation of yam is very popular in this village compare to others since time immemorial, as these villagers are known for specialization in making *Anishi* (biscuits made of yam leaves) which is being used widely by Ao tribes of Nagaland and so is highly in demand. It is one of the income earning activities of Sungratsu village.

Hence from the above analysis, it is evident that there is a shift towards vegetable cropping in all the four villages as the percentage increase in production over the last five years is significantly high.

5.6.2. Production of Other Major Crops and vegetables in Zunheboto District

The maximum number of crops cultivated by an individual farming household intermixed with rice and maize is approximately 24-26 varieties and the minimum is 12-15 varieties. Just like in Mokokchung district, the farmers mostly used local varieties of seeds, except for some specific crop like, cabbage, chilli, coriander, carrot, Green Pea etc. Only five important crops from each village is taken, based on the area and production, which are higher than other crops.

Table no.5.12: Area and Production of other Major Crops in Zunheboto District

			2011-12		2015-16		% change in production over the last five years
Village	**Sl.no**	**Crops**	**Area (Acre)**	**Production (Tonnes)**	**Area (Acre)**	**Production (Tonnes)**	

Asukhomi	1	Potato	0.006	1.26	0.011	1.57	24.60
	2	Beans	0.0087	0.26	0.0094	0.30	15.38
	3	Yam	0.0060	0.88	0.0094	0.96	9.09
	4	Chilli	0.0094	0.20	0.013	0.28	40
	5	Ginger	0.0091	0.55	0.006	0.63	14.55
Kilo Old	1	Yam	0.0027	0.32	0.0036	0.44	37.5
	2	Ginger	0.0018	0.11	0.0022	0.15	36.37
	3	Beans	0.0025	0.07	0.0032	0.10	42.85
	4	Chilli	0.0018	0.02	0.0025	0.03	50
	5	Potato	0.0025	0.27	0.0027	0.31	14.81
Lazami	1	Chilli	0.068	1.49	0.069	1.50	0.60
	2	Ginger	0.034	2.28	0.039	2.61	14.47
	3	Yam	0.045	5.19	0.047	5.52	6.36
	4	Beans	0.048	1.52	0.052	1.73	13.81
	5	Potato	0.033	3.62	0.040	4.77	31.76
Satakha	1	Beans	0.0071	0.22	0.0089	0.29	31.82
	2	Chilli	0.0061	0.17	0.0078	0.17	0
	3	Potato	0.0084	1.23	0.0098	1.44	17.07
	4	Yam	0.0067	0.79	0.0080	0.96	21.52
	5	Ginger	0.0048	0.31	0.0059	0.39	25.80

Source: Field Survey 2015-16

The above table indicates that there is no significant difference in crops cultivated between the two districts. However, differences are observed in terms of area and production which is marginally higher in Mokokchung than Zunheboto. The area and production of five major crops from each village and the percentage change in production during the last five years, prior to the survey are as follows:

Asukhomi: The five major crops taken for study are Potato,Yam, Beans,Chilli and Ginger. The highest percentage increase in production over the last five years was Chilli at 40% and the lowest was Yam at 9.09%. The percentage change in production of potato, beans and yam were 24.60%, 15.38% and 14.55%, respectively.

Kilo Old: The five major crops identified are Yam, Ginger, Beans, Chilli and Potato. The highest percentage increase in production was Chilli at 50% and the lowest was potato at 14.81%. The percentage increase in production of Yam, Ginger and Beans were 37.5%.36.67% and 42.85%, respectively.

Lazami: The five major crops taken for study are Chilli, Ginger, Yam, Beans and Potato. The highest percentage increase in production over the last five years was potato at 31.76% and

the lowest was chilli at 0.60%. The percentage increase in production for Ginger, Yam and Beans were 14.47%, 6.36% and 13.81% respectively.

Satakha: The five major crops are Beans, Chilli, Potato, Yam and Ginger. The highest percentage increase in production over the last five years was beans at 31.82% and for chilli there was no change. The percentage change in production for potato, yam and ginger were 17.07%, 21.52% and 25.80% respectively.

Table no. 5.13: Area and Production of other Major Crops for Mokokchung and Zunheboto District

Village	2011-12		2015-16		% change in production over the last five years
	Area (Acre)	Production (Tonnes)	Area (Acre)	Production (Tonnes)	
Mokokchung	0.864	67.12	0.782	68.766	2.45
Zunheboto	0.3116	20.76	0.3504	21.422	3.19
Total	1.1756	87.88	1.1324	90.188	2.63

Source: Field Survey 2014-15

From the above analysis, it is inferred that there is an increase in vegetable crops production in both the district, but the percentage increase over the observed period is lower in Mokokchung district. However the quantity production is higher in Mokokchung than that of Zunheboto by three folds. The low production may be mainly due to poor marketing facilities and road conditions in Zunheboto district have discourage the farmers to enhance the production.

Out of twenty major crops covered for the study, 12 crops have increased in production by more than 50% during the last five years in Mokokchung district. For Zunheboto district, the percentage change in production of all the 20 major crops was positive but the increase was only marginal (less than 50%). With the current production scenario, it is expected that the production of vegetable crops will continue to increase as the return value is higher than that from rice production.

From the above analysis, the shift from traditional rice cultivation to vegetable crops is taking place due to its capabilities to generate additional income which has increased considerably for both the districts. So, the null hypothesis is rejected and accepts the

hypothesis that the farmers in traditional agriculture adopt changes in cropping pattern, shifting away from rice to other crops and vegetables to improve livelihood status.

5.7. CONCLUSION

In both the districts, the acreage allocation has been shifting gradually from traditional rice cultivation to vegetable crops due to its potential for generation of additional income. It is also evident that rice production is declining considerably and the paradigm shift is taking over in traditional agricultural practices for both the districts. There is an increase in production of maize but the yield per acre is low as the cultivation depends on monsoon rain. It is also felt that the production of maize will increase in the future because it is a livestock fodder crop which is regarded as one of the important source of livelihood for the farmers in sustaining their livelihood. The problems of the farmers are in manifold which hamper their production. The farmers face shortage of labour, cash, proper transportation, storage facilities, improved seeds, improved techniques, poor market infrastructure, lack of institutional support, time constraints etc. Hence from the above analysis, a conclusion may be drawn that there is a major shift towards vegetable cultivation in both the districts with increasing production and yield.

Using the lens of various livelihood vulnerability frameworks, the empirical analysis contributes towards understanding of farmers' livelihood vulnerability not only to climate change, but also other livelihood factors variability such as (i) Socio-demographic profile (ii) Livelihood Strategies (iii) access to health, (iv) Food, (v) Water, (vi) Social Networks, (vii) finance and (viii) Knowledge and Communication in the study area. This analysis contributes towards the understanding of the issues of livelihood vulnerability of the farming households in hilly areas of Nagaland state. Also enables to show whether the areas exposed to similar level of risks and the level of dependence on agriculture will have same level of livelihood vulnerability. Overall, the farming households in both the districts are found to be vulnerable, however Zunheboto exhibits a greater LVI than Mokokchung (0.301 versus 0.258, respectively).

In terms of major components, farming households in Mokokchung district are more vulnerable in social networks, food, and climate change. On the other hand, in Zunheboto farming households are more vulnerable in terms of socio-demographic profile, livelihood strategies, finance, knowledge and communication and health. It is found that knowledge and communication, food, natural disasters and climate variability and social networks are the

major components affecting livelihood sustainability of the farming households, which need greater and immediate attention to reduce the vulnerability and bring about improvement of farmers' livelihood sustainability.

The overall value of LVI-IPCC do not show high vulnerability of farmer's livelihood to climate change in both the districts, which are 0.012 for Mokokchung and -0.015 for Zunheboto. Mokokchung seems more exposed and sensitive to climate variability than Zunheboto, whereas the adaptive capacity to climate change seems higher in Zunheboto than Mokokchung, thus farming households in Zunheboto are less exposed and less vulnerable to climate change.

CHAPTER -6
INSTITUTIONAL SUPPORT SYSTEMS AND ITS IMPLICATIONS

6.1. INTRODUCTION

The institutional system is potentially a significant undertaking for planning and implementing sustainable rural livelihood polices (Scoones, 1997)[1]. The decision-makers and planners in local government should take note of how people in informal settlements are making a living and support the livelihood coping strategies and survival practices of the resource poor farmers. In other words, the planners should make efforts to follow the principles and practices of participatory governance (Endujala and Botes, 2020)[2].

Political representative seem less sensitive to farmers' problem and the improvement in the living conditions of farmers itself is often not their objectives. Meanwhile, proportion of people dependent on agriculture for livelihood has remained more or less stable (Suri, 2006)[3]. There is an urgent need to increase crop production, particularly the food grains, which will become inevitable in view of population growth. As such, efforts have to be directed toward increasing the productivity of various crops. The future policy makers should focus on developing new high-yielding varieties of crops suitable to agro-climate conditions of the regions (Rehman et al., 2011)[4]. The agriculture as a measure of sustainable livelihood depends on a number of factors including agro-ecological environment, level of returns in the face of risk and uncertainty, policy environment, agricultural research facilities, access to technology, information etc. Economic development reflects not merely what is happening to the average farmers, but also growth in the capacity of social institutions. Therefore, consideration needs to be given to the institutional factors which explain the conjuncture that enables sustainable agricultural intensification helping farmers to attain sustainable livelihood (Carswell, 1997)**[5].** This chapter will highlight the institutional support systems and implications of the policies of Government on rural livelihood sustainability. Also explains the problems and challenges of farmers' livelihood in agriculture.

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[1] Scoones (1997), "Landscapes, Fields and Soils: Understanding the History of Soil Fertility Management in Southern Zimbabwe",Journal of Southern African Studies, 23, 615–634.

[2] Endjala and Botes (2020), "Surviving like a Bird", African Sociological Review / Revue Africaine de Sociologie , Vol. 24, No. 1 (2020), pp. 151-173 Published by: CODESRIA Stable URL: https://www.jstor.org/stable/10.2307/26918069.

[3] Suri K.C, (2006) "*Political Economy of Agrarian Distress"*, Economic and Political Weekly Vol.41, No.16, (Apr. 22-28, 2006), PP.1523-1529, http://www.jstor.org/stable/4418110 .Accessed: 28/11/2013 01:59.

[4] Rehman et al (2011), "Estimating growth rates and decomposition analysis of agriculture production in Pakistan: pre and post sap analysis, *Sarhad J. Agric. Vol.27, No.1, 2011*

[5] Carswell, G. (1997), "*Agricultural Intensification and Rural Sustainable Livelihoods: A Think Piece*", http://www.ids.ac.uk/ids/research/env/index.html, IDS Working Paper 64.

6.2. INSTITUTIONAL SUPPORT FOR AGRICULTURAL DEVELOPMENT

There are many stakeholders in both the districts meant for the development of agriculture and allied fields. The various stake holders are concerned departments in the state government, voluntary organizations such as Village Development Board (VDB) & Village Council (VC) at village level and government undertakings which are meant to work towards agricultural development and SHGs. Despite many stakeholders available for support, the institutional supports received by the farmers are relatively low and insufficient to improve the conditions of the farmer's livelihood. There are many constraints and grievances associated with institutional support system for agricultural development and ultimately improving the farmer's livelihood.

The agriculture department in the state has established a number of networks in the entire districts to cater to the needs and improvement of the farmer's livelihood and has its offices in all the district headquarters, mainly to supervise and monitor agricultural activities and livelihood. The types of trainings and supports received by the farmers from the government during the last five years prior to the survey are as follows:

Table no 6.1. Types of training support for promotion of livelihood from various departments

Trainings	**Mokokchung**		**Zunheboto**		**Total**	
	HH	%	HH	%	HH	**%**
Training for fruit, veg. & spices cultivation	51	25.75%	18	17.30%	69	22.84
Training for soil and water conservation	42	21.21%	15	14.42%	60	19.86
Training for animal husbandry	33	16.67%	12	16.67%	45	14.90
Training for fisheries	36	18.18%	27	25.96%	63	20.86
Training for agriculture extension	63	31.81%	31	28.97%	94	312.12

Source: Field Survey 2015-16

In table no 6.1, the trainings received from the various stakeholders over the last five years prior to the survey are shown. In Mokokchung district, the largest proportion of households were beneficiaries for agriculture extension, which was 63 (with 31.81%), then follows fruit, vegetables and spices cultivation with 51 households (25.75%), soil and water conservation was 42 households (21.21%), fisheries was 36 households (18.18%), animal husbandry was the least with 33 households (16.67%). The overall household beneficiaries during the period in Mokokchung district was 198 households (accounted for 22.27%).

During the period, in Zunheboto District, the number of households beneficiaries for fruit, vegetables & spices cultivation was 18 (at 17.30%), soil and water conservation was 15 (at 14.42%), animal husbandry was 12 (at 16.67%), fisheries was 27 (at 25.96%) and agriculture extension 31 (at 28.97%). The overall number of household beneficiaries during the period in Zunheboto district was 104 198households (20%). The impacts of the trainings on the livelihoods of the farmers, as stated by the respondents are as below:

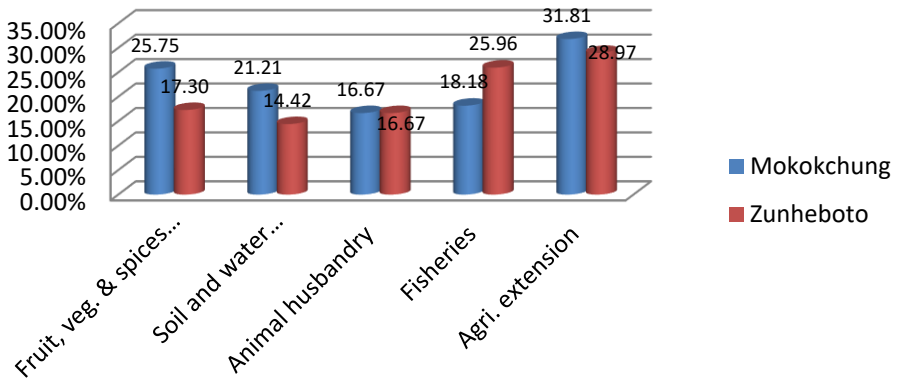
i. Received training for cultivation of fruits, vegetables and spices viz., orange, pineapple, vegetables, cardamom, etc. The training has motivated them to utilize the uncultivated land for enhancing their livelihood.

ii. Animal husbandry department has imparted training on poultry rearing and pig farming for commercial production and marketing to earn additional income and improve livelihood situation.

iii. Department of fisheries have imparted training on integrated fish farming and management and also given financial assistance. This has helped many of the farmers in establishing their own fisheries with financial and technological assistance from the government.

Based on the above, the farmers except for fisheries, the benefits of training outcome in terms of tangible benefits could not be revealed. Hence, it shows the weak institutional support system that imparting trainings alone do not help, but also they need financial and material supports to diversify their livelihood activities to sustain. The types of training from various departments for both districts are given in figure no 6.1.

Figure no. 6.1: Types of Training from various Departments



Source: Field survey 2015-16

Figure 6.1 indicates different types of training received by the farmers from various government departments. The largest proportion of training coverage is given by agricultural extension under agricultural department with 31.81% and 28.97% for Mokokchung and Zunheboto, respectively. The lowest proportion of coverage is training for soil and water conservation in Zunheboto district (14.42%) and training on animal husbandry in Mokokchung district (16.67%).

6.3. ROLE OF INSTITUTIONS TOWARDS IMPROVEMENT OF FARMERS' LIVELIHOOD

The roles of VDB & VC, Public Distribution System (PDS) and Self Help Groups (SHGs) have proved to be of substantial institutional supports to many of the needy farmers. Therefore, the analysis was undertaken for these three institutional supports and their implications on the farmers' livelihood sustainability.

6.3.1. VDB & VC and its impact on Farmers' Livelihood

The VC & VDB are the main decision making bodies at the village level in all the districts of Nagaland. They play significant role in the working of administrative and developmental affairs of the village. It includes all kinds of activities or responsibilities concerning the well being of the people residing within the village jurisdiction. They have the final say in every decision involved. The decision of the VC has direct impact on the livelihood of farmers. Therefore, the study aims to understand this relationship based on farmers' perceptions, taking four activities of the institution as explanatory variables in binary logistic regression analysis, viz., extension service, regulation of agriculture, livestock improvement, and environment protection, and the farmers' livelihood are taken as dependent variable. The result is given in table no. 6.2 as below:

Table no 6.2. Binary logistic regression analysis of VDB & VC and its impact on farmers Livelihood

Variables	**Mokokchung**		**Zunheboto**	
	(B) Coefficient	(S.E) Standard Error	(B) Coefficient	(S.E) Standard Error
Regulate agriculture	2.951 (.002**)	.933	1.792 (.125)	1.169
Extension service	1.384 (0.043**)	.686	16.742 (.995)	2.934

Livestock improvement	4.578 (.000***)	.634	34.726 (.994)	4.641
Environment protection	-.621 (0.258)	.550	33.216 (.994)	4.784

Level of significant at 1% (***) and 5% (**)

(Figures in the brackets represent p values)

Source: Field survey 2015-16

In Mokokchung district, three of the explanatory variables are found to have significant influence on the farmers' livelihood viz., livestock improvement, regulation of agriculture and extension services are all positively related to farmer's livelihood and were statistically significant. This suggests that, as supports from institutional system for these three variables increases each time, the livelihood of the farmers are likely to improve by 4.5, 2.95 and 1.38 times, respectively. This result implies that more initiatives are taken up by the village authority for better extension services, livestock improvement and agricultural regulations; it is most likely to improve the farmers' livelihood in the village. On the other hand, the village institutional activities for environmental protection is found negatively related, but statistically not significant, which suggests that village institutional activities on environmental protection have no influence on farmers' livelihood.

In Zunheboto district, none of the explanatory variables were statistically significant, so the support or activities from village institutional system has no influence on the livelihood condition of the farmers.

So the null hypothesis is accepted for Zunheboto district. On the other hand, for Mokokchung district, except for environment protection activities, all the other variables (providing extension services, livestock improvement and agricultural regulation) were positive and significant so alternate hypothesis is accepted, which states that as more support initiatives are taken by the village institution, it is most likely to improve farmers' livelihood in the village. Thus, village institution has an important role to play for improvement of farmers' livelihood in the district.

6.3.2. Public Distribution System and its impact on Farmers' Livelihood

Among all the schemes available or supports given to the farmers from the government, Public Distribution System (PDS) is said to have most significant positive impact on farmers' livelihood. The respondents from the villages during the survey have expressed that among the institutional supports, the benefits from the ration card has contributed the most towards improvement of their livelihood condition.

The three types of ration cards under PDS in Nagaland are Above Poverty Line (APL), Below Poverty Line (BPL) and Antodaya Anna Yojana (AAY). AAY ration card is issued to those families which fall under '*poorest of the poor'* category, who are entitled to 35 kgs of food grains per month. APL card is issued to household living above poverty line and BPL card is to below poverty line.

Using binary logistic regression analysis, the model examined the influence of PDS schemes on livelihood status of farmers' households. The various cards were considered as explanatory variables; and the farmers' perception about the influence of cards on livelihood status is taken as dependent variable. The result is given as follows:

Table no. 6.3. Binary logistic regression analysis of PDS and its impact on farmers Livelihood

Variables	**Mokokchung**		**Zunheboto**	
	(B) Coefficient	(S.E) Standard Error	(B) Coefficient	(S.E) Standard Error
Below Poverty Line	.740 (.050**)	.398	1.181 (.039**)	.572
Above Poverty Line	.476 (.225)	.392	1.029 (0.129)	.679
Antodaya Anna Yojana	1.573 (.000***)	.353	1.872 (0.042**)	.922

(Figures in the brackets represent 'p' values)

Note: Significant variables influencing farmers' livelihood at 1% (***).and 5 %(**)

Source: Field Survey, 2015-16

The result shows that in Mokokchung district, the benefits under the ration card of BPL and AAY have positively influenced the farmers' livelihoods, which are statistically significant at 5% and 1%, respectively. The result suggests that farmers are quite satisfied with the benefits received through ration card, which improves the livelihood of the farmers' households (0.74 and 1.57 times, respectively) as and when the support from the institution or government is given timely. It also suggests that as the institutional support service improves, the benefits from the scheme will help more farmers in need. However, the influence of APL ration card on farmers' livelihood is not significant.

Similarly, in Zunheboto district the beneficiaries of the ration cards for BPL and AAY have positively influenced the farmers' livelihoods (1.18 and 1.87 times), which are significant at 5%, each. On the other hand, the APL shows positive association to farmers' livelihood; however it was statistically not significant. Thus, it does not have any influence on farmers' livelihood.

Except for APL, the explanatory variables are found to influence the farmers' livelihood positively and are statistically significant in both the districts. So the study rejects the null hypothesis and accepts the hypothesis that the PDS has positive impact on the improvement of livelihood conditions, especially for those households belonging to the poorest of the poor and living below poverty line.

6.3.3. Self Help Group (SHG) and its Impact on Farmers Livelihood

The SHGs is the fastest growing non-governmental organization at grass root level and the most happening development, which focussed on the living conditions of the farmer's households and are generally, meant for the women folks in the village. This support system covers a larger proportion of farming households; the main objective is to inculcate confidence and capabilities, especially among women in all aspects of self employment. The SHGs are mainly to support women by giving loans, encouraging saving and banking habits, giving financial strengths and enhance occupational skills for the economic prosperity of women in improving livelihood.

Table no.6.4: SHGs and its impact on farmers Livelihood

Districts	**Women registered for SHGs**	**Percentage**	**Beneficial**	**Percentage**	**Expecting addition to livelihood income**	**Percentage**
Mokokchung	64	32.3	28	14.1	63	31.8
Zunheboto	43	41.3	25	24.0	40	38.5
Total	107	35.43	53	17.54	103	34.10

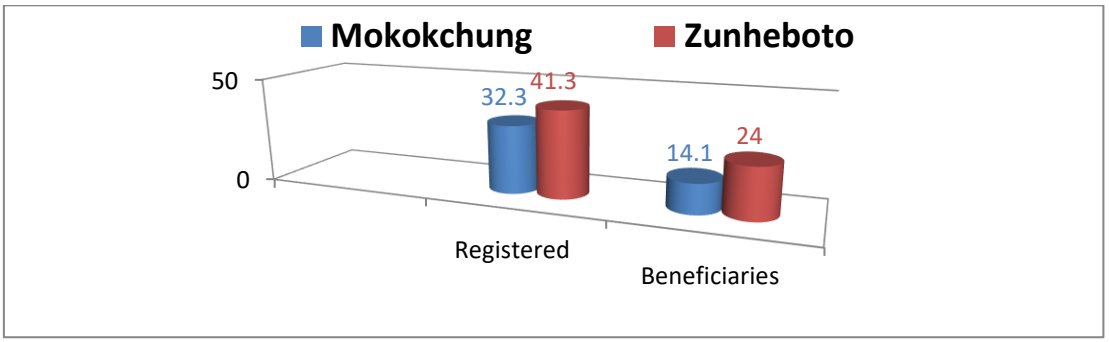
Source: Field Survey 2015-16

In the table no 6.4, in Mokokchung district the total number of women in the sample who are registered with SHGs was 64, this accounted for 32.3% of women in the survey; women who have already received benefits were 14.1% and who are expecting to receive additional livelihood income in future was 31.8% in Mokokchung district. For Zunheboto district, the total number of women registered with SHGs was 43, which accounted for 41.3% of total sample women in the district. Women who have already received benefits were 24.0% and who expects to have additional livelihood income in future were 38.5%.

SHGs are engaged in various livelihood activities like weaving, piggery, making of pickle, detergent powder, lending money etc. To initiate such activities they seek loans from the banks or government assistances. Many SHGs are operating successfully and they give

small loans not only among themselves but also to the non members who are in need of financial help. One of the reasons why women folks show keen interest in SHGs is that, they are getting timely financial help with low rate of interest in time of emergency, commonly arising for children education, health care problems etc. The members registered with SHGs and beneficiaries are given below in figure 6.2.

Figure 6.2: Registered members and beneficiaries of SHGs



Source: Field Survey 2015-16

Figure 6.2 indicates that 32.3% of women in sample have registered as members with SHGs and 14.1% of women were beneficiaries from Mokokchung districts. The same in Zunheboto were higher with 41.3% and 24%, respectively.

6.4. IMPACT OF INSTITUTIONAL SUPPORT ON FARMER'S LIVELIHOOD

Institutional support remains highly imperative for rural farmer's livelihood promotion. The various support institutions like government departments, banks, VDB/VC, SHGs and other NGOs etc., help the farmers to benefit from the economies of scale, improve their production practices, bargaining power and thus their returns and standard of living (Asokhan and Srikar, 2021)[6]. The various types of support received by farmers are monetary, machinery, education, information, seeds, health and technical guidance on production. The institutional support and its impact on farmer's livelihood are discussed below:

[6] Asokhan M. and Srikar K.,(2021),“ Institutional support for enhancing the livelihood of tribal farmers through farmer producer groups”,The Pharma Innovation Journal 2021; SP-10(12): 1446-1448.

Table no 6.5: Distribution of respondents according to institutional support

Support	Statements	Mokokchung		Zunheboto		Total	
		No.	%	No.	%	No.	%
Monetary	I receive credit/loan support when needed.	12	6.06	7	6.73	19	6.29
	I receive old age pension	35	17.6	32	30.76	67	22.1
Machinery	I receive machinery & equipments	8	4.04	4	3.84	12	3.97
Education	I receive knowledge about modern farming	14	7.07	23	22.11	37	12.25
	I receive scholarships	45	22.72	47	45.19	92	30.46
Information	I receive information on various schemes of agriculture and allied departments.	67	33.83	19	18.26	86	28.47
	I receive information regarding market prices.	36	18.18	22	21.15	58	19.20
Seeds	I receive assistance for improved seeds.	27	13.63	36	34.61	63	20.86
	I receive loans for improved seeds.	2	1.01	1	0.96	3	0.99
Health	I receive health care benefits	62	31.31	30	28.84	80	26.49
Technical guidance on production	I receive technical guidance on livestock rearing.	29	14.64	12	11.53	41	13.57
	I receive assistance/guidance on plantation activities	39	19.69	28	26.92	67	22.18
	I receive technical guidance on reducing cost of Cultivation.	12	6.06	9	8.65	21	6.95
	I receive technical guidance on production and protection of crop production.	18	9.09	11	10.57	29	9.60
	I receive support for soil analysis.	19	9.859	7	6.73	26	8.60
		N=198		**N=104**		**N=302**	

Source: Field survey 2015-16

Table no 6.5 shows the distribution of respondents according to various institutional supports. In the sample aggregates, the largest proportion of respondents has received support for technical guidance on production. The technical guidance were for livestock rearing (13.57%) , plantation activities (22.18%), reducing cost of cultivation (6.95%), production and protection of crop production (9.60%) and soil analysis (8.60%), respectively. The second

largest proportion of farmers were those who have received information on various schemes of agriculture and allied departments (28.47%) and market prices (19.20%).The third largest proportion of support is for education, which is 12.25% for modern farming and 30.46% for scholarship. The fourth is monetary support, which is 6.29% and 22.1% for old age pension. The support for health care benefits constituted 26.49%, followed by seeds which are 20.86% for improved seed and 0.9% loans for improved seeds. Lastly, the lowest proportion of support was for machinery with 3.97% only.

For Mokokchung, the largest proportion of support is for technical guidance on production. The technical guidance were livestock rearing (14.64%) followed by plantation activities (19.69%), minimizing cost of cultivation (6.06%), production and protection of crop production (9.09%) and soil analysis (9.59%).The second largest was for information on various schemes of agriculture and allied departments (33.83%) and market prices (18.18%).The third largest proportion was for health care benefit (31.31%).The fourth largest proportion of support was for education, which 7.07% for modern farming and 22.72% for scholarship. The support for monetary consist of 6.06% for credit/loan and 17.6% for old age pension, followed by seeds with 13.63% for assistance for improved seeds and 1.01% loans for improved seeds. Lastly, the lowest proportion of support was for machinery, which covers only 4.04% of the respondents.

Similarly for Zunheboto, the largest proportion of support was for education. The support for education on modern farming was 22.11% and 45.19% had received scholarship for children's education. The second largest proportion of support was for technical guidance on production. The technical guidance on livestock rearing (11.53%), plantation activities (26.92%), cost effective ways of Production (8.65%), production and protection aspects of crop production (10.57%) and soil analysis (6.73%).The third largest proportion of support was for information which 18.26% for agriculture and allied departments and market prices (21.15%).The fourth largest proportion of support was for monetary, which 6.73% for credit/loan and 30.76% for old age pension. The assistance for improved seeds covered 34.61% of the respondents and loans for improved seeds covered 0.96%, followed by 28.84% for health care. Lastly, the lowest proportion of support was for machinery with only 3.84 percent coverage.

Institutions like agriculture and allied departments, VDB/VC, SHGs and other NGOs play an important role in improving livelihood of the farmers. Institution support is important in the development of rural farmers' livelihood as they have been playing a pivotal role for farmer's livelihood through increasing agricultural production. Here, the finding of the study

reveals a medium level of institution support. Hence, more effort should be given by the institutions for support of rural livelihood promotion.

6.4.1. Level of institutional support on farmer's livelihood.

The level of institutional support for the livelihood promotion are analysed and results were presented in table no 6.7. The results were analysed using mean and standard deviation as follows:

Table no. 6.6: Criteria for level of institutional support

Sl.No	Criteria	Level
1	< Mean –Standard deviation	Low
2	Mean –Standard deviation to Mean + Standard deviation	Medium
3	Mean + Standard deviation	High

Source: Mathuabirami,V and Kalaivani,S (2021)[7].

Table no 6.7. Levels of institutional support received by farmers (respondents)

Sl.No	Category	Mokokchung		Zunheboto		Total	
		Number	%	Number	%	Number	%
1	Low	4	2.02	2	1.92	6	1.99
2	Medium	134	67.68	76	73.07	210	69.53
3	High	60	30.30	26	25	86	28.48
	Total	198	100	104	100	302	100

Source: Field Survey 2015-16

Table no.6.7 shows majority of the farmers in the sample total have received medium level of institutional supports (69.53%), followed by high level of institutional support (28.48%) and 1.99% at low level of institutional support.

For Mokokchung, majority of the farmers in its sample aggregate have received a medium level of institutional supports (67.68%), followed by high level of institutional support (30.30%) and only 2.02% of the respondents has received low level of institutional supports. Similarly for Zunheboto, 73.07% for medium, 25% for high and only 1.91% for low level of institutional supports.

[7] Mathuabirami, V. and Kalaivani, S. (2021). Institutional support for tribal farmer interest groups in Erode district of Tamil Nadu, India. Journal of Applied and Natural Science, 13 (SI), 167 - 171. https://doi.org/10.31018/jans.v13iSI.2823

6.4.2. Institutions and support types received for Farmer's Livelihood.

Table no.6.8 shows the various types of supports and sources of support received by farmers in the study area were from Government departments, Banks, Village Development Board / Village Councils, Self Help Groups and other NGOs. The support types received are monetary, machine, education, information, health and technological guidance on production.

Table 6.8: Support Sources and Types received by farmers (in %)

Supports	**Govt Depts.**			**Banks**			**VDB/VC**			**SHGs**			**Other NGO**		
	Mkg	Zbto	Total	Mkg	Zbto	Total	Mkg	Zbto	Total	Mkg	Zbto	Total	Mkg	Zbto	Total
Monetary	13.63	1.3	15.56	1.01	0.96	0.99	4.54	6.73	5.29	2.02	4.80	2.98	2.52	7.56	3.64
Machine	4.04	3.84	3.97	0	0	0	0	0	0	0	0	0	0	0	0
Education	22.72	50	32.11	0	0	0	1.51	5.76	2.98	4.54	7.69	5.62	1.01	3.84	1.98
Information	21.21	14.42	18.87	0	0	0	18.68	7.30	18.21	5.05	2.88	4.30	7.07	4.80	6.29
Health	25.25	15.38	21.85	0	0	0	10.60	3.84	1.98	4.54	7.69	5.62	0.50	1.92	0.99
Technical guidance on production	40.90	31.73	37.74	0	0	0	9.59	19.23	0.99	7.57	10.57	8.60	1.01	2.88	1.65

Source: Field survey 2015-16

The sample total in table no. 6.8 reveals that the support given by government departments for technical guidance accounted 37.74% of the respondents. This is followed by education (32.11%), health (21.85%), information (18.87%), monetary (15.56%) and machine (3.97%). The support given by banks is only in monetary term which covered only 0.99% of the respondents. The VDB/VC extended its support to farmers are in terms of information (18.21%), followed by monetary (5.29%), education (2.98%), health (1.98%) and technical guidance on production (0.99%). The SHGs also extended support in terms of technical guidance on production (8.60%), followed by education and health (5.62%), information (4.30%) and monetary (2.98%). Furthermore, other NGOs also extended support through information sharing (6.29%), followed by monetary (3.64%), education (1.98%). technical guidance on production (1.65%) and health (0.99%).

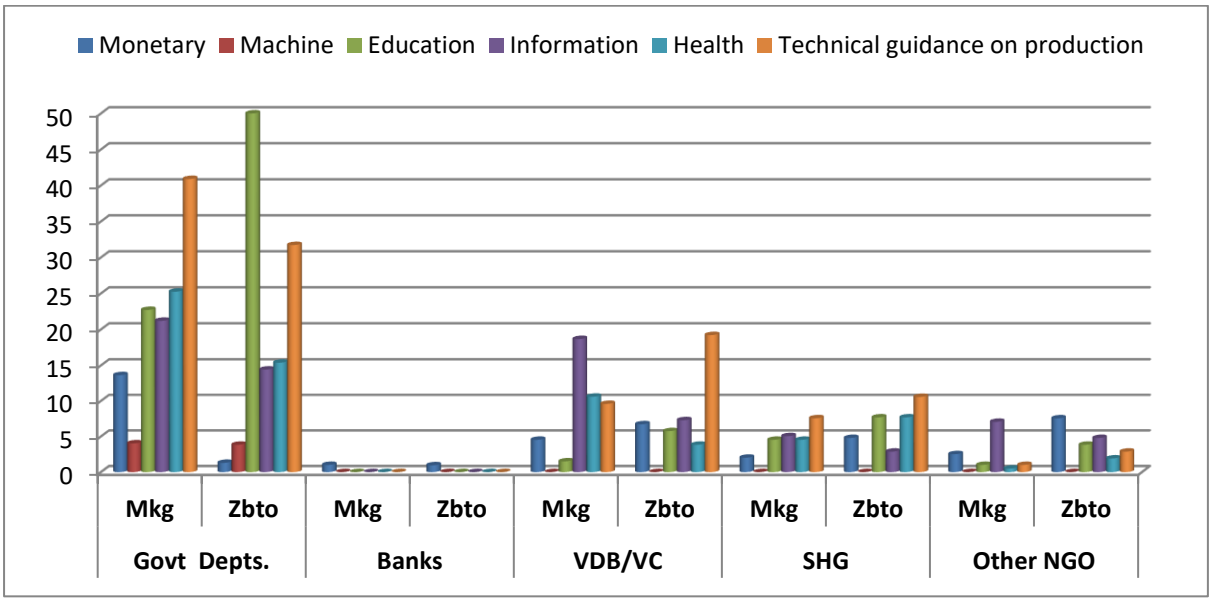
For Mokokchung, the support given by government departments for technical guidance has covered 40.90% of the respondents, followed by health (25.25%), education (22.72%), information (21.21%), monetary (13.63%) and machine (4.04%).The support given by banks is only in terms of monetary which only 1.01% of the respondents. The VDB/VC extended support to farmers are information sharing (18.68%), followed by health (10.60%), technical guidance on production (9.59%). monetary (4.54%), and education (1.51%). The SHGs also extended support in terms of technical guidance on production (7.57%), followed by information (5.05%), education and health at 4.54%, and monetary at 2.02%. Furthermore, other NGOs also extended its support through information (7.07%) followed by monetary (2.52%), education and technical guidance on production (1.01%) and health (0.50%).

Similarly for Zunheboto, the support given by government departments was highest for education (50%), followed by technical guidance (31.73%), health (25.25%), information (14.42%), machine (3.84%) and monetary (1.3%).The support given by banks is only in terms of monetary which is 0.96%.The VDB/VC extended its support to farmers are technical guidance on production (19.23%) followed by information (7.30%), monetary (6.73%), education (5.76%) and health (3.84%). The SHGs also extended support in terms of technical guidance on production (10.57%), followed by information (5.05%), education and health at 7.69%, monetary (4.80%) and information at 2.88%. Furthermore, other NGOs also extended its support through monetary (7.56%), followed by information (4.80%), education (3.84%), technical guidance on production (2.88%) and health (1.92%).

It appears that the largest proportion of support received by farmers is from government departments while the lowest is from banks. The support system that has benefited the farmers most was on information sharing about various schemes under

agriculture and allied departments and market prices, followed by technical guidance on production. The least beneficiary coverage is for machinery & equipments.

Figure 6.3: Support institutions and support types received by farmers (in %)



Source: Field survey 2015-2016

Figure 6.3 indicates the largest proportion of support received is on education and technical guidance on production by governments for both districts at 22.72% and 40.9% for Mokokchung district and 50% and 31.73% for Zunheboto district. The second largest proportion of support received is information on various schemes under agriculture and allied departments and market prices by government departments at 21.21% and 14.42% respectively for both districts. The lowest proportion of support received is machinery & equipments for both districts.

6.5. PROBLEMS AFFECTING SUSTAINABLE LIVELIHOOD OF THE FARMERS

There are numerous problems affecting farmers in attaining sustainable livelihood. Therefore, the livelihood strategies for both agricultural and non-agricultural activities should aim to link the local resources with the institutions, to meet the challenges of sustainable livelihood promotion in rural areas (Singh, 2013).[8] The problems affecting sustainability of the farmers' livelihood in the study area has been divided into eight distinct broad categories, which are, production, marketing, infrastructural, financial, natural, social, and human and

[8] Singh, A .K (2013) "Income and Livelihood Issues of Farmers: A Field Study in Uttar Pradesh", Agricultural Economics Research Review Vol. 26 (Conference Number) 2013, pp 89-96.

lack of institutional support. For each category, sub-indictors were chosen representing the problems and the percentages of farmers who face these problems were calculated, and then estimated the averages within each broad category and ranks were assigned based on the average scores. The problems of the farmers are discussed below:

Table no 6.9: Problems affecting sustainable livelihood (in %)

Problems affecting sustainable livelihood	**Mokokchung**	**Zunheboto**
Production problems		
Less cash	14.14	9.62
labour Shortages	28.78	28.85
Low fertile land	2.52	0.96
Time constraints	41.92	28.25
Marketing Problems		
High Transportation costs	29.29	45.19
Lack of market information and knowledge	60.61	75.00
Time constraints	72.27	73.08
Dependency on market	60.61	85.58
Absence of inter-linkages between demand and supply	12.12	16.35
Lack of marketing facilities	31.82	49.05
Infrastructural problems		
Absence of storage facilities	85.86	53.45
Lack of transportation	77.78	68.27
Lack of irrigation facilities	94.95	90.38
Lack of agricultural machinery	65.66	78.85
Financial problems		
Lack of credit/loan facilities	86.36	89.72
Lack of saving	82.32	87.50
Poor banking habits	76.6	76.92
Natural capital		
Increase in deforestation	15.15	60.58
Non-availability of NTFP	14.14	12.50
Dependence on monsoon rain	79.29	79.81
Increase in soil erosion	21.21	12.50
Social capital		
Absence of active participation in VDB/VC	58.08	65.38
Absence of active participation in government policies undertaking	42.93	54.81
Human capital		
Poor access to health facilities	32.32	92.31
Lack of skill improvement	51.52	66.35
Lack of education	8.39	95.19

Lack of knowledge on modern farming	76.77	67.31
Institutional support problems		
Lack of extension service	77.78	67.31
Lack of support system for local entrepreneurs	30.30	38.46
Lack of support for agricultural management	0.81	91.35
Lack of government support for regulating environment protection	39.39	55.77
Lack of knowledge on animal disease resilience	67.17	68.27
Irregular supply of public distribution system	35.35	36.54
Insufficient supply of improved seeds	55.56	69.23

Source: Field survey 2015-2016

i. Production Problems:Table no.6.9 shows the difficulties faced by farmers from Mokokchung district in production, which are time constraints (41.92%), followed by labour shortage (28.78%), less cash (14.14%) and low fertile land at 2.52%. Whereas, in Zunheboto, shortage of labour is the highest with 28.85%, followed by time constraints (28.25%), less cash (9.62) and low fertile land (0.96%), respectively hamper the farmers to increase their production.

ii. Marketing Problems :Most of the farmers in Mokokchung had difficulties in selling their goods in the market due to time constraints (72.27%), which was followed by lack of market information and knowledge (60.61%) and the dependency on market goods was quite high (60.61%). Further, lack of marketing facilities (31.82%), high transportation cost (29.9%) and absence of inter-linkages between demand and supply (12.12%) were the main hindrances for the farmers to sell their produce in the market. Similarly for Zunheboto district the major difficulties of marketing problems are dependency on market (85.58%), where farmers buy from market for home consumptions. Further, there is no proper market information and knowledge (75%) to encourage selling their produce, and time constraints to go to market to sell produce was another problem (73.08%). There are no marketing facilities (49.05%) in the nearby area and the transportation cost is too high to take the farm produce to the urban market (45.19%). The absence of inter-linkage between demand and supply (at 16.35%) is also another problem for finding a market for the farmer.

iii. Infrastructural problems: In regard to infrastructural problems in Mokokchung, lack of irrigation facilities (94.95%) was the highest as farmers mostly do jhum cultivation on hilly area. This is followed by absence of storage facilities (85.86%) and lack of transportation (77.78%) leads to low production and commercialization. Lack of

improved machinery (65.66%) is another problem faced by the farmers, where farmers commonly use age old machineries and tools resulting in low production. Similarly for Zunheboto, lack of irrigation facilities is 90.38%, followed by lack of agricultural machinery (78.85%), lack of transportation (68.27) and absence of storage facilities (53.45%).

iv. Financial problems:The farmers in Mokokchung faced with severe financial problems due to lack of credit/loan facilities (86.36%) followed by lack of saving(82.32%) and poor banking habits (76.6%).Similar case for Zunheboto, lack of credit/loan facilities at 89.72% followed by lack of saving (87.505) and poor banking habits (76.92%).

v. Natural capital:In Mokokchung, many farmers livelihood is affected due to dependence on monsoon rain for cultivation which is 79.29% followed by increase in soil erosion (21.21%),increase in deforestation (15.15%) and non-availability of NTFP product (21.21%).For Zunheboto, the dependence on monsoon rain is 79.81% followed by deforestation(60.58%),non-availability of NTFP and increase in soil erosion at 12.50%.

vi. Social capital: In Mokokchung absence of active participation in VDB/VC and government policies undertaking is 58.08% and 42.93% respectively. Similarly for Zunheboto, absence of active participation in VDB/VC and government policies undertaking is 65.38% and 54.81% respectively

vii. Human capital: In Mokokchung, the lack of knowledge on modern farming is 76.77%, followed by lack of skill improvement (51.512%), poor access to health facilities (32.32%) and lack of education (8.83%). For Zunheboto, majority of the respondents were having poor access to health facilities (92.31%), followed by lack of knowledge of modern farming (67.31%) and lack of skill improvement (66.35%).

viii. Institutional support problem:In Mokokchung, absence of support for agricultural management was the highest (80.81%), followed by lack of extension service (77.78%), lack of animal resilience (67.17%), insufficient supply of improved seeds (55.56%),lack of government support for regulating environment protection(39.39%),irregular supply of PDS and lack of support system for local entrepreneurs. For Zunheboto, lack of support for agricultural management is 91.35% followed by insufficient supply of improved seeds (69.23%), lack of animal disease resilience (68.27%), lack of extension service(67.31%),lack of government support for regulating environment protection (55.77%), lack of support system for local entrepreneurs (38.46%) and irregular supply of PDS at 36.54%.

Based on these percentages, the Category wise overall average were calculated and the problems affecting sustainable livelihood is ranked which are shown in the table no.6.10.

Table no 6.10: Problems affecting sustainable livelihood (in Average and Rank).

Problems affecting sustainable livelihood	**Mokokchung**		**Zunheboto**	
	Average	**Rank**	**Average**	**Rank**
Production problem	21.84	VIII	17.06	VIII
Marketing problem	45.28	VI	57.37	VI
Infrastructural problem	81.06	II	72.83	III
Financial problem	81.65	I	84.61	I
Natural capital	32.45	VII	41.43	VII
Social capital	50.50	V	60.09	V
Human capital	62.5	III	80.28	II
Institutional support problem	55.19	IV	60.98	IV

Source: Field survey 2015-2016

Table no.6.10 shows the severity of the problem effecting livelihood of the farmers in terms of average and rank. In Mokokchung district, the financial problem is ranked I with an average score of 81.65%, which implies that the highest proportion of respondents face financial problems to improve their livelihood. This is followed by Infrastructural problem with average of 81.06% and ranked II, Human capital improvement (average of 62.5%; ranked III), Institutional problems (average of 55.19% and ranked IV), Social capital with average of 50.50% and ranked V, Marketing (average of 55.19% and ranked VI), natural capital rank VII and Production (average of 21.84%, ranked VIII).

Similarly for Zunheboto, The financial problem is ranked I with an average score of 84.61% followed by human capital (average of 80.28% and ranked II), Infrastructural (average of 72.83% and ranked III), institutional (average 60.98% and ranked IV), social (average of 60.09% and ranked V), marketing (average score of 57.37% and ranked VI), natural (average of 41.43% and ranked VII) and Production (average score of 17.06 and ranked VIII).

The sample survey reveals that financial problem is the most common problem in the both the districts in achieving and sustaining farmers' livelihood. This is followed by infrastructural problems (like lack of irrigation facility, modern machineries, transport,

storage etc.) and human capital (like lack of prober health facilities, knowledge on improved farming, skill and education).

6.6. CONCLUSION

Apart from the agriculture and allied departments, various other institutions like banks, VDB/VC, SHGs and other NGOs in the state have established a number of networks in the districts to cater to the needs of the farmers and improvement of the farmer's livelihood in particular. In spite of the available support from all the stake holders, the institutional support of the farmers is relatively low and insufficient to improve the livelihood conditions of the farmers. There are many constraints involved in terms of institutional support for agricultural development for the farming community like regulating agricultural activities system, environment protection, livestock improvement and extension service etc. The farmers stated that in spite the trainings on crop cultivation, horticulture, animal husbandry and fisheries, which has motivated them to utilize the uncultivated land for enhancing their livelihood, but the farmers could not achieved the desire outcome of the trainings.

The Self Help Group is the fastest growing organization and the most happening development which focused on the improving the living conditions of the farmers' household. Among the sources of support system available in rural area, the larger proportion of support for the farmers is from the government departments and lowest is from the banks. Of the types of support system, the benefit of information on various schemes of agriculture and allied departments and market prices, technical guidance on production were of major coverage. The least was machinery & equipments, which could cover the smallest number of beneficiaries.

The study reveals that majority of the respondents have received a medium level of institutional support. Therefore, more effort should be taken by the institutions to extend maximum support to rural households. There were many problems affecting livelihood sustainability of the farmers like production, marketing, infrastructural, financial, natural, social, and human and institutional. The most severe one was financial shortage, followed by infrastructural and human capital resources. Hence, policy makers have to promote farmers livelihood activities, which has to be linked with available local resources and institutions supports and definite measures has to be adopted to meet the challenges of sustainable livelihood of the farmers.

CHAPTER-7
SUMMARY AND CONCLUSION

7.1. SOCIO ECONOMIC PROFILE OF MOKOKCHUNG AND ZUNHEBOTO DISTRICTS.

The overview of the Socio economic profile of Mokokchung and Zunheboto Districts is discusses in chapter 3, and the main observations made in this study are summarized below.

7.1.1. Profile of Mokokchung and Zunheboto districts.

Mokokchung, another district in Nagaland is the home of the Ao Naga tribe. It covers an area of 1,615 sq km with a total population of 1,94,622.It lies between 93.53 and 94.53 degrees Longitude and 25.56 degrees Latitude. The physiography of the district shows six distinct hill ranges.

Zunheboto is the home of the Sumis. It covers an area of 1,255 sq km with a total population of 1,40,757. There are high hills spread over many areas of the district. The hills vary from 1000 to 2500 metres and most people live between 1500 - 2000 metres altitude. The altitude of the district HQ. Zunheboto is 1874.22 meters above sea level. Most of the population resides in rural areas.

7.1.2. Distribution of sample population by Age

The data for both the districts shows that more than 60% of the population were economically less active group (below 30 years and above 60 years) who are mostly of students and the older age group. The farmers actively engaged in agriculture activities are mostly in the age group of 30-60 were only 38.44% .

7.1.3. Distribution of sample population by Gender

The proportion of male population is more than that of female.Mokokchung district showed 561 male and 520 female, which is 51.9% and 48.1% respectively. Likewise for Zunheboto district 332 were female and 299 were male which is 52.6% and 47.4%. The gender distribution of the sample population for both the districts indicates that work participation in agricultural operation of both the gender is fairly equal

7.1.4. Distribution of sample population by Education

The respondents with no education is quite negligible (3.9% and 12% in Mokochung and Zuunheboto respectively).Majority of the respondents were with primary level of education (75% and 69% respectively) and 10% each with secondary level. Similarly, respondents with degree level were also low (10.9% and 6.8% respectively).The low level of education of farmers must have contributed to the livelihood vulnerability in the study area.

7.1.5. Distribution of sample population by Livelihood Status

Livelihood status is showed based on the employment activities of the surveyed Households. In Mokokchung, household engaged in Crop sale and Animal Sale i.e,79.3% and 71.2% followed by Government Job 28.2%, pension 18.2%,Agricultural labor 15.2%,Business 5.1%,carpenter 1.5% and others 11.6%.

For Zunhebtoto District, the households engaged in Crop sale and Animal Sale i.e, 56.7% and 79.8% followed Government Job 22.1%, Agricultural labor 21.2%, pension 17.3%,Business 3.8%,Carpenter 1% and others 5.7%.Majority of the sample households depend on agriculture for their livelihood.

7.1.6.Distribution of sample population by Types of Houses, cooking energy, drinking water, and assets.

The analysis shows that semi-pucca houses dominates and they cannot afford for cleaner energy LPG and electrical appliances.100% of the respondents from both the district use wood as cooking energy. Uses of gas and electricity for cooking with low at 18.18% and 11.61% for Mokochung and 33.56% and 12.58% for Zunheboto respectively. The household assets like car car, motorcycle, television and modern furniture determine the living condition of farmers. The most owned households assets are television with 50.66% and least owned is car with 4.96%.This reflect that majority of farmers household in the study area have low level of well being.

It is found that access to quality drinking water facilities has improved for both the districts which is 97.47% for Mokochung and 88.07% for Zunheboto. Having access to safe and good quality of drinking water results in better health and quality of life.

7.1.7. Monthly household Income and Annual Expenditure

The average monthly income of households in Mokokchung is Rs 12355 whereas for Zunheboto is at Rs 8000. The average monthly households' consumption expenditure of Mokokchung is Rs 6347 whereas for Zunheboto is at Rs 5508. This reveals the respondents could meet their ends meet, even though they could not afford the luxury or enhance livelihood up to their satisfaction. The respondent households try every possible measure to improve their livelihood for sustainability.

7.2. ASSETS AND LIVELIHOOD STRATEGIES OF FARMERS

Assets and Livelihood Strategies of Farmers have been discussed in chapter 4. The major findings are summarized below.

7.2.1. Analysis on Natural Capital and Livelihood

The result of the binary regression estimate in the sample aggregates shows investment on land is positively related to livelihood and statistically significant at 1%. The increase in investment for plantations, horticultures, irrigation for terrace fields has resulted in positive impact on farmers' livelihood. Availability of NTFP was found to have negative relation to farmer's livelihood, which was statistically significant at 1 %. This means increase in deforestations for firewood, timber for furniture and buildings, jhum cultivations etc have decreased the availability of NTFP. However these resources have helped increased the livelihood sustainability. Forest conservation and water availability were found to have significant relations with livelihood sustainability.

The result further shows for Mokokchung, water availability was negatively related to farmer's livelihood, while, forest conservation was positive and significant.The investment on land and availability of NTFP are positively related to livelihood but statistically insignificant. For Zunheboto, only availability of NTFP was found to have negative relation to farmers' livelihood. On the other hand, investment on land, forest conservation and water availability was found to have positive relations to livelihood but also statistically not significant so they do not have noticeable impact on farmers' livelihood.

7.2.2 .Analysis on Human Capital and Livelihood

Training for skill development for Mokokchung was found to be negatively related to livelihood, which is statistically significant at 1 %. The results simply mean that the training given to the farmers for skill development does negatively impact on livelihood of the farmers. The skill of the farmers was also found to be negatively related to farmer's livelihood. This means farmer's inherent skill is unutilized and there seems negative contribution towards the improvement on farmer's livelihood. Health care and education were found to be positively related to livelihood although statistically not significant. This result may suggest improvement in health care facilities and household head need to be educated about farming techniques as they are the decision makers in the family. Hence, the better the health facilities and education provided to the farmers, the higher contribution will be made in improving livelihood and vice-versa.

Based on the analysis, Skill development is found to have negative impact on livelihood of the farmer, which is statistically significant, and education and health facilities are positive but statistically not significant. Which result is in contrast to what was assumed. Thus, the null hypothesis is accepted.

7.2.3 .Analysis on Physical Capital and Livelihood

The results of the binary logistic regression estimate in the sample aggregates for transport and communication and investment on irrigation were found to be positive to farmer's livelihood and statistically significant at 1 %. The results indicate the improvement of transport and communication and irrigation have strong influence on livelihood. However, Soil fertility was found to be positively related to farmer's livelihood but statistically not significant.

The means of transport and communication for Mokokchung has positive influence on farmer's livelihood and highly significant at 1%. However investment in Soil fertility was found to be negatively related but statistically insignificant. The investment on irrigation is positive yet insignificant. For Zunheboto means of transport and communication and investment on irrigation were found to be positively related to farmers' livelihood and significant at 5% and 1%, respectively. However, Soil fertility was found to be positively related but insignificant statistically.

7.2.4. Analysis on Financial Capital and Livelihood

The results of the Binary logistic regression estimate in Table no.4.9, the sample aggregates for saving was found to be positively related to farmer's livelihood, and statistically significant at 1 %. This result reveals household savings for both district has influenced livelihood of the farmers positively. The influence of Bank account deposit and loan were found to be positive to the farmer's livelihood, yet statistically not significant. Moreover, access to loan is considerably low and statistically not significant.

7.2.5. Analysis on Social Capital and Livelihood

The results of binary logistic regression estimate in the sample aggregate, the Village Development Board /Village Councils and Access to public schemes were found to have positive influenced on farmer's livelihood and statistically significant at 1%. These reveal that increase in membership and active participation in VDB/VC and access to public schemes has resulted in the benefits of the farmers and thus improving farmers' livelihood.

It is observed that an undeveloped capital asset not only leads to slow growth of agricultural production but also decrease it thereby having a negative impact on farmers' livelihood. Proper utilization of capital assets will not only increase production but also simultaneously generate benefits to increase their livelihood status and thus enhancing their income. Hence, proper access to capital assets is necessary to boost farmer's livelihood.Therefore, accepts the hypothesis the capital asset determines the sustainability of livelihood of farmers.

7.2. 6.Livelihood strategy and Types of households

The pure agricultural household constitutes 71.21% and part time agricultural household consist of 28.79% of the total households covered in the study area in Mokokchung district. For Zunheboto district the pure agricultural households constitute 78.85% and part time agricultural household consist of 21.15% of the total households covered in the study area. For both the districts, pure agricultural household consists of 73.84% and part time agricultural household consist of 26.16%

7.2.7 Livelihood strategies of Full-time and Part-Time Agricultural Households

The above analysis indicates that the average monthly income of the full time agricultural household is lower than the part time agricultural household. Moreover, a single livelihood activity alone cannot sustain farmers' livelihood, either it's for full-time or part-time agricultural households. Thus, in order to sustain their livelihood, farmers take up diverse portfolios of livelihood activities by combining to a maximum of four livelihood activities in

the sample. The outcome is the more diversified livelihood activities of the farmers are; the higher is the sustainability of the farmers' livelihood. Henceforth, the most suitable livelihood strategies for the farmers are the combination of different livelihood activities according to their capabilities and access to capital assets.

7.2.8. Extent of Livelihood Diversification of Farming Households

In table no 4.16, the sample aggregates shows that majority of farming households were under low level of diversification index (51.66%), followed by medium level which is 47.02% and only 1.32% were of high level diversification index.

For Mokokchung district, 51.51% were under low level of diversification index as against 46.47% of medium level and only 2.02% of high level of diversification index. Similarly for Zunheboto, 51.92% were under low level of diversification index as against 48.08% of medium level and 0% of diversifiers for high level of diversification index. Thus, farming households in Nagaland are unable to diversify their livelihood to improve their living conditions.

7.2.9. Determinants of Livelihood diversifications of Farmers

The results of multiple regression estimates for Mokokchung and Zunheboto are presented in Table no 4.19. In the regression estimates of Mokokchung district, the adjusted R^2 is 0.44 and r = 0.63, this implies there is positive relations among the variables and the explanatory variables fairly explains the variations of the dependent variable in the model. The regression coefficients of age of household head, education level, livelihood diversification, road distance, livestock size, urban linkages, cooperatives membership, and households' total income were all found to have positive impact on the livelihood diversification and were statistically significant.These are in conformity of the hypothesis, except for age of the household head. The regression coefficient values reveal that one unit increase in each of the respective independent variable will result in increase in livelihood diversification as given. Out of the given determinants, the impact of livelihood diversification is higher, followed by household annual income, education level of head, urban linkages, cooperative membership, live stock size , road distance , and age of household head .

Further, it is reveal that the influence on livelihood diversity by access to credit, media , irrigation, extension contacts and household size were all positive, but statistically not significant so they do not have influence on the dependent variable. On the other hand, access

to training (statistically significant at 5%) has negative influence on livelihood diversity. For which null hypothesis is accepted.

Similarly, for Zunheboto district, the multiple regression result is shown in the table no 4.19, where r = 0.72 and adjusted R^2 is 0.52, which implies that there is positive relationship between the variables and the explanatory variables explains about 52 percent of the variation in the model. Those explanatory variables with regression coefficient value in the brackets viz., total income (0.067), cooperative membership (0.10) urban linkages (0.06), diversification of livelihood (0.15) and age of household head (0.002) were found to have positive impact on livelihood diversity, and all are statistically significant. On the other hand training (-0.097), extension contacts (-0.108) and livestock size (-0.04) are statistically significant, having negative influence on livelihood diversity.

7.3. LIVELIHOOD VULNERABILITY AND SUSTAINABILITY OF THE FARMERS

Livelihood Vulnerability and Sustainability of the Farmers have been discussed in chapter 5. The major findings are summarized below.

7.3.1. Analysis of Livelihood Vulnerability

The results in table no. 5.2 show that the LVI of major components ranges from 0.105 to 0.450 in Mokokchung district, and from 0.200 to 0.498 in Zunheboto, which means health is least vulnerable while knowledge & communication is highly vulnerable, in both the districts. The overall LVIs of major component for Mokokchung and Zunheboto districts were 0.269 and 0.306, respectively. This implies that the livelihood of farmers in both the districts is vulnerable, but the degree of vulnerability is relatively higher in Zunheboto district than that in Mokokchung district and thus supports the hypothesis of the study.

Overall, the farming households in both the districts are found to be vulnerable, however Zunheboto exhibits a greater LVI than Mokokchung (0.301 versus 0.258, respectively), indicating relatively greater vulnerability.

7.3.2. Livelihood Vulnerability Index-Intergovernmental Panel Approach

Using the lens of various livelihood vulnerability frameworks, this empirical analysis contributes towards understanding of farmers' vulnerability not only to climate change, but also other livelihood factor variability such as (i) Socio-demographic profile (ii) Livelihood Strategies (iii) access to health , (iv) Food , (v) Water , (vi) Social Networks , (vii) finance and (viii) Knowledge and Communication in Mokokchung and Zunheboto districts, which also contribute towards the understanding of the issues of livelihood vulnerability of the farming households hilly areas of Nagaland state.

7.3.3. Cropping Pattern

The shift from traditional rice cultivation to vegetable crops is taking place due to its capabilities to generate additional income which has increased considerably for both the districts. So, the null hypothesis is rejected. Hence, there is a change in cropping pattern from rice to income generating crops over the last five years.

7.3.4. Rice Production

The plight of rice production in Mokokchung and Zunheboto has decreased tremendously in a negative manner. Rice is an important staple food crop to the farmers for their survival but due to low productivity the farmers are decreasing their production and shifting to cash crop. Hence from the above analysis, one can understand the dilemma of rice production in the district, which has been declining considerably and the paradigm shift is taking place moving from traditional rice production towards vegetable production, encouraged by potential additional income from the vegetable sell.

It is clearly evident that rice production is declining significantly while vegetable cultivation is increasing, encouraged by higher cash return so, the null hypothesis is rejected and accepted the alternate hypothesis that farmers are reducing the cultivation of rice and switching over to vegetable crops to sustain their livelihood. So, the null hypothesis is rejected and accepts the hypothesis that the farmers in traditional agriculture adopt changes in cropping pattern, shifting away from rice to other crops and vegetables to improve livelihood status.

7.3.5. Maize Production

There is an increase in the production of maize for both districts but there is partially increase and partially decreasing in the production of maize in Zunheboto as the farmers increase or decrease their production every year based on fertility of the soil yield per acre is low as the cultivation depends on monsoonal rain.

7.4. INSTITUTIONAL SUPPORT SYSTEMS AND ITS IMPLICATIONS

Institutional Support Systems and its Implications have been discussed in chapter 6. The major findings are summarized below.

7.4.1. Institutional support for agricultural development

The farmers stated that they receive training for cultivation of fruits for orange, pineapple, elachi, etc.Under animal husbandry department; they receive training on poultry rearing and pig farming. From the department of fisheries they receive training for integrated fish farming, management of fishery ponds and tanks and they even receive financial help, this in turn has already helped many of the farmers in establishing their own fisheries with the assistance from government. Based on the above statement, The farmers only state the benefits of training but could not reveal the outcome of the benefits so the null hypothesis is accepted.hence,it shows the weak institutional support system.

7.4.2. Institutional support and its impact on farmer's livelihood.

Institutions like department of agriculture and allied departments, VDB/VC, SHG and other NGOs play an important role in improving in livelihood diversifying of the farmers. Institution support is important in the development of rural farmers. Institutions have been playing a pivotal role for farmer's livelihood through increasing agricultural production. Here, the finding of the study reveals a medium level of institution support. Hence, more effort should be taken by the institution for support of rural households.

7.4.3. The level of institutional support on farmer's livelihood.

Table no.6.8 shows majority of the farmers in the sample aggregates have received a medium level of institutional support (69.53%) followed by high level of institutional support (28.48%) and 1.99% at low level of institutional support.

For Mokokchung, majority of the farmers in the sample aggregates have received a medium level of institutional support (67.68%) followed by high level of institutional support (30.30%) and 2.02% at low level of institutional support.Similary for Zunheboto,73.07% for medium,25% for high and 1.91% for low level of institutional support.

7.4.4. The Support institutions and support types received for farmer's livelihood.

The larger proportion of support received by farmers is from various government departments and a lowest proportion is from banks. The support system mostly benefited is on information on various schemes of departments of agriculture and allied departments and

market prices followed by technical guidance on production. And the lowest beneficiary is support for machinery equipments.

Figure 6.3 indicates the largest proportion of support received is on education and technical guidance on production by governments for both districts at 22.72% and 40.9% for Mokokchung district and 50% and 31.73% for Zunheboto district. The second largest proportion of support received is information on various schemes of department of agriculture and allied departments and market prices by government departments at 21.21% and 14.42% respectively for both districts.

7.4.5. Problems affecting sustainable livelihood of the farmers.

The most severe problem effecting livelihood of the farmers in Mokokchung district. The financial problem is ranked I followed by Infrastructural, Human, Institutional, Social, Marketing and Production. Similarly for Zunheboto, The financial problem is ranked I followed by human Infrastructural, institutional, social, marketing, natural and Production problems respectively.

7.5. POLICY SUGGESTIONS

7.5.1. Increase in Forest Conservation and Investment on Land

Forest conservation is found to be positively significant at 1 %, to farmer's livelihood. The results suggest that, as forest conservation increases, the agricultural production is likely to increase. These results mean that the more initiative taken for forest conservation the more likely increase in agricultural production which will provide favourable atmosphere for agricultural products. Given the results, it can be stated that as the forest conservation increase, the increase in farmers livelihood based on agriculture is predicted.

There is no problem in access to land for all farmers. But the land has not been utilized to its maximum potential. There are no restrictions imposed on farmers but due to lack of scarcity of labor, finances etc the farmers have reduced the size of land over the last five years. The investment on land is negatively insignificant suggests that investment does not have any impact on the current livelihood practices but changes can happen if the increase in investment on land is made to improve farmers livelihood. If no corrective measures are taken on time for conservation of forest and investment on land then it will have adverse impact on agriculture sustainability in future.

7.5.2. Development of Health Facilities

Farmers are not satisfied with the health centre provided in their village for which they go to town for health related problem which is costly. It was found only 25% and 24.24% from Mokokchung and Zunheboto districts are satisfied with the health facilities provided.The farmers health problems which effect their livelihood adversely but neither medical facilities are immediately available to the farmers. The farmers have to sspend their hard money and have to go to hospital in town which is quite expensive. Hence, health care facilities in the village should improve and made efficient lack of which adversely effects farmers sustainability.

7.5.3. Training for skill Development.

Human capital is found as the one of the most undeveloped assets. The farmers feel that no change has taken place for improving human capital. Traditional skills have lost its importance. There is barely any training organized for skill development of the farmers. A few training was given by KVK, ATMA etc, to farmers but due to lack of financial assistance it did not make much impact on promotion of livelihood. Hardly few of them benefited from it. The livelihood skills like traditional basket, carpenters, bee keeping, weaving, poultry, piggery diary, local pickle making etc were found among the farmers but hardly there are any success stories.

Thus, the skills of the rural farmers should be developed and utilised with full potential by motivating them through required training and support from various Stakeholders whether government or village organisation in order to pursue different livelihood strategies and achieve livelihood objectives.

7.5.4. Investment on Irrigation

The agricultural productions for both districts depend on monsoonal rain. But it is a challenge to achieve self sufficiency in production in the wake of monsoon uncertainty. Lack of irrigation facility hampers agricultural growth as according to farmers. Proper development of canal, tank, well .etc will not only enhance growth but also enable to cultivation crops during the off season, instead of simply staying idle at home. The investment on irrigation would certainly improve farmers' livelihood.

7.5.5. Proper Marketing facilities and infrastructure

The farmers who earn their livelihood with agricultural income alone are unsustainable for both the districts as it is difficult to sustain their livelihood without additional source of income. The farmers felt that by switching over to vegetable crops generate additional

income and helps in improving their livelihood. However in the process, they were unable to sell their entire produce due to severe market constraints, for which reason their income could not be increased as expected. Farmers could not sell their products due to lack of market infrastructure, proper transportation, storage facilities etc. Thus, reducing the post harvest lost with good storage facilities, proper transportation facilities and market infrastructure will be a sustainable solution for the farmers' livelihood in future.

7.5.6. Investment in veterinary service and animal disease surveillance

Supplementary livelihood activities are vital strategy for sustaining farmers livelihood living in rural areas of Nagaland where agriculture remain underdeveloped. In order to sustain their livelihood, farmers diversify their Livelihood activities for additional source of income. In order to cope with the increasing expenditure, the farmers had increased their economic activities by increasing in animal sale. Most of the Household in Mokokchung and Zunhebtoto are engaged in Animal Sale which is 79.3% and and 79.8% respectively.

Livestock contribute to the value of agricultural output and support livelihood of farmers. Hence, investing in veterinary service and animal disease surveillance will help improve animal health leading to sustainable livelihood.

7.5.7. Empowerment and strengthening of Self Help Group

The Self Help Group is the fastest growing institution and the most happening development which focussed on the living conditions of the farmer's households which is meant exclusively for the women folks in the village.SHG are engaged in various kinds of livelihood activities like weaving, piggery, making of pickle, making of detergent powder etc to name few. Many of the SHG are successfully operating and they even have started giving loan not only among themselves but also to the other who are in need of financial help. One of the reason women folks show keen interest in SHG is that, they are getting timely financial help with low interest rate in time of emergency situation arising for education ,health problems etc.SHG seeks to improve livelihood security through a number of activities as the very purpose of SHG is the empowerment of the poor which really help the farmers in emergency credit needs. Therefore, SHG need to be promoted as it strengthened farmer's livelihood.

7.5.9. Strengthens institutional support system

There are many constraints and the grievances of the farmers involved in terms of institutional support for agricultural development to the farmers community. Strong institutional support system not only increases the production and income of farmers but also ensures stability for a sustainable livelihood. One of the major constraints found with the farmers is lack of appropriate information or knowledge of market. The farmers produce without the working of supply and demand in market that many times that either there is excess supply or excess demand. Moreover,The farmers should be made aware of the Centre/state/policies so that they can actively participate and update themselves and benefit various schemes meant for their growth and developments and have an advantage of receiving important information, guidance and support. Some of the problems which needs strong institutional support supplyy of improved seeds, implementation of modern techniques of production, proper market infrastructure, regular supply to ration card beneficiaries, extension service etc which is necessary to assist farmers in order to increase productivity,effeciency and income for sustainable agriculture. Strong institutional support system not only increases the production and income of farmers but also ensures stability for a sustainable livelihood

7.6. CONCLUSION

Since pure agricultural household constitutes 71.21% for Mokokchung and 78.85% for Zunheboto, agriculture is the major source of livelihood for majority of the farmers. A single livelihood activity alone cannot sustain farmers livelihood either its for full-time or part-time agricultural households. The farming households in both the districts are found to be vulnerable; however Zunheboto exhibits a greater LVI than Mokokchung. Institutions like department of agriculture and allied departments, VDB/VC, SHG and other NGOs play an important role in improving in livelihood diversifying of the farmers. Here, the finding of the study reveals a medium level of institution support. Hence, more effort should be taken by the institution for support of rural households. Agriculture is also a major source of supply of food for fodder, marketable surplus, and employment opportunities for labour force, food security and source of saving. Proper measures and policy must be adopted to make agriculture more remunerative through Increase in forest conservation, investment on land,

development of health facilities, training for skill development, proper marketing facilities, investment on irrigation, investment in veterinary service and animal disease surveillance, empowerment and strengthening of self help group for ensuring sustainable livelihood opportunity to the rural people. Proper steps must also be undertaken for improvement of capital assets and institutional support system for sustainable agriculture.

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