IMPLICATION OF CONTRACT FARMING ON LIVELIHOOD WITH REFERENCE TO OIL PALM PLANTATION IN MIZORAM

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

LALHERLIANA SAILO

MZU REGISTRATION NO.: 15 OF 2009-10

Ph.D. REGISTRATION NO: MZU/Ph. D./860 of 13.04.2016

DEPARTMENT OF GEOGRAPHY AND RESOURCE MANAGEMENT

SCHOOL OF EARTH SCIENCES AND NATURAL RESOURCES MANAGEMENT

APRIL, 2023

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BY

LALHERLIANA SAILO

DEPARTMENT OF GEOGRAPHY AND RESOURCE MANAGEMENT

SUPERVISOR

PROF. P. RINAWMA

JOINT SUPERVISOR

PROF. BENJAMIN L. SAITLUANGA

SUBMITTED

IN PARTIAL FULFILLMENT OF THE REQUIREMENT OF THE DEGREE OF DOCTOR OF PHILOSOPHY IN GEOGRAPHY OF MIZORAM UNIVERSITY, AIZAWL.

DEPARTMENT OF GEOGRAPHY AND RESOURCE MANAGEMENT
MIZORAM UNIVERSITY, AIZAWL - 796004

Benjamin L. Saitluanga

Post Box No. 190
Gram : MZU

Phone : 0389-2331604(O)
: 0389-2331613(O)
Mobile : 9856537375
Email : bena.sailo@gmail.com

CERTIFICATE

This is to certify that Lalherliana Sailo, registered under MZU/Ph.D./860 of 13.04.2016 of is a research scholar working under my supervision on a thesis entitled 'Implication of Contract Farming on Livelihood with reference to Oil Palm Plantation in Mizoram'.

All through his research pursuance, I found Lalherliana Sailo very serious, hardworking and dedicated. He could challenge his tasks with quality of scholarship and was able to carry out his assignment successfully.

I further certified that the thesis in this form is the report of the research scholar's original work. Certain extracts and quotes are duly referred to in an appropriate manner.

I recommend the thesis for due evaluation and recommendation.

Dated:

(Prof. P. RINAWMA)
Supervisor

(Prof. BENJAMIN L. SAITLUANGA)

Joint Supervisor

DEPARTMENT OF GEOGRAPHY & RESOURCE MANAGEMENT

MIZORAM UNIVERSITY, AIZAWL

April, 2023

DECLARATION

I Lalherliana Sailo, hereby declare that the subject matter of this thesis is the record of work done by me, that the contents of this thesis did not form basis of the award of any previous degree to me or to do the best of my knowledge to anybody else, and thatthe thesis has not been submitted by me for any research degree in any other University/Institute.

This is being submitted to the Mizoram University for the degree of Doctor of Philosophy in Geography.

(LALHERLIANA SAILO)
Candidate

(PROF. CH. UDAYA BHASKARA RAO)
Head

(PROF. P. RINAWMA)
Supervisor

(PROF. BENJAMIN L. SAITLUANGA)
Joint Supervisor

Acknowledgement

First and foremost, I thank to Almighty God for his countless blessings upon me to be present in the Ph.D. course and complete the Thesis.

My indebted gratitude goes out to my supervisor, Prof. Benjamin L.Saitluanga, Prof. P Rinawma, Department of Geography and Resource Management, Mizoram University, Aizawl, Mizoram and Rinpuia Vangchhia, for their unlimited encouragement and guidance throughout my research. They are my source of inspiration and motivation in completing this work.

I also thank all the faculty members and non-teaching staff at Department of Geography and Resource Management, Mizoram University, for their guidance throughout my work.

I am highly indebted to and all other people for their precious help and their suggestions.

I would also like to thanks to my family and friends, who provided me with support and patients during my studies. Without their love, help and encouragement, this work would never been completed.

(LALHERLIANA SAILO)

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CHAPTER 1
INTRODUCTION

1.1 Introduction:

Contract farming can be defined as an agreement between farmers and processing and/or marketing firms for the production and supply of agricultural products under forward agreements, frequently at predetermined prices (Jackson & Cheater, 1994). The arrangement also invariably involves the purchaser in providing a degree of production support through, for example, the supply of inputs and the provision of technical advice. The basis of such arrangements is a commitment on the part of the farmer to provide a specific commodity in quantities and at quality standards determined by the purchaser and a commitment on the part of the company to support the farmer's production and to purchase the commodity.

In an age of market liberalization, globalization and expanding agribusiness, there is a danger that small-scale farmers will find difficulty in fully participating in the market economy (Jackson & Cheater, 1994). Agribusiness firms, besides providing resources for productive investment, can benefit the locals in employment, technology transfer, and incremental technical knowledge, especially at the farmers' level. But, agribusiness firms in general, and multinational companies in particular, may not promote larger national objectives like employment generation, equity, and balanced regional growth as they are driven by business goals alone. They tamper with the local production structures in order to tailor the agricultural production to their needs, thus generating a process of dependence of producers on these corporations.

The oil palm (Elaeis guineensis) originated from West Africa, where evidence of its use as a staple food crop dates as far back as 5,000 years. There is even evidence in Egyptian tombs of people being buried with casks of palm oil, reflecting the high societal value attributed to the product. While palm oil was ubiquitous in West Africa, the use of palm oil in the international market expanded significantly as a result of the Industrial Revolution and the expansion of overseas trade. From candle-making to industrial lubricants, palm oil was a driving force behind the expansion of industrial production, while nutrient rich red palm oil became a vital asset on long sea-faring voyages. With the increasing demand,

Europeans began investing in palm oil production, first in West Africa and then expanding to Southeast Asia. A combination of European settlers and entrepreneurs, seeing the opportunity for commercial palm oil production to produce soaps, lubricants and edible oils lead to a dramatic expansion of oil palm plantations throughout Sub-Saharan Africa and Southeast Asia. The first commercial scale plantation in Malaysia was founded in 1917 and established in Tennamaran Estate in Selangor.

Presently, palm oil has penetrated global markets (including food, toiletries, cleaning products, and biofuel) because it is efficient (in terms of the amount of land required), versatile, and relatively cheap compared to other vegetable oils. It has been described as a 'golden crop', lifting many poor farmers from poverty.

Palm oil is currently the world's most consumed vegetable oil, with its main consumers being India, China, and European Union (EU) (United Nations Environment Programme, 2011). Besides food, palm oil is widely used in other commodities such as detergents, plastics, cosmetics, and biofuels (Basiron, 2007). Thus, profits from palm oil have attracted many industrial-scale palm oil producing companies, both regional and international (Carrere, 2013).

Under special government programme such as the Oil Palm Area Expansion (OPAE) between 2011 and 2014 and National Mission on Oilseeds and Oil Palm (NMOOP) since 2014, India has been aggressively pushing for increased domestic cultivation of oil palm (NMOOP, 2014). However, India is home to two global biodiversity hotspots (Myers *et al.* 2000), and only 4.90 percent of its entire land is under protected area status (Ministry of Environment, Forest and Climate Change [MoEFCC], 2018). These sensitive areas, especially in the northeastern states are under increased threat from unguided oil palm expansion, due to the lack of robust studies on the feasibility of oil palm plantations and potential threats to the biodiversity and livelihoods of indigenous communities in this region. Moreover, substantial amounts of land in the northeastern states are community owned and managed. But, because of oil palm expansion, states such as Mizoram have instituted New Land Use Policies with a focus to replace traditional shifting cultivation with settled agriculture. This has resulted in social unrest with communities opposing the

proposed New Land Use Policies in Manipur, stating that it is harmful for their ecologically sustainable traditional land-use management systems (Nagalimvoice, 2014). Similarly, conservation scientists working in Arunachal Pradesh have also cautioned against oil palm establishment in the state (Srinivasan, 2014, 2016; Velho et al., 2016), highlighting deficiencies in the governments' oil palm policies, such as lack of sufficient dialogue with stakeholders, low transparency with the policies, biased experimental studies, and non-evidence based actions (Nyori, 2016; Velho et al., 2016).

In Mizoram, oil palm plantations started in 2004 and practicing in 7 districts of the state such as Aizawl, Kolasib, Mamit, Serchhip, Lunglei, Lawngtlai and Siaha. Area and Production are increasing during the starting period whereas it is a decline in the recent years. It is observed that oil palm is beneficial for only big and already settled farmers but not fruitfully beneficial for small/marginal farmers to their livelihood (Vangchhia & Sati, 2017). Many farmers want an abandoned plantation of oil palm due to many factors. Currently, the study of livelihood development from oil palm production is highly important. The present study attempts to analyses growth and development of oil palm plantation in Mizoram and its implications on livelihood of oil palm farmers and problems and prospect of oil palm plantation in Mizoram.

1.2 Area of Oil Palm Plantation Owned by Farmer

Majorities of the oil palm farmer in the study area own land less than 1 hectare of land which is being used for oil palm cultivation and most of them belong to farmer's organizations. These lands for oil palm cultivation were acquired in different ways like purchase, lease in, inheritance and pledge. The capitals required for oil palm cultivation was mainly financed by using their private savings. As shown in Table 6.2 the total 56.88 percent of the total household owned less than 1 hectare of land which is used for O il palm plantation. The total number of households having 1 to 2 hectare of land are 35.18 percent. The households practicing oil palm plantation with a wider area is still less where percentage of household have owned 2 to 3 hectare of land and more than 3 hectare of land is 6.2 and 1.74 percent respectively. The total number of household own more than 3

hectare of oil palm plantation area is highest in Aizawl district where (4.2%) followed by Lunglei district (2.74%), Lawngtlai district (2.55%) and Mamit district (2.03%), Kolasib district (0.62%). There are no households having more than 3 hectares of land in Siaha and Serchhip districts. Based on classification made by Press Information Bureau, Government of India, Ministry of Agriculture & Farmers Welfare, more than half of the total oil palm farmers in the study area are marginal farmers (56.88%), small farmers (35.18%) and semi-medium (7.94%).

Table 1.1
Households and Own Land Oil Palm Plantation Area (in %)

District	> 1 Hectare	1 - 2 Hectares	2 - 3 Hectares	< 3 Hectares
Aizawl	70.59	17.65	7.56	4.20
Lawngtlai	42.49	38.24	16.71	2.55
Mamit	19.19	69.89	8.89	2.03
Siaha	34.88	62.79	2.33	0.00
Serchhip	93.12	6.88	0.00	0.00
Kolasib	69.89	23.40	6.08	0.62
Lunglei	68.01	27.42	1.83	2.74
Average	**56.88**	**35.18**	**6.20**	**1.74**

Source: Field survey 2018-2019

1.3 Number of Oil Palm Planted by Household

The total number of oil palm planted by the farmers in the study area is classified in to 4 such as 0-100, 100-200, 200-300 and more than 300 seedlings. Majority of the oil palm (40.85%) plating less than 100 oil palm which is followed by 100-200 (33.75%), 200-300 (20.45%) and more than 300 comprising 4.94 per cent of the total farmers. The farmers planting more than 300 number of oil palm is highest in Aizawl district accounting 10.08 percent of the total selected households whereas there is no oil palm farmer growing more than 300 oil palm trees in Siaha and Serchhip districts. More than half of the total households growing less than 100 number of oil palm trees in Serchhip, Kolasib and Lunglei district. Most of the households in Lawngtlai district grow 100-200 number of oil palm. Half of the total households grow 200-300 number of oil palm in Mamit district. Generally, the

farmers who early started the plantation grow a higher number of oil pam and vice versa as shown in table 1.2.

Table 1.2
Number of Oil Palm Planted by Households in %

District	0-100	100-200	200-300	More than 300
Aizawl	36.97	35.29	17.65	10.08
Lawngtlai	28.61	56.66	13.60	1.13
Mamit	17.47	24.02	50.39	8.11
Siaha	30.23	23.26	46.51	0.00
Serchhip	60.74	36.10	3.15	0.00
Kolasib	57.10	28.39	7.49	7.02
Lunglei	54.84	32.54	4.39	8.23
Average	**40.85**	**33.75**	**20.45**	**4.94**

Source: Field survey 2018-2019

There are currently a number of organizations and initiatives that are trying to increase the sustainability of palm oil production, to ensure that this product is profitable now, and in the future, without devastating the natural environment.

In Mizoram, oil palm plantations started in 2004 and still practicing in 7 districts of the state such as Aizawl, Kolasib, Mamit, Serchhip, Lunglei, Lawngtlai and Siaha. Area and production are increasing during the starting period whereas it is a decline in the recent years. It is observed that oil palm is beneficial for only big and already settled farmers but not fruitfully beneficial for small/marginal farmers to their livelihood (Vangchhia & Sati, 2017). Many farmers want an abandoned plantation of oil palm due to many factors. Currently, the study of livelihood development from oil palm production is highly important. The present study attempts to analyses Growth and development of oil palm plantation in Mizoram, livelihood of oil palm farmers, implications of oil palm production (OPP) on the livelihoods of oil palm farmers, problems and prospect of oil palm plantation in Mizoram.

1.4 Scope of the Study

The rapid increase of land degradation due to Jhumming, deforestation, loss of biodiversity and productivity are leading to an ecological crisis affecting livelihood options for Jhumia families. This suggests inter-alia policy to encourage and support plantation of Oil Palm to overcome these constraints. Oil Palm stands as an ideal crop capable of achieving conservation of soil and moisture, repair of degraded land, provide ecological balance, food and security of rural and urban poor. The Government of Mizoram aims to implement and action programme with an objective of placing Oil Palm as a key component in the plan to generate employment and mitigate environmental degradation and to strengthen the process of Oil Palm Development**.**

The study of contract farming on Oil palm plantation will help policy makers and other stakeholder. So the topic is chosen to study the helpfulness of contract farming in solving the problems of input supplies, marketing of produce income increasing product etc.

1.5 Objectives:

The main objectives of the study are:

1. To highlight the Status of Oil Palm Plantation in Mizoram
2. To study Spatial- temporal change of Oil Palm Plantation in Mizoram
3. To analyse the Impact of Oil Palm Production on Livelihood in Mizoram
4. To examine the Problems and Prospects of Oil Palm Plantation in Mizoram

1.6 The Study Area

The study covers seven districts of Mizoram as per 2011 Census where oil palm plantation is practised such as Aizawl, Lawngtlai, Mamit, Siaha, Serchhip, Lunglei and Kolasib districts. Champhai District is not included as they do not practice Oil Palm plantation. During the study period i.e., 2018-2019, the total 10843 farmers are practicing Oil Palm plantation. Mamit district got the higest number of Oil palm farmer i.e. 3042 followed by Kolasib (2155), Lawngtlai (2007), Lunglei (1803), Serchhip (1390), Aizawl (403) and Siaha (43). The study covers 184 villages

from seven districts comprising 2693 household/ Oil palm farmers. The total Oil Palm plantation area is 2261.52 Hectares.

The state is increasingly promoting oil palm plantation in these districts with multiple aims of generating jobs, benefiting farmers and attracting edible oil makers. It has earmarked 1, 33,000 hectares of land in Mizoram for oil palm plantation as the region's climatic and geographical conditions are suitable for its growth.

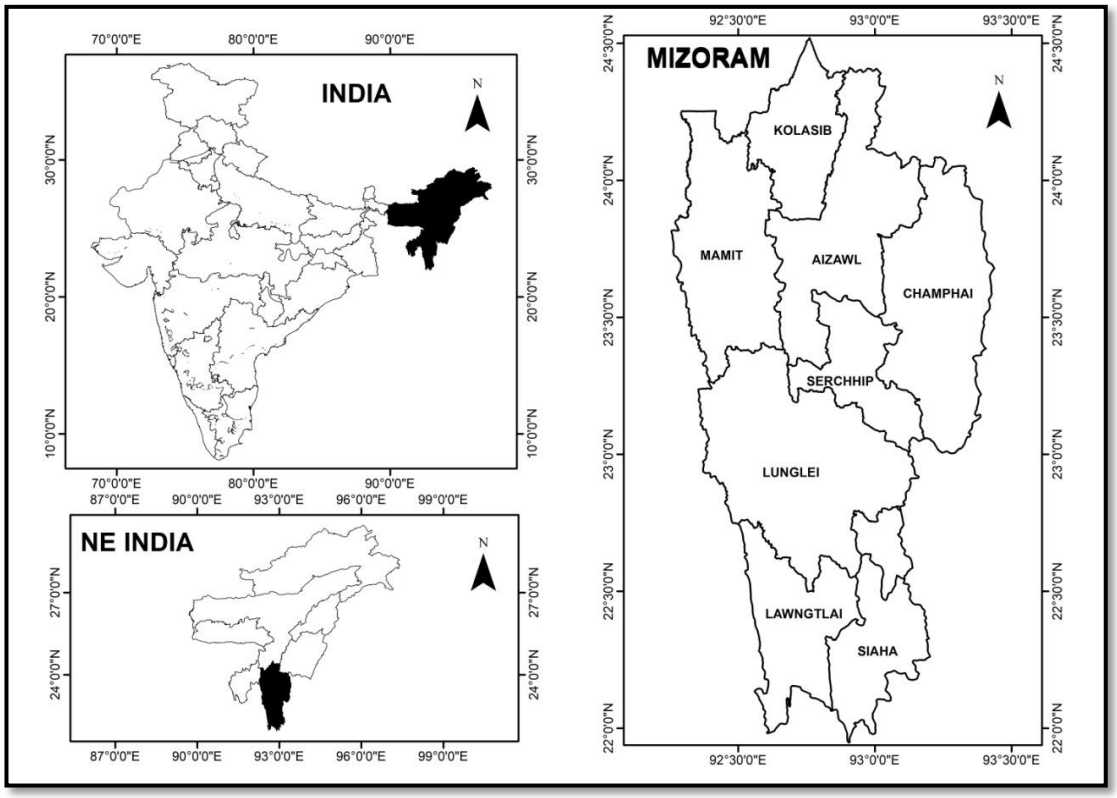

Figure 1.1 Location map of the study area

1.7 Methodology

Methodology of the present study includes selection of the study area, preparation of scheduled, sampling design and sample size, collection of data, data processing viz., data entry, tabulation, analyze and interpretation with application of statistical techniques and graphical works. The study was mainly based on primary data collected by author during the year 2018-2019.

1.7.1 Selection of Study Area

Since the main intention of the present study implication of oil palm plantation on rural livelihood of Mizoram, the study covers all the district of

Mizoram where oil palm cultivation is practicing such as Aizawl, Lawngtlai, Mamit, Siaha, Serchhip, Kolasib and Lunglei.

1.7.2 Sampling and Sample Size

The study is based on both primary and secondary data. Applying the sampling method given by Yamane (1967), 2693 oil palm farmers were selected from 184 villages covering 28.4 percent of the total oil palm farmers of Mizoram by purposive random sampling techniques**.** The Primary data has been collected from seven districts by sampling method as under.

The required sample size is determined with the help of the following formulae given by Yamane (1967).

$$\mathbf{n = \frac{N}{1 + N\,(e)^2} = \frac{10843}{1 + 10843\,(0.05)^2} = 387.25}$$

Where n is the sample size, N is the population size and e is the level of precision with 95 percent confidence level.

The estimated sample size is 387 for the entire state of Mizoram. By taking districts as strata, the total sample size will be divided among the seven districts with 'Disproportionate Stratified Sampling Method'. In the end, the following number of the sample was collected from each seven district.

Each district is proportionately stratified again on the basis of RD block by following the same procedure and, household survey has been done from the selected villages. Selection of villages from each RD block will be ascertained after obtaining data on the number of oil palm planters from the villages.

The secondary data are collected from Department of Agriculture Mizoram and the three companies Godrej Agroved Ltd., Ruchi Soya Industries Ltd. And 3F Oil Palm Agrotech Pvt Ltd. for oil palm development in Mizoram. High Resolution Satellite images were used to identify the potential areas of oil palm plantation.

Table 1.3
Sample Size for primary data collection

Districts	No. of Beneficiaries	Samples	
		Number	Percentage
Aizawl	403	119	29.53
Lawngtlai	2007	353	17.59
Mamit	3042	641	21.07
Siaha	43	43	100
Serchhip	1390	349	25.11
Lunglei	1803	547	30.34
Kolasib	2155	641	29.74
Total	**10843**	**2693**	**24.84**

1.7.3 Data Collection

Data collection was been done during the year 2018-2019. Before conducting case study, a pilot survey was undertaken first to select the villages and appropriate variables to be included in the study. Those variables which have no relationship were excluded from further analysis. Thereafter, a structured scheduled was framed and face to face interviewed were conducted. Household surveys were done in each village during the said period. Oil palm plantation area were also visited as much as possible in the villages.

1.7.4 Data Analysis

Statistical techniques like Z score standardize techniques, Principal Component Analysis (PCA), Factor Analysis (FA) and Pearson's coefficient of correlation statistics were applied to analyze the collected data.

(1) Z-Score

A Z-score standardized technique was used for normalization of the raw data and to find out the composite index. Data collected from primary and secondary sources were transformed into variables to be used as indicators. To transform data matrix into scale free matrix, indicators were standardized by subtracting the mean from each individual variables and divided by their standard deviation, as the following formula:

$Zi = (Xij - Xj)/SDj$

Where,

Zi is the Z-score for the i^{th} unit

Xij is the X variable in the i^{th} unit and j^{th} variable

Xj is the mean of j^{th} variable and,

SDj is the standard deviation of the j^{th} variable

After obtaining Z-score for every indicator, composite score was obtained by adding up of all individual Z-score or standard data as-

$Ci = \sum Z$

Where, Ci is the composite scores and $\sum Z$ is the summation of Z-scores

(2) Principal Component Analysis (PCA)

Principal Component Analysis and Factor Analysis are dominant multivariate statistical techniques. The main reasons of using PCA and FA is to reduce a large number of variables in to a smaller number of factors, to clearly describe the relationships among observed variables. They are the techniques of data reduction methods that drive a composite, smaller set of variables. Then each of the factors or components may be thought as 'supervariable' (Tabachnick and Fidell, 2013).

According to Knox and Pinch (2010), the most chosen statistical techniques for measuring spatial differentiation are PCA and FA. At one side, PCA is a preferred method for data reduction and FA is more appropriate for detecting structure on other (Krishnan, 2010). Use of FA is very helpful in a theoretical solution without error variability or without a unique mathematical solution (Tabanick and Fidell, 2013)

In principal component analysis (PCA), an original set of variables is transformed into a smaller new set of orthogonal (uncorrelated) variable called principal components. The components are linear combinations of variables with weights in terms of their eigenvectors. These eigenvectors are derived from the correlation matrix of the variables. Thus each principal component is a linear combination of Z's obtained as

$$Z_1 = \alpha_{11}\varkappa_1 + \alpha_{12}\varkappa_2 + \ldots + \alpha_{1q}\varkappa_q$$

$$Z_2 = \alpha_{21}\varkappa_1 + \alpha_{22}\varkappa_2 + \ldots + \alpha_{2q}\varkappa_q$$

…

$Zq = \alpha_{q1}\varkappa_1 + \alpha_{q\,2}\varkappa_2 + ... + \alpha_{2\,qq}\varkappa_{qm}$

Where $\varkappa_{1,}\ \varkappa_{2,.....}\ \varkappa_q$ are the variables or indicators, *q* the number of variables and Z_i (*i*= 1,…., *q*) represents the principal components. a_{ij} are the component loadings which are chosen as weights applied to the variables x_j in the above equation so that the principal component Z_i satisfies the following conditions:

i. They are uncorrelated also called as orthogonal

ii. The first component is accounting for maximum possible proportion of the variance of the set of $x_{s,}$ while the second component includes maximum of the remaining variance, and so on until the last of the principal components absorbs all the remaining variance not accounted for by the preceding components, as-

$a^2_{i1} + a^2_{i2} \ldots + a^2_{iq} = 1$

where $i = 1,2,\ldots.q$.

PCA involves finding of the eigenvalues λj, where j=1, 2,…. q.of the sample covariance matrix (CM) as-

$$CM = \begin{matrix} cm_{11} & cm_{12} \ldots cm\ 1_q \\ cm_{21} & cm_{22} \ldots cm\ 2_q \\ \ldots & \\ Cm_{q1} & cm_{q\,2} \ldots cm_{qq} \end{matrix}$$

Where,

The diagonal element cm_{ij} is the variance of x_i and cm_{ij} is the covariance of variables xi and x_{ij}. The eigenvalues of the matrix CM are the variances of the principal components and can be found by solving the characteristics equations where *I* is the identity matrix and λ is the vectors of eigenvalues.

One of the important properties of the eigenvalues is that they add up to the sum of the diagonal elements of CM. that is, the sum of the variances of the principal components is equal to the sum of the variances of the original variables. Such as-

$\lambda_1 + \lambda_2 + \ldots + \lambda_q = cm_{11} + cm_{22} \ldots cm_{qq}$

All the variables are standardized first to have zero means and unit variances at the start of the analysis to prevent some variables having undue influences on the

principal components. Then covariance matrix CM takes the form of the correlation matrix. The correlation matrix rather than the covariance matrix is used in PCA that all individual indicators are given equal weights in forming the principal components (Chatfield and Collins, 1980).

(3) Factor Analysis

Factor analysis (FA) and PCA are similar in terms of procedure and constructions. However, PCA is based on linear data combinations, while FA model assumes that the data are based on the underlying factors of the model and that the data variance can be decomposed into that accounted for by common and unique factors.

The mathematical equation for calculation in FA is given as (OECD, 2008)

$$X_1 = \alpha_{11} F_1 + \alpha_{12} F_2 + ... + \alpha_{1m} F_m + e_1$$

$$X_2 = \alpha_{21} F_1 + \alpha_{22} F_2 + ... + \alpha_{2m} F_m + e_2$$

…

$$Xq = \alpha_{q1} F_1 + \alpha_{q2} F_2 + ... + \alpha_{qm} F_m + e_q$$

Where X_i (i=1,…q) represents the original variables but standardized with zero mean and unit variance; α_{i1}, α_{i2},…, α_{im} are the factor loadings related to the variable X_i; F_1, F_2,…,F_m are m uncorrelated common factors, each with zero mean and unit variance; and e_i are the q factors supposed independently and identically distributed with zero mean.

(4) Steps in Factor Analysis

There are three basic steps in FA including PCA (Ho, 2014) such as computation of the correlation matrix for all variables, extraction of initial factors, and rotation of the extracted factors to terminal solution.

(i) Computation of correlation matrix

Factor analysis (FA) is based on correlation between measured variables. Extreme multicollinearity is not permitted to conduct FA because this would result problems in determining the unique contribution of the variables to a factor (Field, 2000). According to Hutcheson and Sofroniou (1999) Kaiser-

Meyer-Olkin (KMO) measure of sampling adequacy is a statistics for comparing the magnitudes of the observed correlation coefficients.

The KMO statistic is computed for every individual indicator, and their total is the KMO overall statistic. The range of KMO value varies from 0 to 1 and overall should be 0.60 or higher to proceed with factor analysis (Kaiser and Rice, 1974). Malticollinearity can also be identified via the determinant of the correlation matrix. If the determinant is greater than 0.00001, then there is no multicollinearity (Field, 2000).

The Kaiser-Mayer-Olkin measure of sample adequacy is

$$KMO_j = \frac{\sum_{i \neq j} r_{ij}^2}{\sum_{i \neq j} r_{ij}^2 + \sum_{i \neq j} a_{ij}^{2*}} \quad KMO = \frac{\sum_{i \neq j} \Sigma r_{ij}^2}{\sum_{i \neq j} \Sigma r_{ij}^2 + \sum_{i \neq j} \Sigma a_{ij}^{2*}}$$

where a_{ij}^* is the anti-image correlation coefficient.

r_{ij} is the correlation coefficient of variable *i* and variable *j*, Then presumably r_{ij} must be the original correlations between *i* and *j*.

Saitluanga (2017) discussed about Barlett's test of sphericity is used to test the null hypothesis that the individual indicators in a correlation matrix are uncorrelated, i.e., that the correlation matrix is an identity matrix. The statistic is based on a chi-squared transformation of the determinant of the correlation matrix

(ii) Extraction of factors

Extraction of factors (or components in case of PCA) is the second step in FA which is simply aggregates of correlated variables. Tabachnick and Fidell (2013) mentioned that to be labeled something as a factor it should have minimum 3 variables. A factor with 2 variables is only considered dependable when there is a high correlation between variables (R =0.70) but fairly uncorrelated with other variables (Young and Pearce, 2013). These factor loadings were coefficients of correlation which indicate the relationship between the original variables and the newly derived factors. We can also say that they measure the degree of contribution to the meaning of each new

factor by each original variable in the data set. In this case, a factor loading of 0.812 could be interpreted as being 82.1 per cent correlated positively with the factor.

There are different methods for extraction of the factors or components. Selection of extraction methods depends on nature of research undertaken. There are two basic methods for obtaining factor solution in Principal Component Analysis (PCA). There are six methods of extraction under common factor analysis model such as principal axis factoring, un-weighted least squares, generalized least squares, maximum likelihood, alpha factoring and image factoring. However principal axis solution (or Principal axis factoring) and PCA are the two most common extraction methods in geography (Clark et al., 1974).

For the present study, PCA was used to determine composite index of socio economic, food security, nutritional status and reproductive healthcare status. As Ho (2014) mentioned that PCA is suggested when the purpose of the study is no more than to reduce data in order to obtain the minimum number of factors needed to represent the original set of data. This method is chosen to other methods for construction of composite index of various dimensions of indicators components as all the variances in the observed variables are analyzed.

On the other hand, factor analysis, particularly Principal Axis Factor (PAF) method was also employed in the present study. As Tucker and Mac Callum (1997) mentioned PAF method was based on the notion that all variables belong to the first group and when the factor is extracted, a residual matrix is calculated. Factors are then extracted continuously until there is a large enough of variance accounted for in the correlation matrix

(iii) Determination of number of factors

The eigenvalue criterion and scree test criterion are the two conventional criteria for determining the number of initial un-rotated factors which is to be extracted. The eigenvalue criterion also called Kaiser's criterion suggest

retaining all factors which are above the eigenvalue of 1 (Kaiser, 1970). Then this scree test rule is based on a visual plot of the eigenvalue against the number of factors in their order of extraction. In this scree test, factors located above the break (i.e., point of infection) are retained. Parallel analysis is also recommended to extract reliable number of factors (Zwick and Velicer 1986, Streiner, 1998 & O'Connor, 2000). The eigenvalues derived from the actual data are compared to the eigenvalues derived from the random data sets in parallel analysis. Factors are retained as long as the i^{th} eigenvalues from the actual data is greater than the *i*th eigenvalue from the random data. Hence Kaiser's rule was followed for the present analysis.

(iv) Methods of Rotation

Since un-rotated factors are ambiguous factors are rotated for better interpretation. The main used of rotation is to attain a simple optimal structure which attempts to have each variable load on as factors as possible, but maximizes the number of high loadings on each variable (Rummel, 1970).

According to Rummel (1970) the most commonly used methods in factorial ecology as orthogonal rotation is when the factors are rotated 90^0 from each other, and it is assumed that the factors are uncorrelated. On the other hand, Giggs and Mather (1975), Constello and Osborne (2005) explained that oblique rotation is when the factors are not rotated 90^0 from each other, and the factors are considered is however, inconclusive.

The selection between orthogonal and oblique rotations depends on the purpose the study. 'If the goal of the research is no more than to 'reduce the data' to more manageability proportions, regardless of how meaningful the resulting factors may be, and if there is reason to assume that the factors are uncorrelated, then orthogonal rotation must be used. Conversely, oblique rotation is appropriate' if the goal of the research is to discover theoretically meaningful factors, and if there are theoretical reasons to assume that the factors will be correlated (Ho, 2014), Hence, one orthogonal rotation method 'varimax' was used in PCA, and 'direct oblimin' which is an oblique rotation

method was adopted in factor analysis in the present study.

1.7.5 Construction of Weights Using principal Component Analysis

To obtain the weight and aggregate variables in a composite index PCA and FA can be used. These methods are useful because they require no a priori assumptions on the weights of the different dimensions.

In the present case one of the main objectives was to construct a composite index of the socio-economics, food security, nutritional status, reproductive healthcare and infant mortality rate. PCA was useful as it is weighting technique in the development of composite indices as it has the virtue of simplicity and allows for weights representing the information content of individual indicators (OECD, 2008). Thus PCA and FA are the most commonly used multivariate statistical techniques used in the weighting of composite indices (Booysen, 2002).

By the way of Greyling (2013) and OCED (2008), a novel method developed by Nicoletti et al., (2000) has been applied here as it is a weighting technique. This technique considers the factor loadings of the entire extracted components to weigh a composite index. One of the significance of this method is that higher proportion of the variance in the data set is explained (Greyling, 2013).

In this case Nicoletti et al., (2000) discuss the approach as follows:

1. Firstly, make a group of the individual indicators with the highest factor loadings into intermediate composite indicators.
2. Secondly, the weight of each variable in the intermediate composite is derived by squaring the factor loadings of the variables and scaling it to unity sum within each intermediate composite index. The squared factor loadings signify the proportion of the total variance of the indicator which is explained by the component.
3. Thirdly, aggregated by assigning a weight to each of them equal to the proportion of the explained variance divided by total variance of each factor once the intermediate composite indices have been constructed. Then, weight score (W_i) is found by multiplying the variables weight is obtained which is rescaled again to sum up to one to preserve comparability.

4. Lastly, after obtaining the final weights, rank of each village council was obtained by the product of normalized variable and the final weight.

1.7.6 Correlation

Pearson coefficient of correlation was used to measure the relationship between selected variables. This technique is one of the most common methods in quantitative geography. It measures the degree and direction of relationship between two or more variables. The formula of correlation for *x* and *y* variable as follows:

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n(\sum x^2) - (\sum x)^2]\,[n(\sum y^2) - (\sum y)^2]}}$$

The value of correlation coefficient ranges between -1 and +1. A value of -1 refers to perfect negative correlation while a value of +1 refers to perfect positive correlation. If the value is 0, it implies no relationship.

1.7.7 Calculation of Composite Index

After obtaining weights of every indicator, the index value of all village councils have been worked out by the following formula is used to determine the Composite index score.

$$I = \sum_{j=1} Xi \left(\sum_{j=1} /Lij/.Ej \right) / \sum_{i} \left(\sum_{j=1} /Lij/.Ej \right)$$

Where *I* is the index, Xi is the i-th Indicator; Lij is the factor loading of the i-th variable on the j-th factor; E is the Eigen Value of the J-th factor.

1.7.8 Classification of the Village Councils

Natural break data classification developed by Jenks called Jenks natural break method or Jenks optimization method was adopted. The method partitions statistical data into classes using an algorithm which calculates groupings of data value based on the data distribution (Jenks 1967). The Jenks method is calculated using Arc GIS 10.1 software that automatically figures the natural breaks.

1.7.9 Construction of Maps

India map shape files or Vector Data have been downloaded from open sources like DIVA-GIS, IGISMAP, and Bhukosh Geological Survey of India. The study area and other Coropleth maps have been constructed by using Arc GIS 10.1. Other figures were also prepared through Statistical Package for Social Science (SPSS) and Microsoft excel, 2010.

1.7.10 The following are the limitations of the Study

1. District wise secondary data for year wise area, production and number of farmers involved are not available to obtained district wise development of oil palm plantation.
2. Some variables are difficult to interpret because they may load onto more than one factor which is known as split loadings. These variables may correlate with each other to produce a factor despite having little underlying meaning for the factor.
3. There was no proper village boundary in the study area. Since the study was village level, maps could not be prepared to show the result.

1.8 Organization of the thesis

The present study has been organized into seven chapters

The first chapter is an introduction to the study. It deals with the scope of the study, objectives, study area, review of literature, and organization of the chapters.

The second chapter is devoted to the methodology of the study including selection of the study area, preparation of the schedule, sampling design and sample size, collection of data, data processing, data analysis and interpretation.

The third chapter deals with oil palm plantations in Mizoram. It highlights the history of oil palm plantation, growth and changing pattern of area and production of oil palm in the state. It also includes district-wise areas of oil palm plantation, production and productivity of oil palm.

The fourth chapter analyses livelihood of oil palm farmer. It deals with household economy and livelihood standard of oil palm farmer.

The fifth chapter deals with the implication of oil palm plantations for livelihood in Mizoram. It pertains to income and households assets improvement due to oil palm production. Annual income and expenditure for oil palm plantation, profit earned improvement of house types and household assets were discussed.

The sixth chapter is problems and prospects of oil palm plantations in Mizoram. It deals with the current situation of oil palm plantations, factors influencing to start of the plantation, problems and prospects of oil palm plantation, and sustainable oil palm plantation among the farmer.

The seventh chapter is conclusion. It provides a conclusion summary of the findings and suggestions.

CHAPTER 2

REVIEW OF LITERATURES

Singh (2000) has conducted a study on Contract Farming. He focuses the role of contract farming in agricultural diversification and development in terms of its practice and implementations for the producer and the local economy in Punjab India. The study highlight role of contract farmers and the contracting companies in three different crops (tomatoes, potatoes and chilies).The main benefit of contact farming as perceived by contract farmers were better and reliable income, new and better skills, better soil management and outlet for bulk sales. The study also identified the faults of the contracting system both at company and farmer level.

Phil (2002) has published a paper "Smallholder Contract Farming in Developing Countries ". He focuses on smallholders' contract farming. Smallholders may enter contract to reduce transaction cost of accessing new markets, borrowing, managing risk, acquiring information or increasing employment opportunities. The success of contracts reflects both the contracting environment and management practices.

Dev (2002) had published a paper "Small Farmers in India: Challenges and Opportunities". He examines the roles and challenges of small holding agriculture in India. It covers trends in agricultural growth, cultivation patterns, participation of small holding agriculture, productivity performance of small holders, linking small holders with markets including value chains, role of small holders in enhancing food security and employment generation, differential policies and institutional support for small holders and, challenges and future options for small holding agriculture including information needs. It also provides lessons from the experience of India on small holding agriculture for other countries.

Singh (2003) has published a study on impact on women and child workers. The paper draws on case studies of hybrid cottonseed production in Andhra and vegetable farming in Punjab to examine the labor conditions in contract farming in India. He argues that agriculture is becoming increasingly 'feminised' as men move

out of the sector more quickly than women and as women become the perfect labor type for many employers. While these new labor arrangements have led to marginal increases in real income for some women workers and employers, workers and work and led to differentiation within labor.

Belcher *et al.* (2004) compared the financial returns from the cultivation of oil palm, rubber and rattan. The financial costs and benefits of the principal land use in two districts of Kalimantan province, Indonesia was assessed. Farmers were interviewed who were purposively included in the sample. The study inferred that oil palm cultivation was most profitable with regard to land use per area. Rattan cultivation was less attractive from a financial perspective. Some farmers even stop cultivating rattan and start looking for other livelihood activities. But some farmers still cultivated rattan as inputs requirements are low and yield a high ratio of benefits to costs. Rattan cultivation also provides financial stability and functions as an important source of savings and insurance. From the villages studied, rubber cultivation was dominant in one village due to limitations of land and displaced rattan cultivation. Oil palm cultivation has displaced large areas of rattan cultivation and is expected to continue in the future. The processors of oil palm play an important role in this regard. The main reason was also due to the high economic returns of oil palm cultivation. On the other hand, rattan cultivation also supplies a valuable export industry. The study stated that there is a scope to improve rattan gardening that will increase its benefits. The values must be recognized and incorporated in planning and policymaking.

Soyebo1 (2005) investigated the constraints militating against oil palm production in the central Local Government Area (LGA) of Osun State, Nigeria which was carried out in eight selected villages in Ife Central Local Government Area (LGA). A random sampling technique was used to select the respondents. To collect data, a structured interview schedule was used. The socio-economic characteristics challenges inhibiting oil palm plantation and method of production were assessed. In addition, a key informant interview was also used to develop a better understanding among the head of the village. The study revealed that almost all the farmers growing tree crops were producing oil palm in wild state. With regard

to the challenges of oil palm cultivation, the major factor limiting oil palm cultivation was land. Some farmers experienced problems in funding and the remaining few had faced climatic problems. Most of the farmers also stated that they did not receive proper knowledge and information that are required for oil palm cultivation and did not get government support. Based on the group discussion, the study concluded that tenancy right makes it hard for the tenant to cultivate oil palm. The land is communally owned and land inheritance is followed. Due to this the size of land became small and cannot grow oil palm. The tenants can only grow food and annual crop. The attitude of landowners is negative due to the involvement of hard work. Most of the beneficiaries were inherited from their parents. The long period of maturity and fruiting is a problem for the farmers. It is hard for them to cultivate new plants or crops as the land was inherited. A crisis in the community was also a challenge for the farmers. For processing the fruits, none of the farmers use hand-operated press and power operated mill. Most of them could not afford this machine due to poverty. The paper concluded that the farmers were in charge of oil palm existing in the wild groves. The study recommended that the extension workers should intensify efforts to educate the farmers on improved oil palm production management practices. The farmers should be motivated to form cooperative societies to solve the tripartite problems of inadequate information and cultivation knowledge about oil palm, lack of funds and lack of land, by pooling their resources together. The groups formed canbe made use as mediums, targets and change agents.

Vermeulen and Goad (2006) conducted a study in Johor, the largest palm oil-producing state in Malaysia and stated that smallholder farmers are very important and determine the future of the oil palm industry in terms of sustainability and credibility. Smallholders constituted around 40 percent of oil palm producers in Malaysia and Indonesia which are the leading producer. The paper highlighted the present situation of smallholders and suggests measures to alleviate their challenges. Smallholders are taken as households who owned land of less than 50 ha for oil palm cultivation. Among the smallholders, supported smallholders achieved higher yields than independent smallholders as they received support in the form of quality seed and others. But the independent smallholders also have the opportunity to yield

larger due to higher investments. Independent smallholder was selected which constitutes three hundred households. The study revealed that oil palm cultivators were from the age group of 45 to 76 years. This was due to the low opportunity from off-farm activities. The labor requirements were mainly provided by family members. Modern machinery was also not used by most of the cultivators. The available power cart wasrent out by the owners. Due to insufficient fertilizer and the absence of a joint estate system, there was no high production among the cultivators. The farmers were vulnerable in certain ways as there was no capital and collateral available to them. They faced challenges and constraints like ownership status, capital inputs; the flow of information and the need for balancing with other crops. The smallholders and plantations faced social challenges mainly of the security and legitimacy of their landholdings, labor availability and effects on wider communities. The smallholders experienced certain other challenges and constraints like to maximize their potentiality from oil palm production while maintaining local choice and autonomy. The challenge of land ownership is also a big challenge. There was uncertainty and disagreement over a land tenure that is widespread. This also turned into violence sometimes. The companies and government even go beyond legislation to settle disputes and conflicts. In addition, smallholders cannot take loans as they were not entitled based on the conditions and requirements set by the financing institutions. Further, smallholder farmers faced problems in accessing genuine information such as the price policy, market opportunity, site management, and technical aspect as well as the rights and alternatives under the national law or formal agreements. The problem of food security and balancing with cash crops also exists. The market system is also a risk for independent smallholders as there was fluctuation in the price. At present, the main challenge is how to spread and share good practice broadly. The real success will be seen in action from different stakeholders that include smallholders and their association, plantation and milling companies, government agencies, traders and retailers, third parties, financial institutions, NGOs and insurance organizations are developed and extended which will ensuresustainability and equity in the production of oil palm.

Hayashi (2007) scrutinized the impact of oil palm industries in Indonesia. The paper outlined that the plantations and processing of oil palm generate different kinds of biowastes that are harmful to the environment. Fell palm trunk, palm fronds at felling and annual pruning are the main types of biowastes generated in the plantations. In the factory different kinds of biowastes such as empty fruit bunch, fibers and shells and oil palm mill effluent are also produced. Based on these, business on oil palm in Indonesia was analyzed by a factory visit survey. Material balance and impact on the environment were discussed concerning the oil palm business, especially for plantations, transportation, and crude palm oil mill stages. The recent approach to utilize and manage these bio-wastes generated by crude palm oil mills was also covered. In addition, suggestions were provided to improve the conditions of the existing approaches. The total amount of biowastes generated in plantations and crude palm oil was also presented in brief. With regard to crudes palm oil production process, the study divided into two parts. The natural resources such as fuel, water, electricity, and raw materials are the first part of inputs. The second part is output which is further categorized into products including crude palm oil and palm kernel and solid wastes including fiber, shell, gases, etc. It was found that most of the oil palm factory in Indonesia used the same kinds of crude palm oil production process. Most of the factories studied tried to use zero-waste emission but many environmental impacts must be taken into consideration. Water and air pollution are happening due to the processing of oil palm y these factories. CO2 was also largely emitted due to the transportation of oil palm fruits. Burning of fibers in a factory rather than using electricity also must be considered. The study suggested developing a material balance sheet from the plantation stage to the refinery stage to get a clear picture of the existing conditions as it was not well maintained in the regions. The companies must also maintain information systems to understand the environmental impact of oil palm cultivation. There is also a way to utilize the biowastes effectively which must be taken into consideration.

Owolarafe and Arumughan (2007) had a review on Oil Palm Fruit Plantation and Production under the Contract- Growers Scheme in Andhra Pradesh and Tamil Nadu States of India". They study an assessment of the oil palm plantation

management and fruit supply, under the Indian contract-growers scheme. Data was collected from about 96 plantations on the age of plantation, size of plantation, cost of establishment, maintenance practices and cost , yield of fresh fruit bunches, profitability of the scheme for the farmers and so on. It was observed that most of the plantations (69.8%) are in the range of 6-10 years of age while the size of 1-5 ha dominates the sample (76%). Farmers are able to procure land and source fund for the establishment of plantations. Farmers also perform maintenance activities (irrigation, weeding and fertilizer application) satisfactorily, though incure considerable cost on the activities. Statistical analysis indicates that weeding and fertilizer applications have significant effect (at 99.9 and 90.0% levels respectively) on the total maintenance cost. Harvesting and haulage of fruits are well organized to ensure prompt processing of fresh fruit bunches for the mill to achieve the desired quality of palm oil. The farmers make profit from the scheme but some farmers are faced with the problems of pest infestation of the fruit, water stress and lack of fund. Farmers should be given continuous training on plantation management. There should be plan for the establishment of additional mills to cater for the expansion of the programme as more farmers are interested in the scheme.

Ritcher (2009) explored the environmental challenges and controversy of oil palm cultivation by using case studies from Malaysia, Indonesia, and Myanmar. The paper outlined that oil palm cultivation caused environment problems like monocultures, loss of biodiversity and climate change but as well social issues caused by lack of workers' rights and diverse conflicts with indigenous people. Due to increasing demand, the production still increases and have given pressure to the government to form a policy that is sustainable and environmentally friendly. The paper suggests for sustainable palm oil production, effective monitoring, and control system of the currently existing commitments is required. This would involve all stakeholders and indigenous people as a directly concerned group. Indonesia and Malaysia as the largest producing countries of oil palm also need to keep in mind the importance of economic diversification in order to avoid becoming too dependent on the palm oil sector.

Ugwu (2009) studied the problems and prospects of commercial small and medium scale cocoa and oil palm production in Cross River State, Nigeria. The study employed a purposive random sampling technique to select a firm based on different criteria. The study attempted to identify the problems and examine the prospects for the commercialization of small and medium scale cocoa and oil palm production in the state. The study found that most of the cocoa and oil palm enterprises in the state are small to medium scale in size and mostly inherited the former government plantations which are sub-divided and given to private producers. Regarding the processing, there are a good number of palm oil extraction technologies of different sizes as well as palm kernel and palm kernel oil extraction mills in the state. The market of palm oil involves interstate trade from Cross River State to Abuja, Lagos and various parts of the northern states of Nigeria. The constraints identified include the use of low yielding varieties, limited land for cocoa and oil palm cultivation, high cost of establishing nurseries and plantations, high cost of labor, unavailability of skilled and unskilled labor, fluctuations in market prices, lack of market information, spoilage and low-quality products. The study concluded that there is a good opportunity to develop and commercialize cocoa and oil palm. In light of this, the study offered suggestions to improve the production. The institutions that are confined in research must be funded adequately and the information must be passed inclusively. This will increase the quantity and quality of production. Infrastructure in rural areas must be developed by the government through donor agencies. A public-private partnership must also be strengthened that will motivate the private sector to supply inputs, technical and extension as well as strengthening the market system. Lastly, credit linkage must also be promoted in terms of loans and micro-credit as well as conducting training for capacity building.

Oil palm contributes about 30 per cent of the global production of vegetable oil. It also supports economic development of tropical countries like Indonesia, Malaysia and Africa and other tropical regions. Majority of the crops grows in tropical regions. Indonesia and Malaysia dominate based on its production. Like ways other tropical countries have a good potential to grow and to produce oil palm

vegetables oil. Across the world, about 15 million hectare of land is used for Oil Palm Plantation (FAO, 2009).

Swain (2009) has a conducted study on contract System in Orissa. He has analysed to study how the contract farming system explores the agricultural development in Indian agriculture and why we need this type of system. This study is based on the following objective the nature of contractual between industry and farmers, what are the constrains for contract system to increase the area under the crop cultivation.

Feintrenie *et al.* (2010) paper discussed the livelihood impacts of oil palm development in Indonesia, based on lessons learned from Bungo district, in the province of Jambi. The advantages and disadvantages of oil palm cultivation were analyzed by using a socio-economic survey. There was a conflict between the companies and smallholders mainly on the issue of land tenure and lack of leadership among smallholders. With regard to profit, the independent smallholders of oil palm gained more benefits than other crops cultivator as it was highly competitive in the region. Before the arrival of oil palm, livelihoods in the district depended mainly on rice cultivation for self-consumption and rubber cultivation for cash income which were mostly replaced by oil palm cultivation. The three determining factors include the direct profitability of smallholdings, the technical characteristics of the crop including less labor, the high return on investment, and the partnerships with big companies and banks, that bring a number of advantages. It has generated job opportunities and augmented income to the local people and the possibility to vary their cash crops. Although there were some conflicts related to oil palm plantations, local people are willing to convert large portions of their land into oil palm cultivations. This improved the livelihood conditions of the local people and migrants. They prefer to cultivate their own land rather than selling their land to the companies. The agrarian transformation is taking place in the region and become more urbanized and industrialized.

Prasad *et al.* (2010) paper discussed the performance of oil palm production technologies based on the study of three major states growing oil palm in India viz.,

Andhra Pradesh, Karnataka and Goa. To understand the adoption pattern and to enumerate various constraints in adoption of improved production technologies, the study interviewed 516 respondents. The study found that a large number of the oil palm growers were marginal (31.59%) and small farmers (27.91%). A substantial proportion of the respondents (74.61%) were following basin method of irrigation with four to seven days interval (29.84%) to irrigate the palms and more than eighty per cent of the farmers were applying farmyard manure. Majority of the respondents were applying lower doses of Nitrogen (54.07%), Phosphorus (42.64%) and Potassium (34.69%) and majority of the farmers were not applying micronutrient fertilizers. Some farmers (34.69 %) were applying fertilizers in 2 split doses. The paper stated that efforts are required to put for sustained area expansion and also required to increase the productivity of the plantations. They advised to switch over from basin irrigation to drip irrigation for efficient utilization of water resources and it is advised to give frequent irrigations with less quantity of water in case of basin irrigation. They also advised to apply the fertilizers based on leaf nutrient analysis and soil test values. The imbalance application of major and micronutrients could be avoided by the judicial and rational application of fertilizers along with required quantity of organic manures. An uninterrupted power supply is also required to make best use of micro irrigation systems.

Rist *et al.* (2010) assessed the livelihood impacts of oil palm cultivation in Indonesia from selected districts and provinces among the rural farmers. The study found that many smallholders have benefited substantially from the higher returns to land and labor afforded by oil palm but district authorities and smallholder cooperatives play key roles in the realization of benefits. The main livelihood activity in the region was rice cultivation which was replaced by oil palm cultivation. This was due to the direct profit from oil palm cultivation, fewer labor requirements, good return in investments and the existence of companies as a partnership. The introduction of oil palm has generated new employment opportunities for the local farmers and substantially increase their income. The main beneficiaries were independent smallholder oil palm farmers. It has improved the livelihood conditions of local people and migrants and large conversion of land into oil palm plantations

that happened in the region. The paper stated that conflicts between communities and companies have resulted almost entirely from lack of transparency, the absence of free, prior, and informed consent and unequal benefit- sharing, and have been exacerbated by the absence of clear land rights. There was also strong opposition from NGOs against oil palm cultivation on the basis of its negative impacts on the ecology. Among the sample villages, the study found that where development schemes were rather similar the livelihood outcomes were often very different. Farmers frequently sold their land to companies rather than developing a smallholding leaving them without a source of agricultural income, or with such income significantly reduced. The manager of the smallholder also gains benefits by cooperating with the companies. In some cases, they also play an important role to negotiate for better prices for smallholder while another of them usethe position for personal gain and benefits. The study also observed that oil palm cultivation contributes significantly to improve the livelihood of rural communities. The cultivation of oil palm has larger returns than other cultivation in terms of investing labor. However, the subject of oil palm remains controversial as some agencies are against it. Specific recommendations were made to improve the present situation and foster the establishment of smallholder friendly production regimes.

Ntsiful (2010) seeks to examine the effectiveness of corporate out-grower oil palm plantation schemes as a poverty alleviation tool in Ghana. The paper stated that along with the implementation of different schemes, the implementationof out-grower oil palm schemes by corporate entities has emerged as a development initiative to supplement the state provision of micro-credit to reduce poverty in Ghana. Beneficiary partnerships were formed with rural communities and corporate entity's support in different ways. The findings of the study show that the schemes have generally contributed to the participants' accumulation of financial, physical and human capitals which are a useful tool to come out of the poverty trap and have a positive impact on the communities within which they are developed and are seen as partner for development in their operational area. The schemes have a significant positive impact on the livelihood of the respondents and an increase in assets possessions which protect them against risk and vulnerability.

The financial capitals of the beneficiaries have increased significantly as financial assistance was given under the scheme. The loan was also given to them under specific guidelines. Besides the positive impacts, the schemes are confronted with constraints that militate against their development which ought to be addressed to make them more vibrant as poverty intervention mechanisms.

Wilcove and Koh (2010) assessed the threats to biodiversity from oil palm cultivation. They mentioned that oil palm cultivation is the greatest immediate threat to biodiversity in Southeast Asia. Although different initiatives are being taken by environmentalists, the oil palm cultivation is still expanding in the region. The paper outlined that there are some harsh social, economic and ecological realities to those who are concerned about the effects of oil palm cultivation on biodiversity. These include oil palm production is very profitable, it is used in many products that are simply processed and directed so prohibition will be impossible and there is still an increasing demand for oil palm. The cultivation of oil palm also plays an important role in poverty alleviation and income augmentation. In order to prevent the threats posed by oil-palm agriculture to biodiversity, environmentalists must change the behavior of the palm oil business through (i) regulations to curb undesirable activities (e.g., a ban on converting forests to oil palm); (ii) financial incentives to promote desirable behavior (e.g., production of certified, sustainable oil palm); (iii) financial disincentives designed to discourage undesirable behavior (e.g., consumer pressure on major manufacturers and retailers to use palm oil that does not come from plantations created at the expense of forests); and (iv) the promotion of alternative, more biodiversity-friendly uses of forested land that might otherwise be converted to oil palm. There is no single best strategy for dealing with the oil-palm crisis in Southeast Asia as all of the present approaches have weaknesses and strengths. So a mixture of regulations, incentives, and disincentives targeted at all sectors of the oil-palm industry is necessary to protect the region's rapidly disappearing forests. The provision of incentives to oil palm farmers can promote better and responsible behavior to oil palm farmers. A complete prohibition on the use of forest land will not be effective, there is a need to pressurize the government of Southeast Asia to ban forest conversion and demand a sustainable

product by the major importer of oil palm are necessary. The question is whether these can happen fast enough before the crisis happens.

Norwana *et al.* (2011) outlined the local impacts of oil palm expansion in Malaysia based on the case study in Sabah state. Household surveys were conducted in four villages neighboring the estates and falling within *Mukim* Sapi, namely Toniting, Bintang Mas, Ulu Sapi and Lidong in Malaysia. They also used focus group discussions (FGDs) for the study. The study indicates that Sapi estates were covered by forest before they were converted into oil palm cultivation. The remote sensing analysis shows that in 1979 the plantation area was still covered by forest but after 1991 the area was converted to cultivation of oil palm and in 2005 it was entirely used for oil palm cultivation. This also endangered the animals and species living in the region. Most animals have to shift to another place as majority of the area was used for oil palm cultivation. The perceived impact of oil palm shows differentiation in the findings as it was largely determined by the respondent's dependency level on natural resource and their location. They also responded that due to oil palm cultivation they were forced to hunt and encroach in protected areas as it is the source of their livelihood. This had many effects on the ecosystem of the areas. Due to insufficient information on the history of land use, government approach and socio-economic characteristics the study is limited. It is also limited in terms of depth and scope with issues such as land tenure and ownership as well as quantitative socio economic comparisons before and after oil palm cultivation. Even so, the findings revealed that there is a scope for improvement in both the social and environmental practices, particularly of large oil palm estates.

Akangbe *et al*., (2011) identified the constraints and the needs of training of oil palm fruit processors in Nigeria by taking Afijio Local Government Area of Oyo State, Nigeria. A case study was used for the study. A total of 160 households of oil palm farmers from four towns were selected with the help of a two-stage sampling technique. To analyzed data, the statistical tools of descriptive statistics were used and present in the form of frequency distribution, percentages and mean. The study found that the main extractors of oil palm were aged women and have no formal education. The mean age was 54 years. These women have experience of oil palm

extracting about 35 years on average. Most of them have a secondary occupation in the form of petty trades. Overall, 60 percent of them possess lands by inheritance and 50 percent have access to less than thirty bunches for extraction activities. A substantial portion of 80 percent transported the fruit to the extraction place by head loads. The remaining few used bicycles and vehicles for transporting fruit. The extraction was primarily done by traditional methods and this practice is inefficient and unhygienic. The assessment on the needs of training shows that training on clarification, skimming, mixing and sterilization operations during oil palm extraction are needed. The study also concluded that there is no need for training on the boiling of fruits, digestion chopping, and storage operations. With regard to the gap result, it was found that the lack of tasks can be addressed with the help of training the performers of the task as all tasks scores were below average. The constraints identified were poor and inefficient transportation systems as they have to carry by head loads. This was followed by a lack of labor and no link with external agents. In the light of these, the study offered suggestions for restructuring the infrastructure, training, credit linkage and cooperative formation.

World Growth (2011) paper stated that Indonesia is the largest exporter oil palm and second-largest producer and the existing industries in the country generate large employment opportunities and social development. This is also an important means of income augmentation and economic development for rural poor. Althoughit is expected to grow larger, the anti-oil palm campaign will have negative effects on it. In the country, agriculture contributes only 14 percent to its GDP but provides employment over 41 percent of its population. They are mainly oil palm cultivators from rural areas. In a country where half of the population resides in rural areas and over 20 percent below the poverty line, oil palm provides an incomparable activity ofpoverty alleviation. With the increasing demand for oil palm globally, it is the most promising economic prospects for Indonesia. On the other hand, measures taken to restrict clearings of forests cover for oil palm cultivation will reduce the availability of fertile land and the policy of governments should try to increase production and not implement anti-growth policies. The large productivity gap

between the actual and achievable yields of palm oil cultivation is a significant challenge. Therefore this gap must be reduced.

ITS Global (2011) highlighted that oil palm production and industry has the potential to generate substantial income in Papua New Guinea. It accounts for around 39 percent of export and provides income for around 160,000 people living in rural areas. The production must still be increased as around 40 percent still lives below the national poverty line, unemployment, illiteracy with high levels of child mortality and population growth. Therefore a vibrant oil palm industry had the potential to foster economic growth and raise the living conditions of these people. The country depends heavily on agriculture for its economy and there is a necessity to extend agricultural activities. The existing performance is still below its potential. Oil palm is the most relevant option in the agricultural sector. The other countries that produce oil palm are also declining which can be an advantage for the country. The global demand will also keep on increasing which is another advantage. Besides these, the country has an advantage due to its suitable soils and climate, available land and adequate rainfall for oil palm production. The employment, revenue, and export sales are expected to increase with greater growth in the oil palm industry.

Ibitoye *et al*. (2011) identified the factors affecting oil palm production in Ondo state in Nigeria. The paper stated that the civil war and discovery of crude oil had negatively affected the production of oil palm in Nigeria. The price became higher and scarcity was observed in the region. From the predominant oil palm producing areas, a number of 150 respondents were selected using a purposive sampling method. Rainforest and the derived savannah zones were selected for the study. A structured questionnaire was used to collect data and was analyzed with the help of computer packages of SPSS. To calculate and represent data, simple statistics tools like frequency counts, means, standard deviation, and percentages were used. In addition, inferential statistics such as chi- square, Pearson correlation and T-test were also employed to test the significance of the relationship and differences of different variables. Moreover, regression analysis was also used. The study found that majority of the cultivators was males and from the age group of 41-60 years. The

household composition shows that majority of them were married and lived with dependents. The average area of cultivation was below 10 ha of land and most of them did not attend training organized for cultivators. Information was mainly disseminated through extension services, radio, and neighbors. The main challenge identified was the supply of seedlings. It was found that human capital has a significant relationship with the yield of oil palm. The paper concluded that the farmers of oil palm cultivation did not want to use improvedhybrid planting materials from organization nurseries. They stated that these agencies did not sell to them a quality and mature seeds but only try to pretend themselves as selling improved hybrid seedlings. With regard to the fruiting stage, this has been significantly tested. The farmers were also complaining about the measuring container for selling fruits which were very irregular. Overall, the cultivation of oil palm improved the livelihood conditions of the farmers although they faced certain challenges. The study offered suggestions to educate the farmers about the seedlings which must be established well in the nursery before transplanting it to the land. Improved hybrid seedlings in the nursery must also be investigated and studied to prevent further problems. Cooperatives societies should also be formed by the farmers to improve their conditions along with the intervention from the government.With all these, it is perceived that oil palm cultivation will contribute more to the livelihood of the farmers.

Palm oil production is a prominent example of one of the few global land uses that have accelerated in importance as opposed to the majority of major agricultural crops, which have remained remarkably constant with regard to production acre age (Kongsager and Reenberg, 2012)

Kongsager and Reenberg (2012) have conducted a study that palm oil production is a prominent example of one of the few global land uses that have accelerated in importance as opposed to the majority of major agricultural crops, which have remained remarkably constant with regard to production acre age. It is also one of the land uses characterized by telecommunications. The increasing global demands impact on a limited number of local places. During the past few decades, the oil palm has become one of the most rapidly expanding equatorial crops in the

world; oil palms are now grown in 43 countries and their total cultivated area accounts for nearly one-tenth of the world's permanent crop land. This impressive and rapid land use alteration caused by palm oil cultivation has been fuelled by the growing demand for vegetable oil on the global market, driven by population growth as well as the general improvement in economic wealth and consumption. The use of palm oil as a biofuel feedstock is still limited, but that may change in the future since palm oil has higher energy efficiency than the current major biofuel crops (soya bean and sugarcane). Moreover, the liquid bio fuel market is one of the fastest growing markets for agricultural products globally.

Cramb and Curry (2012) wrote a paper on the expansion of oil palm cultivation in Asia–Pacific region. They stated that this expansion has important implications in rural livelihoods transformations. It happened in different forms within and between countries that depend on local context involving regional flows of labor and capital, global environmental impacts and efforts to build international governance structures. The paper is based on comparative case studies of seven studies to presents the diversity and complexity of the process. The paper highlighted that the introduction of oil palm in colonized countries has made a huge impact that reduced the forest cover areas and improved the livelihood conditions of the settlers in those regions. The cultivation of oil palm helps people to escape from poverty. However, there are different environmental impacts of oil palm cultivation. Thus, there is a need for more research to assess how the economic, social and environmental issues are negotiated and played at different levels. This will help in the understanding of how to develop sustainable oil palm cultivation and improve rural livelihoods across different regions and mitigate the environmental impact.

Budidarsono *et al*. (2012) made an assessment on the socio-economic impact of palm oil production. This assessment was done base on the production of oil palm in Indonesia which is the leading producer country. A household survey was conducted to analyze the livelihoodconditions of oil palm farmers in 78 villages out of 8 provinces. Secondary data was also used in the study. The study revealed that the adoption of oil palm cultivation as a primary occupation was not high when a comparison was made between different households in a specific region. Among the

oil palm cultivators, the determinants of oil palm cultivation include the existence of market links before oil palm development, working as a tandem program with transmigration, demographic and socio-cultural characteristics, tenure systems and biophysical characteristics. Thecomparison between oil palm cultivator villages and non-cultivator of oil palm villages inferred that oil palm cultivator villages were more populated than non- cultivator of oil palm villages. However, there was no significant difference regarding the birth rates and death rates. Conversely, in-migration was significantly higher in oil palm cultivator villages than non-cultivator of oil palm villages. The percentage of men in oil palm cultivation villages was also significantly higher than the non-cultivator of oil palm villages. The attainment and accessibility of elementary education show no significant differences while distances to secondary schools, hospitals, and other medical services were significantly higher in oil palm cultivator villages than non-cultivator of oil palm villages. The study draws indications that oil palm cultivator villages were mostly in distant places and were not given preferences in developments by the governments. However, oil palm cultivator villages showed lower rates of malnutrition but lower per capita health insurance for poor families and per capita services for poor people compared to non- cultivator of oil palm villages. With regard to industry and economic opportunities, oil palm cultivator villages were much better than non-cultivator of oil palm villages.

Shops, minimarkets, and the hotels were also more in oil palm cultivation villages than non-cultivator of oil palm villages. In addition, cooperatives and village unit cooperatives were also higher in number in oil palm cultivator villages than non-cultivator of oil palm villages. The study also revealed than majority of the households replaced their livelihood activity by adopting oil palm cultivation. There was also a substantial increase in household income through oil palm cultivation. This increase was even thirteen times higher among some oil palm farmers. The secondary occupation was also observed among these farmers. The paper concluded that oil palm cultivation has significantly contributed to socio-economic conditions positively.

Obidzinski *et al*. (2012) studythe impact of oil palm cultivation in Indonesia. The study revealed that the customary land users perceived negative livelihood changes due to land transfer for oil palm cultivation. The conversion of land into oil palm cultivation reduces the income from forest-based and access to sources of food. Some respondents perceived that land conversion into oil palm has a positive impact that includes infrastructural development like schools, health centers, and religious places. The study also observed that livelihood was improved in site one of the study and this was not entirely due to oil palm cultivation but income from off and on-farm activities. They received compensation as communal ownership of land was taken away and were given land for oil palm cultivation. As the years go by there were conflicts of land between the two parties due to lack of transparency and mismanagement. In site two of the study, companies acquired land from the native people by promising those better roads and other infrastructures, establish plasma plantations, etc. Thecompanies also promised to give a job and compensations for the land lost. However,the job provided was only unskilled work and the livelihood declined after it. But some respondents stated that their livelihood improved and these respondents were mainly smallholders. Site three inferred that only little respondents improved their livelihood due to expanding in oil palm cultivation. The substantial remaining livelihood declined as livelihood based on forests and its resources decreased. The study offered different suggestions to improve the present situations in the study areas.

Ajani *et al*. (2012) assessed oil palm cultivation and processing among rural women in Enugu North Agricultural Zone of Enugu State, Nigeria. The respondents obtained palm oil, palm kernel, palm kernel oil, palm wine, brooms, baskets; livestock forage and fuelwood from oil palm production which was mostly from women cooperative society. Cooperative societies were an important mechanism in which majority of the respondents obtained oil palmfruits through it. The remaining obtained oil palm fruits by buying while the remaining few obtained from their own production. This indicates that majority of them did not own oil palm farms. They were motivated to join cooperatives as it isthe main source of oil palm fruits. They observed that a hundred percent of the respondents used their legs in processing oil

palm fruits. They also used hand pressing and hydraulic pressing machines besides this. The paper stated that traditional methods of oil palm processing which is unhygienic, tedious and time- consuming were still practiced in the area. Fermentation in the course of processing was also used by majority of the respondents along with sterilization and clarification. With regard to labor requirements, majority of the respondents stated that household members were the main source of labor followed by hired labor, exchange labor and help from relations. Majority of these households could produce more than 20 liters of palm oil which could be a good source for their income and survival. Overall, there were several benefits which include augmenting income, purchase of household basic needs and payment of school children fees. This implies that women's involvement in oil palm cultivation and processing empowered them economically. However some challenges were also found viz., processing machine, high cost of labor, poor extension services, use of a poor variety of oil palm seedlings, lack of storage facilities, lack of improved varieties/cultivars, poor access to good road network for easy transportation of produce and others. The study recommends that appropriate labor-saving technologies should be developed to reduce the challenges thereby increasing productivity.

Sayer *et al*. (2012) paper stated that oil palm is a highly profitable crop adapted to the humid tropics and the area devoted to this crop is likely to expand significantly in the future. Although it can have environmental effects, when well managed it has a positive carbon balance and when grown in a landscape mosaic it can play a role in biodiversity conservation. Oil palm cultivation has driven high economic growth in several tropical developing countries and plays an important role in the alleviation of rural poverty. Under good governance, oil palm can make valuable contributions to the development and the resulting prosperity may free people to invest in better environmental practices. The large area of degraded land can be used for oil palm cultivation to increase production, improve yields and provide incentives to motivate smallholders. The paper made recommendations to ensure sustainable oil palm cultivation that includes promoting yield intensification which will reduce the necessity for area expansion; promoting smallholder

organizations to redress the balance of power in mutual agreements and good governance in terms of smallholder tenure security and forest conservation. The expansion of oil palm is mainly driven by demand and the consumer. Thus, consumer behavior is very important to achieve sustainability and equity.

Damoah (2012) conducted a study on the impacts of oil palm promotion schemes in Mpohor Wassa East district of Ghana. The Benso Oil Palm Plantation smallholder farmer scheme includes different provisions for oil palm promotion. It tried to assess the extent to which the scheme is benefiting the beneficiaries and the community. The study was descriptive in design and data was collected from 200 smallholder oil palm farmers including the scheme manager. The study found that incomes of farmers were being improved and had translated into higher access to health care, education, and food security for the households of smallholders. The production of oil palm fruits is also increasing among smallholders but there was a fluctuation in the production. The relation between yield and income of farmers shows a positive correlation which indicates that incomes of the farmers increase along with the increase in yield. The income from oil palm contributes around 51 percent of their household income. Income from smallholders was higher among female smallholders than male smallholders. The paper concluded that income from smallholder oil palm farmers could contribute significantly to household income and improved the socio-economic conditions of the households. However, several challenges were also identified including a low understanding of technical details; low pricing of oil palm leading to reduced incomes confronted the scheme. Theywere supported through loan facilities and subsidies, as well as helping improve on the prices offered for the oil palm fruits. The study recommended the scheme of BOPP to review deduction from farmers' gross incomes.

Amponsaha *et al*. (2012) conducted an action research programme toimprove the processing practices of small-scale oil palm fruit processors in the Kwaebibirem District of Ghana. The paper stated that Ghana produces 2000000 metric tons of oil palm in a year. About 60 percent was contributed by small scale processors. There is an insufficiency of fats and oils needed for industrial and household consumption in the country. A substantial quantity of oil palm produced by these small sale

processors cannot be used by large scale industries as it does not meet the requirements in terms of quality. There is a need to scrutinize the situation and find ways to improve the quality of production. Data was collected using semi- structured interviews, key informants interview and focus group discussions. The study has assessed the processing practices of small-scale oil palm fruit processors in six purposively selected sites in the district. The findings include storage of loosened fruits for long periods before boiling, disposal of effluent into drains, use of spent tiers for boiling fruits and no clarification of the oil. Majority of the processors store oil palm fruits for 1 to 3 weeks before processing, possibly allowing some fermentation, to increase extractability and reduce labor costs which may reduce the quality of palm oil by increasing the levels of free fatty acids. A cross-disciplinary research approach is needed to effectively address these complex issues and search for integrative solutions that are well embedded in the current local processing practices which will ensure that the processors can take advantage of an opportunity to access a remunerative market, for improved livelihoods. The processing of oil palm in small scale innovation is inferred as a multiple-scale, multi-stakeholder and interdisciplinary process.

Rao (2013) has conducted a study of oil palm cultivation in Andhra Pradesh .He study that India is the largest consumer of Oil palm in the world (18% of world consumption) and also largest importer of oil palm (45% of world imports). Andhra Pradesh has been the leading palm oil producing state in India (85% of country's production) followed by Kerala (10%), Karnataka (2%). The West Godavari, East Godavari and Krishna districts of Andhra Pradesh extensively cultivate oil palm. Oil palm is the highest oil producer among perennial oil yielding crops. Oil palm marketing in the country is well streamlined, earmarking plantation zones for each palm oil mill. Oil palm growers are under an obligation to supply the fresh fruit bunches from the oil palm plantations in that area only to the factory to which the zone is attached. The Government of India has been supporting oil palm through subsidies (planting, fertilizers, micro-irrigation) and various State Governments also provide assistance for oil palm development. Even though the Government has been trying to expand the area under palm oil cultivation, low productivity, price

fluctuations, insufficient processing facilities, lack of suitable technologies for harvesting cause very slow growth rate in expansion of oil palm cultivation.

Rao (2013) paper attempts to address some of the important issues oil palm cultivation in the State of Andhra Pradesh. He stated that India is the largest consumer and importer of oil palm in the world and Andhra Pradesh has been the leading palm oil-producing state in the country. The study tries to assess the production of oil palm, the existing market system, and financial problems. The study used primary and secondary data and select oil palm cultivators from the region of Krishna and West Godavari districts. The final data were analyzed using statistical tools of ANOVA, chi-square, and correlation. The study inferred that even the government supports oil palm cultivation there are still problems like low productivity, price fluctuations, insufficient processing facilities, lack of suitable technologies. Majority of the farmers were small and marginal farmers and hold land of 2 hectares. Most of them used the basin method for irrigation and there is a need to aware the farmers to use micro-irrigation. There is a high fluctuation of oil palm price that is fixed by the price fixation committee. The farmers faced challenges to adjust themselves with the frequent change of price. Although the government provides a financial provision of Rs 5000 per ton under the Market Intervention Scheme of Minimum Support Price, the farmers felt this is insufficient and demand Rs 8000 per ton as the capital and expenditure of oil palm cultivation is increasing. The cultivation of oil palm steadily increased the area of cultivation and there is a need to extend the area of cultivation according to the requirements. The fertilizer, manures, and micronutrients like boron and magnesium are limited and did not meet the recommended dose. There is a need to take initiative and efforts towards this. The paper concluded there is a need to focus more on innovative growth strategies such as marketing of high-grade derivatives, biomass utilization and branding of palm oil as a healthy cooking medium. The existing schemes of the central government should be made use to develop and improve oil palm cultivation in their respective zones in order to introduce modern technology and innovations. Harvesting machines must be provided as it is difficult for the aged farmers and the tax on oil palm must be exempted under VAT. Entrepreneurs should play an important role in oil palm

development in their respective allotted zones for effective transfer of production technologies and all thrust areas shall be taken care of through the cooperation of all agencies.

Nkongho *et al*. (2013) assessed the strength and weaknesses of the smallholder oil palm in Cameroon. Out of seven industrial mill supply basins, four mills were selected for the study. As different people involved in oil palm production the studied categorized them as villagers, non-natives, company workers, and elites. The criteria used were based on income level, place of origin, social status, past and present work with any of the oil palm agro-industries. Due to the heterogeneous population, it was divided into subgroups and a random sampling technique was used in each subgroup. Primary data was collected using a semi- structured interview schedule and semi-guided discussions. Overall from different subgroups, a total of 176 persons were interviewed in the study. The study revealed that almost cent percent of the producers were headed in their family and the majority of them were males. Majority of oil palm producers were older in terms of age with the remaining of younger age. The main constraints identified were access to capital and customary rights to land. These problems were faced by a younger age in the region. Majority of the respondents bought land for oil palm cultivation which can be one of the challenges. The capital for oil palm cultivation was met mainly through their personal savings in banks followed by bank loans, cooperatives and grants from the government. A substantial portion of the farmers could not use fertilizer as it was expensive. The plants were also affected by different diseases which were also a problem for the farmers. With regard to labor requirements, majority of them used family labor, and the rest hired native workers and migrant workers. The non-industrial sector of oil palm provides a potential source of income, development, and employment in rural areas. The intercropping and diversification of livelihood became an important coping strategy. It also helps to minimize environmental damage, prevents soil erosion and ensures food security. There was a better profit when artisanal extraction of oil is carried out by adding value to fresh fruit bunch. The non-industrial oil palm also has little effect on the environment although there were little initiatives by the government. As financial linkage is a challenge, few

institutions made provisions to give loans at low-interest rates with a no refund scheme up to four years.

Laschinger (2013) study reports on the results of research undertaken to assess the role of oil palm cultivation for local livelihoods in the sub-district of Karaket in Thailand. Karaket has recently experienced substantial uptake of oil palmsby independently operating smallholder farmers which served as an interesting case to explore the main outcomes of oil palm cultivation for local livelihoods; regardedto operate in a system at the interface with the social and the ecological. The study showed that oil palm cultivation has created high social and economic value for sustainable livelihoods without seriously undermining the natural resource base inthe immediate term. Oil palm cultivators have invested their profits from oil palm cultivation to strengthen their own assets like in the areas of education, health, hiring labor, etc. It strengthens their financial asset which is very important for their survival and raises the standard of living. The cultivators were highly satisfied with the income generated from oil palm cultivation. The study revealed that multiple interrelations between the contextual, governance, resource, and resource user systemhave created values, and if beneficial system interrelations are strengthened, sustainability may be secured. It may also be argued that such smallholder-dominated oil palm cultivation may set a good example and serve as an initial learning platform for how palm oil can be cultivated in a way that contributes to beneficial livelihood outcomes. The study suggested there is a need for capacity building and extension education among farmers to increase production and gain maximum benefits from oilpalm cultivation.

Faruk (2013) outlined that oil palm cultivation is increasing in South East Asia regions. This results in a decrease in species diversity in the region. The information regarding this is very few in anuran diversity. Therefore an attempt was made to study the differences of anuran biological diversity between the oil palm cultivation area and forest cover area. The study also tries to find out if the difference in biological diversity has an impact on the environment in its region. A hypothesis was formulated which states that biological diversity is lower in oil palm cultivation and that cultivation supports a larger proportion of disturbance tolerant species than

forest. A comparison was made regarding the richness of species, abundance and the composition of communities between oil palm cultivation and forest areas and the kinds of sites in the forest and oil palm cultivation. They were assessed based on the characteristics of streams, riparian and terrestrial between oil palm cultivation regions and forest cover regions. The study found that differences were not found in all the cases or indicators made in the study. However, the study inferred that composition in the community differs largely between oil palm cultivation regions and forest cover regions. The community in anuran oil palm cultivation consists of species that prosper in disturbed regions. The main species found in oil palm cultivation regions were species that are common and need little conservation efforts. The study concluded that using various management strategies, oil palm cultivation areas can be an important area for supporting the life of many species that can live in secondary forests.

Dano (2013) reviewed commercial oil palm cultivation in Ghana. The paper stated that among the member of the genus Elaeis with regard to production and economic yield the African oil palm is the most important one. In Ghana, the total area of cultivation of palm oil is estimated at around 3,05,758 hectares. Commercial agriculture is restricted to the forest zones where the climate is ecologically suitable for oil palm plantation. There are three major scales of production recognized for commercial oil palm cultivation. They include large industrial plantations with large-scale processing mills and a network of smallholder and out-grower farmers, medium-scale plantations with medium-scale industrial mills with a network of out-growers and small private farmers cultivating less than 10 hectares. The Oil Palm Research Institute of the Council for Scientific and Industrial Research supported the industry with scientific research and technological innovations. Oil palm cultivation in Ghana has great potential if t is backed up with good investments like input in capital, research-oriented, and policy intervention. This can be supported by government and corporate bodies. Different challenges of socio-economic and ecological issues must also be addressed which can be an obstacle for oil palm development. The rules of tenants and agreements relating to oil palm cultivation are also very complex and there is a need to reframe appropriate tenancy

rules and arrangements that may enhance the profits and motivates to invest more in farm production. The support from institutions is very important in Ghana which will motivate and encourage smallholder farmers and processors to utilize modern tools and technology. This will increase the production of oil palm and augment their income. Lastly, the existence of a change in climate and variation needs to be studied and investigated to promote oil palm cultivation.

Cahyadi and Waibei (2013) paper scrutinized the impact of oil palm industries in poverty alleviation among contract farmers in Indonesia. A simple random sampling technique was used to collect data among 245 smallholders of contract farmers and non-contract farmers in Jambi province, Sumatra. The study found out that there was a difference in the socio-economic conditions among contract farmers and non-contract farmers. The size of land possession, household income, and other assets was much larger among contract farmers than non-contract farmers. The input in oil palm by contract farmers was also larger than non-contract farmers which resulted in higher yields and income. These contract farmers were mainly the indigenous people of the area and migrants were less likely to adopt contract farming. Contract farming was also significantly associated with the household head, size of oil palm land, indigenous status and planting period. It was also positively correlated to household income among contract farmers. In addition, income was also generated from off-farm activities and rubber plantation. The model used in the study inferred that the participation of poor households in contract farming was negative. It was also found those households having weak manpower were discriminated from contract farming to make arrangements. Overall, the paper concluded that contract farming has improved the standard of living and raise household income. The study offered suggestions that policymakers and companies must restructure the contract policy to ensure more income and higher yield by smallholders. Further, the paper also supplemented that contract farming can increasedependency among these farmers which will make them more vulnerable to shocks.

Murphy (2014) has published a study on the future of oil palm as a major global crop. In recent years, the oil palm sector has witnessed a period of historically

high prices with buoyant global demand and high levels of production driven largely by economic development in major Asian countries such as India and China. However, the oil palm sector is also confronted by many important challenges that require attention. Such challenges include fragmentation of the industry, stagnating yields, and an image problem that is largely due to the conversion of tropical rainforest and peat lands in a few regions in South-east Asia. The biological and managerial tools to surmount these challenges already exist but need more focused application and political support. Potentially groundbreaking biological tools include the new molecular breeding technologies. The more focused use of new and traditional technologies can also help to confront pest and disease problems, to redesign of crop architecture, and to facilitate yield and harvesting efficiency. In the medium-term future, we can look forward to a considerable geographical extension of oil palm cultivation in a broad zone across the tropics of Africa, Asia and the Americas. If these and other measures can be taken, increased palm oil output could more than meet the highest projections for future vegetable oil requirements while minimizing adverse environmental consequences. Improved oil palm varieties could also considerably increase the global market share for this highly productive tropical crop at the expense of some of the less efficient temperate oilseed crops.

Mingorria *et al*. (2014) outlined that oil palm has become one of the most rapidly expanding crops in the world and many countries have promoted its cultivation as part of a broader rural development strategy that aimed at generating paid work and producing both export commodities and bio-fuels. On the other hand, oil palm expansion has often occurred at the expense of ecosystems and subsistence agriculture, and on lands riddled with tenure conflicts. They analyzed the implications of the combined effect of labor in oil palm plantations and land access on households, and discuss how these implications affect human well-being in two indigenous communities of the Polochic valley, Guatemala. They revealed how oil palm cultivation increases incomes for plantation workers' households, but decrease the productivity of maize cultivation by combining participant observation, semi-structured interviews, and land-time budget analysis at the household level. The cultivation of oil palm also reduced the time that household members have available

for other activities and, particularly reduces women's resting time. Conversely, households that engaged in maize cultivation show higher degrees of food security and women can allocate more time to social activities. They made argument that while working for an oil palm cultivation can increase specific elements of the basic material conditions for a good life, other aspects such as food security, health, freedom of choice, and social relationships can become deteriorated.

Ibitoye and Jimoh (2014) assessed oil palm marketing in Dekina Local Government Area of Kogi State, Nigeria. Based on the sizes and volume of trade in palm oil, five markets were purposively chosen for the study. From these markets, 125 respondents were randomly selected. Interviews and questionnaires were used to collect primary data besides secondary data. To analyze data, statistics of mean, standard deviation, frequency distribution, and percentages were used. In addition, shepherd-futrell model, bivariate correlation and 5-point Likert-scale were also employed. The analysis revealed that 96 percent of palm oil marketers were female and 42 percent were in the age group of 41 to 50 years which is an active and productive age group. Majority of them were also married and attained formal education. The average year of marketing experience is fifteen years and only eight percent were wholesalers. This was due to the huge capital required to start a business. Palm oil marketing was profitable as the total revenue is greater than the total variable cost and the marketing efficiency of the sellers was observed to be low due to low capital investment. Price fluctuation, inadequate capital, and too many retailers were the main constraints identified. The high cost of transportation, poor communication, poor storage facilities, and low quantity production had no significant effect on marketing. However, it was found that oil palm marketing in the area was highly integrated, profitable and viable. Policy implications were made on promoting agricultural marketing activities through the provision of physical infrastructures, credit linkage, and rules for protecting the interests of retailers.

Anaglo *et al*. (2014) examined the influence of the adoption of improved oil palm production practices on the livelihood assets of oil palm farmers in Kwaebibirem district of Ghana. Overall 120 oil palm farmers were randomly selected in the region. This region was selected as it is the major oil palm producing

area in the country. These farmers were individual farmers who started oil palm plantation in 2000. They harvested after four years of cultivation. A structured questionnaire was used to collect data. The study revealed that indicators viz. education level, size of landholding had a significant relationship with the adoption of improved oil palm production practices. However, the age of farmers, gender and experience on farming did not have a significant relationship with the adoption of improved oil palm production practices. In addition, the study observed significant differences among farmers who adopted improved oil palmtechnology than the non-adopters. The adopters were acquiring more physical assets, social capital, financial assets, and human capital. The indicators used were houses and household appliances, increased income and savings, participation in group activities and the ability to pay children's school fees respectively. The paper stated that adopting improved oil palm production practices will enhance the livelihood assets of the farmers. The farmers having well assets will likely to diversify in other livelihood activities and adopt other innovations to acquire more livelihood assets. Recommendations were made to include more under extension services and to encourage farmers to improved oil palm production farming practices which will also improve their assets or capitals.

Lee *et al*. (2014) stated that the oil palm industry in Indonesia faces several challenges in its bid to adopt more sustainable practices. The main challenges were to find a way to increase the production among smallholder oil palm and to promote benefit sharing with the local communities. The determining factors of these challenges are not well known in the region. In the light of this, they surveyed in 15 villages in Sumatra, Indonesia. The study inferred that decreasing monthly harvesting rotation of oil palm smallholdings decreases oil palm yield and the independent smallholder households receive lower gross monthly incomes. The harvesting rotation and type of smallholder managementare important constraints on oil palm yields and incomes of smallholders. The study made certain recommendations viz. prioritizing agricultural extension on best management practices for independent smallholders and improving access to oil palm mills to lower marketing costs of fresh fruit bunch for independent smallholders. The past

experiences proved the need for stronger institutional structures, greater mobilization of farmers into cooperatives, and better resources to manage credit for smallholders. The study concluded that combine factors under the agronomy of oil palm smallholdings and the supportive environment for smallholder oil palm development best show the differences in both household incomes and smallholder oil palm yields. From the findings, the study recommends to give priority to an agricultural extension on best management practice for the independent smallholder and to improve the utilization of oil palm mills that will lower the marketcost of fresh fruit bunch for the independent smallholder. Although the existing policy and agricultural extension are effective, the approach should be made based on the past policy of agricultural extension for the smallholder farmer. Besides these, mobilization of farmers into cooperatives, strengthening the institution and better management of resources are required.

Okungbowa1 *et al*. (2014) analyzed themarketing channel, cost, and return of oil palm in Ethiopia East Local Area of Delta State. They also covered the socio-economic characteristics and constraints of oil palm cultivation. The study employed a structured questionnaire that was asked to hundreds of farmers that were selected randomly. The data collected was analyzed using descriptive statistics and budgetary analysis. The result shows that majority of the respondents were educated have attained at least a secondary education. They suggested that new technology can be easily transferred to this area as most of them are literate. They also stated that marketing is practically done by well-experienced traders. Regarding marketing, the wholesalers were involved in purchasing,transportation, packaging, and storage of oil palm and they used to sell it to the retailer or directly to the consumers. The average profit made by the marketers is N18, 742.5 per ton of oil palm and the rate of return on investment shows that for every naira invested, a profit of ten kobos is made. However, the farmers also faced certain challenges and constraints in producing oil palm. Majority of the farmers have inadequate capital to expand oil palm cultivation which was followed weak market facilities, high cost of transportation, instability of price and so on. Overall, although there were different challenges and

constraints, the study concluded that oil palm cultivated in the area is economically profitable to the region and to oil palm farmers.

Gatto *et al.* (2015) carried out a village survey in the lowland regions of Jambi province that have been most affected by land-use changes over the decades which are one of the hotspots of Indonesia's recent oil palm boom. A survey was done in the lowland districts which were randomly selected. A total of hundred villages were selected again under these districts. To collect data, structured questionnaires and group interviews were used. The result shows that Oil palm has not been a major driver of deforestation but oil palm growth occurs in locations with ongoing logging activities, so indirect effects on deforestation are possible. In terms of the drivers of the oil palm expansion and related other land-use changes, theresults show that socioeconomic and policy factors play a key role. The results do not allow statements on whether the oil palm expansion in Jambi is good or bad due to the limitations of the study. To draw such conclusions, there is a need for a comprehensive analysis of the economic, social, and environmental impacts which is not the focus of the study. But the study revealed that factors of socio-economic and policy played a significant role in understanding land use patterns at the local level. Due to this, the findings of the study go beyond spatially explicit analyses with satellite data that also assess land-use trajectories. A better understanding of socio-economic and policy factors is necessary to design sustainable land-use policies.

Cramb (2016) paper outlined the political economy of large scale oil palm development in Sarawak region. Sarawak region experiences a rapid expansion of oil palm plantation. This has led to the transformation of the agricultural economy to semi-subsistence smallholding to the domination of private large scale estates. In the history of Sarawak, large scale capitalist or estates played only a minor role in the economy. Due to the rising demand for oil palm globally in 1981, a dual agriculture economy was created in the region. It was promoted by Mahmud and promulgated a policy that focuses on delivering extensive tracts of state and customary land to private estates and hiring low wage labor from Indonesia and minimizing the potential for smallholder expansion. The main change was the transfer of land to the big estate sector, which constitutes nearly 80 percent of the oil palm area. This

created an opportunity for surplus extraction and patronage through the allocation of land leases, business contracts, consultancies, shareholdings and so on. Forest cover and agricultural land conversion into oil palm plantation in the area can be an inexorable process of expending agriculture that is determined by global economic forces. Overall the analysis of the political economy of large scale oil palm development in Sarawak region shows that it is a process with different outcomes and pathways, which involves contestation between actors and community spheres. It is ultimately influenced by the exercise of political, ideological, legal and economic power to redistribute access to land and forest resources.

Izahi *et al.* (2016) outlined the environmental impacts of oil palm processing in Nigeria. The paper stated that Nigeria is one of the largest producers of oil palm with a total production of 930 thousand metric tonnes domestically and accounts for 1.5% of global output approximately. As the cultivation of oil palm has improved the livelihood and standard of living in Nigeria, the negative impacts on the environment are little discussed in the country. Due to oil palm cultivation and processing, it has several negative impacts that include deforestation (clearing), soil erosion and fertility, water cycle disruption and pollutions associated with fertilizer use, pollution due to emissions from combustion, POME discharged and unused solid wastes. Thus, the paper assessed the impact of oil palm cultivation on the environment in Nigeria. It was revealed that the processing of oil palm emitted three waste streams that include gaseous (pollutant gases), liquid (palm oil mill effluent i.e. POME) and solid (palm press fiber, chaff, palm kernel shell and empty fruit bunch). These wastes were used by boilers of oil palm mill in a small quantity while the rest were discharged in the environment with limited management. The impact on soil properties by palm oil mill effluent and the emission from burning solid wastes in oil palm processing exceeded the allowable limits stipulated by the Federal Ministry of Environment/Department of Petroleum Resources. The paper offered suggestions to introduce biotechnological applications for wastes treatment. The emissions in the air could be managed by drying the biomass properly prior to use as boiler's fuel. The wastes also could be managed by converting to a different range of value-added products and different bioenergy.

Petrenko *et al*. (2016) paper states oil palm is the most widely used vegetable oil due to its high yields, low cost, and stability. The production of oil palm is also being increased globally along with the growth of population which increases demand and different policies of governments that promotes oil palm cultivation. Indonesia is the largest producer country which accounts for almost half of the global production. On the other hand, the cultivation of oil palm has severe environmental and social consequences besides the growth in industries. The area under agriculture is limited globally as the cultivation of oil palm increases thereby replacing other crop cultivation and forest cover. This led to the depletion of tropical forests and biodiversity as well as destroyed the old-growth rainforest. Air pollution is also increased due to the growth in industries. Further, Indonesia's rainforest grows on carbon-rich peat-land, destroys biodiversity and affects the climate. Southeast Asia is a region where different biodiversity hotspots are found and are also unique in terms of its geographical and other characteristics. However, the tropical forests in this region are being destroyed rapidly as compared to other regions of the world. Indonesia as the leading producer of oil palm lost 0.84 Mha (approx) of its primary forest covers from 2000 to 2012. This exceeds the deforestation rates in Brazil and half of these were caused by oil palm cultivation. The biodiversity loss is a huge problem as Indonesia's rainforest supports many plants even in a single hectare. More than half of the rainforest is also endemic in this region. The rare species like orangutan which is found only Sumatra and Borneo is also declining due to deforestation. The marine ecosystem is also being depleted in this region. The cultivation of oil palm may not be responsible for all the biodiversity lost but it can be observed that it is depleting biodiversity more than any other crop in that region. The pollution caused by emissions from deforestation and oil palm millis also a great concern.

Vangchhia & Sati (2017) conducted an impact of oil palm on rural livelihoods at mamit and Kolasib district of Mizoram which reveals oil palm plantation ave not much harmful effects on the environment, it reduce the soil quality but not the water quality. The study also finds that Oil Palm plantation is not benefited by the small farmers because the livelihood development through oil palm

productions is very low in every selected village. But at the same time it might be beneficial for big farmer. For instance, one of the farmer in Nalzawl village in Mamit District produces Rs 11, 15, 950 (i.e. 57.84% of the total production in the village) in 2014 - 2015 while the remaining 28 household have contribute 42.16 percent only. Mizoram as a whole per capita per day income from oil palm products (till 2005) is on Rs 0.12. Since the selected two districts i.e. Kolasib and Mamit are the core area of Oil Palm plantation in the state, (contributed 97 % of the total production of the whole state till 2015, according to Agriculture department record), the results from the two districts are treated as valid for consideration of the whole state. Hence, for the whole state, Oil Palm cultivation is not much beneficial for rural farmers especially the low income family because the management expenditure of farmland is very high while the selling price is low as compared to expenditure. It does not have a big improvement for rural livelihood development till the study period.

Yuliani (2018) outlined that despite the forest reform movement in 1998 in Indonesia, deforestation is still increasing in the region. Kalimantan in Indonesia experienced the highest rate of deforestation but some local people are against deforestation and conversion of forests to oil palm plantation. Based on this, the study assessed two communities who try to protect their land and forests. Semi-structured interview schedules and key informants interview were used to collect data. To identify the respondents, a snowball sampling technique was employed. The study revealed that community response to illegal logging and conversion to oil palm cultivation was largely motivated by the history and policy of land use, culture and economic context. There was good participation and initiatives from women. The communities were aware of oil palm cultivation through their relatives who were working in oil palm mills and plantations. They also learned the negative effects of oil palm cultivation through them. Oil palm companies visited them and promised to build infrastructure and generate income if they allowed them to convert their land into oil palm plantations. Most of the villagers opposed to this proposal as they have already learned from their neighboring villages. The companies still try to make use of some influential individuals and leaders in the village to convince others to let them cultivate oil palm in their village. They also paint a negative image of NGOs

who are working towards environment protection. However, all these efforts failed as the villagers were consistent in their rejection. They said that we will live with economic limitations than surrender our land for oil palm cultivation. The paper concluded that these villages were a battleground in which local people put a continuing effort to save the traditional practices and rights over land. The efforts andproposals made by companies to convert their land into oil palm cultivation were not still in success in the regions.

CHAPTER – 3

OIL PALM PLANTATION IN MIZORAM

3.1 Introduction

The economy of over 70 per cent of the population in Mizoram is based on farming with Shifting or Jhuming system of cultivation, which is the mainstay of majority of the farmers. Several efforts have been made to abandon, traditional jhum practice by adopting modern technology. In spite of such effort, the rural community is still depends on their jhum cultivation along with Wet Rice Cultivation (WRC) in some areas.

To change the existing Jhumming practice to permanent settlement, Oil Palm cultivation is one of the options that have vast potential area in Mizoram. Scientists from ICAR-IIOPR (formerly known as DOPR), Pedavegi, Andhra Pradesh have identified Oil Palm potential areas of 1,01,000 Ha in Mizoram. It is expected that the cultivation of Oil Palm will enhance the income of Farm families and will ultimately result in economic upliftment of the rural poor. Oil Palm Development Programme has been implementing in Mizoram since 2004-2005 through the Centrally Sponsored Scheme known as Integrated Schemes on Oilseeds, Pulses, Oil Palm and Maize (ISOPOM). On receipt of the assistance received from Govt. of India under ISOPOM (2004-2005), the Department of Agriculture initiated cultivation of Oil Palm in Kolasib and Lunglei District with an aim to uplift the rural economy to motivate the farmers from traditional to permanent farming. The Mizoram Oil Palm (Regulation of Production & Processing) Act, 2004 was passed in Mizoram Legislative Assembly on 2nd December, 2004. The Government of Mizoram appointed Secretary, Agriculture Department as Oil Palm Officer and the concerned District Agriculture Officers as Oil Palm Inspector in their respective jurisdiction as required under Oil Palm Act, 2004. As required under Oil Palm Act, state level, district level and Village level Committee are constituted for successful implementation of the scheme. The Govt. of Mizoram tied up with private Companies and signed M.O.U for Oil Palm Development Programme. The implementing partner Companies with areas allotted to them are:

Table 3.1
Partnership Companies of Oil Palm Production in Mizoram

Name of Companies	Area allotted	MOU signed on (date)
Godrej Agrovet Ltd.	Kolasib & Mamit	14th Sept. 2005
3F Oil Palm Agrotech Pvt.Ltd.	Aizawl, Serchhip & Siaha	7th March 2006
Ruchi Soya Industries Ltd.	Lunglei & Lawngtlai	3rd Oct. 2006

Source: GOM, Agriculture

During 2011-12, a new Scheme known as Oil Palm Area Expansion (OPAE) under RKVY was introduced for Oil Palm area expansion, which had been implemented in Mizoram till 2013-14. The Ministry of Agriculture, Govt. of India has recently restructured the previous schemes for development of Oilseeds into National Mission on Oilseeds and Oil Palm (NMOOP) and this new Mission will operates from 2014-15.

The Government of Mizoram, Agriculture Department has selected oil palm as one of the crops to be cultivated under the New Land use Policy (NLUP) which is a Flagship Programme of the state Government. Oil Palm is being cultivated in Seven (7) Districts viz- Aizawl, Kolasib, Mamit, Serchhip, Lunglei, Lawngtlai and Siaha District covering an area of 23,358 Ha. So far, 8917 MT costing Rs.455.67 lakh have been sold to the Company. The Companies purchased the FFBs produces by the farmers directly at the Collection Centers for Rs.5.50 per Kg. The price of Oil Palm FFBs is fixed by the Price Fixation Committee on Oil Palm. The farmers have assured market for their produce. Each company should set up Oil Palm Processing Mill for their respective Districts. The First Oil Palm Mill at Bukvannei, Kolasib Dist. under Godrej Agrovet Ltd. was commissioned on 28.10.2014. Another two Processing Mills to be set up by 3F and Ruchi Soya company are in the pipeline.

3.2 Year of Oil Palm Plantation in the Study Area

In the study area, plantation of oil palm firstly started in Mamit and Lunglei districts. All the farmers started the plantation in 2005 having 14 years of experiences. In Mamit district, 30.27 % of the total farmers started the plantation in 2005-2009 and the other 61.78 % started during 2010-2014 and the remaining 7.96 % started in the year 2015-2019. All the selected households in Lawngtlai district have started oil palm plantation during 2015-2019. Like ways a large number of farmers started very recent in Aizawl district (27.73 %). Most of them (72.27 %) started the plantation during the year 2010-2014. All the farmers started the plantation during the year 2010-2014 in the districts of Siaha, Serchhip and Kolasib. Table 3.2 shows district wise year of plantation among oil palm farmers in the study area.

Table 3.2
Year of Oil Palm Plantation in the Study Area

District	No. of household			Household in %		
	2005-'09	2010-'14	2015-'19	2005-'09	2010-'14	2015-'19
Aizawl	0	86	33	0.00	72.27	27.73
Lawngtlai	0	0	353	0.00	0.00	100.00
Mamit	194	396	51	30.27	61.78	7.96
Siaha	0	43	0	0.00	100.00	0.00
Serchhip	0	349	0	0.00	100.00	0.00
Kolasib	0	641	0	0.00	100.00	0.00
Lunglei	547	0	0	100.00	0.00	0.00

Source: Field survey 2018-2019

3.3 Growth of Oil Palm Plantation in Mizoram

The total area under oil palm plantation in Mizoram has increased from 110 Ha. to 2842 Ha during 2005 and 2010. The area under oil palm plantation has increased continuously till 2013-2014 but shows a declining pattern from the year 2013-2014. The reason was two fold - there was a declining trend of adoption and a large number of early adopters have stopped oil palm plantation from 2017. Figure 3.1 shows the changing patterns of oil palm plantation area in Mizoram.

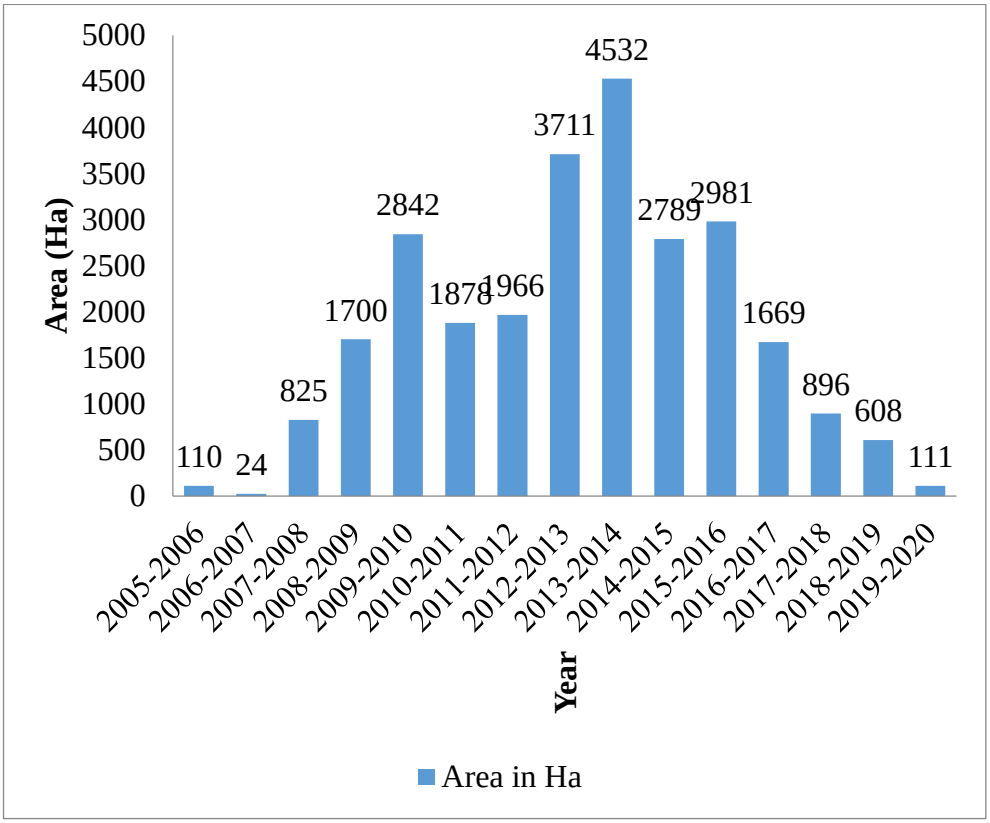

Figure 3.1 Year wise Oil Palm Plantation Area in Mizoram (*Source: Field Study*)

From the starting year of 2005 to 2019-2020, the average growth rate of oil palm plantation area in Mizoram was 73.39. The highest growth rate (615.67) was found during the year 2007-2008 when oil palm plantation has reached the third year of its introduction. The next two years have also witnessed staggering annual growth rates. However, from the year 2007-2008, the growth rate has been declining every year even though the area has still increased slowly. In 2019-2020, the growth rate

was only 0.42. Due to various factors, many oil palm farmers stop the plantation and the area cover has also been increased very minimum. Figure 3.2 shows the growth rate of oil palm plantation area in Mizoram from 2005 to 2019.

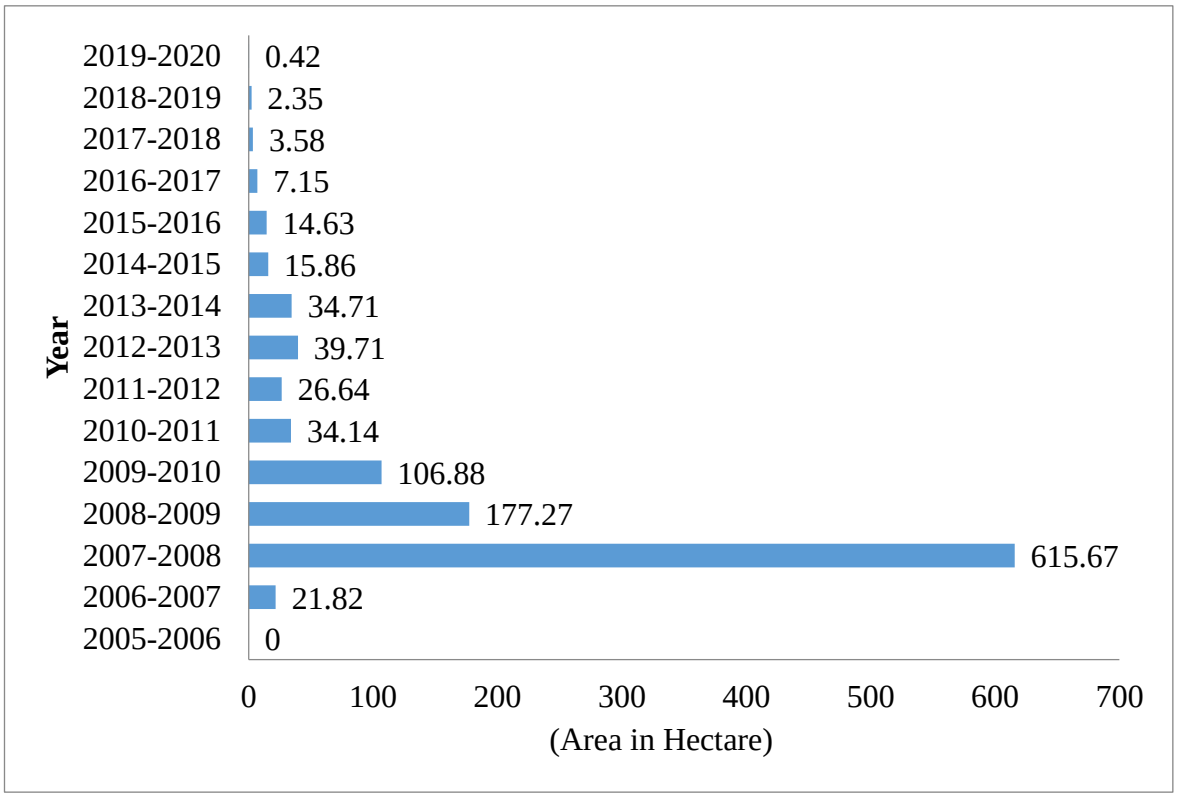

Figure 3.2 Growth of Oil Palm Plantation Area in Mizoram (*Source: Field Study*)

3.3.1 Growth of Oil palm Production in Mizoram

Oil Palm has been harvested from the year 2008-2009. In the first year of production, the state produced the total 2.2 metric ton of Fresh fruit bunches (FFB). The amount of FFB production has increased every year until 2019-2020. The state attained the maximum FFB production in the year 2018-2019 where the total production reach 5298.4 MT after which it decreases rapidly to 1394.65 MT in 2019-2020. As oil palm the plantation crops as well as the permanent crops, the production is supposed to be increased through time.

Since production of FFB has been started, the average growth rate of the production in Mizoram is 120.44. The increasing patterns of FFB production has

been observed till 2011-2012. The highest growth rate has observed in the year 2011-2012 where the growth rate of FFB reaches 618.66. A huge declining growth rate has been observed from the next year i.e., from 2012-2013 where growth rate of FFB production reach only 181.96. The growth rate does not cross 100 after the year 2013. Then, the growth rate was declining continuously and negative growth rate found in the year 2019-2020.

Year wise Production of FFB (MT) in Mizoram

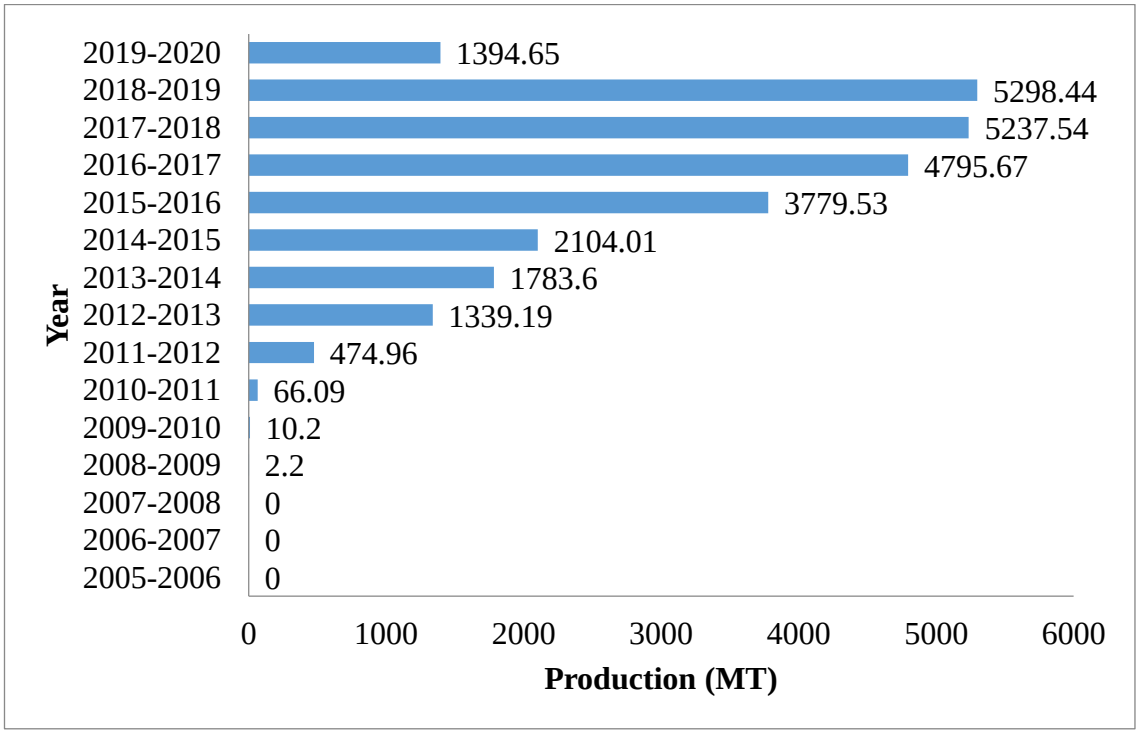

Figure 3.3 Year Wise Production of FFB in Mizoram (*Source: Field Study*)

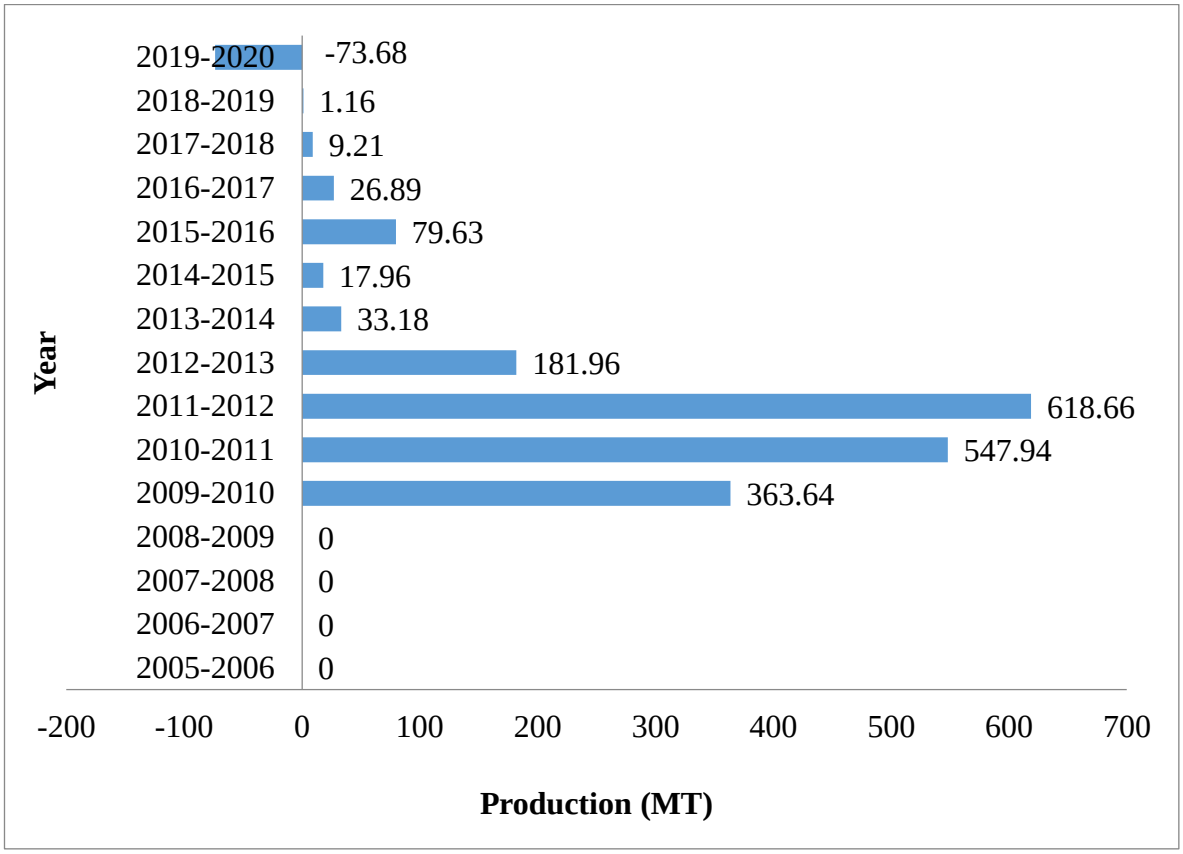

Figure 3.4 Year Wise Growth Rate of FFB Production in Mizoram

3.4 District-wise Analysis of Oil Palm Plantation in Mizoram

3.4.1Aizawl District, 2018

The total plantation area of Oil Palm in Aizawl district was 128.1 hectare of land from the total selected household (i.e., 119 households) who are practicing Oil Palm plantation. The widest plantation area among the 17 villages was Sairang village. In the village, the total area under Oil pam plantation was 26.4 from the selected 14 household. It is calculated as 1.08 hectare of land per household. The total production from the district is 189.76 quintal of FFB from the total area of 128.1 hectare of land. Then the average productivity is 1.34 quintals per hectare or 1341.18 kilograms per hectare. The highest productivity found in Aizawl where the average productivity was 4000 kilograms per hectare which is followed by Thiak (3200) and Dilkhan (2400). There was no FFB production in the four villages such as Rulchawm, N.Lungpher, Phulpui and Muallungthu villages during the study period.

Table 3.3 shows number of household, area, production and productivity of FFB in Aizawl district 2018.

Table 3.3
Area and Production of FFB in Aizawl District 2018

Town/Village	No. of Household surveyed	Area in Ha	Production of FFB in Qtl.	Productivity (Kg/Ha.)
Aizawl	14	15.6	62.4	4000
Sairang	28	26.4	42.24	1600
Sesawng	9	13.5	16.2	1200
Thingsul Tlangnuam	3	2.5	5	2000
Tlungvel	1	0.5	0.6	1200
Rulchawm	3	5.1	0	0
Keifang/Saitual	2	2.3	1.84	800
N.Lungpher	2	3	0	0
Dilkhan	2	2.9	6.96	2400
Phulpui	4	3.4	0	0
Muallungthu	13	9.1	0	0
Sumsuih	3	3	4.8	1600
Falkawn	2	2.4	3.84	1600
Thiak	2	2	6.4	3200
Sialsuk	15	17.3	20.76	1200
Thingsulthliah	9	10.5	8.4	800
Saitual	7	8.6	10.32	1200
Overall	**119.00**	**128.10**	**189.76**	**1341.18**

Source: Field Survey 2018-2019

3.4.2 Lawngtlai District, 2018

As shown in Table 3.4, the total 53 village are selected in Lawngtlai district to meet the required sample. The total FFB Production in the district is 5976.26 quintal from the total area of 383.42 hectare of land. The production per hectare of land in the district is 13976.23 Kilograms of FFB per hectare of land. Three villages like R.Vanhne, Nghalimlui and M.Kawnpui have the highest productivity among the villages where 28,600 kilograms of FFB was produced per one hectare of land. There were nine villages which have no FFB production during the study period such as Adubangasora, Mondirasora, Old Bajeisora, Bajanpara, Palenasora, Ulasury, Rulkual, Chawnhu and Hruitezawl village.

Table 3.4
Area and production of FFB in Lawngtlai District, 2018

Village	No. of Household surveyed	Area in Ha	Production in Qtl.	Productivity (Kg/Ha)
Adubangasora	2	3.5	0	0
Sakeilui - II	3	5.9	101.24	17160
Sakeilui - I	2	3.5	45.04	12870
Sumsilui	1	2.1	3.00	1430
Ajasora - I	4	5.2	37.18	7150
Mondirasora	16	15.2	0	0
Old Bajeisora	2	3.5	0	0
Bajanpara	7	10.8	0	0
Jamersury	3	3.5	40.04	11440
Nalbonya	2	2.1	15.01	7150
Kamalanagar 3	2	2.1	15.01	7150
Kamalanagar 2	1	1	4.29	4290
Bajeisora	1	1	2.86	2860
Palenasora	1	1	0	0
Udalthana II	4	2.1	30.03	14300
Ajasora - II	12	20.9	149.43	7150
Ulasury	1	1	0	0
Ngengpui	20	16.7	286.57	17160
Khawmawi	15	17.6	302.01	17160
Rulkual	3	4.5	0	0
Diltlang	8	8	148.72	18590
Kawlchaw	8	12.9	276.70	21450
R.Vanhne	1	1.7	48.62	28600
Saikah	3	3.12	66.92	21450
L-III	1	1	7.15	7150
College veng	1	2	14.3	7150
Chawnhu	1	3.1	0	0
Hmunnuam	6	5.3	98.52	18590
Bungtlang South	12	8.6	196.76	22880
Lunghauka	15	21.2	454.74	21450
Ngengpuitlang	6	6.6	151.00	22880
Vaseitlang	14	7.7	143.14	18590
Longpuighat	6	6	102.96	17160
Tuidangtlang	8	13.2	226.51	17160
Hruitezawl	11	13.1	0	0
Tuithumhnar	5	6.6	141.57	21450
Hmawngbu	13	8.9	178.17	20020
Fulsora	15	20.8	416.41	20020

Saibawh	11	10.7	183.61	17160
Vaseikai	6	3.5	75.07	21450
Damdep I	5	4.5	102.96	22880
Nghalimlui	5	5.2	148.72	28600
Silbanga	2	1.7	24.31	14300
Vaseitlang II	10	10	185.9	18590
Damdep II	8	8	183.04	22880
Gobasury	5	5	107.25	21450
Bonduk Banga	21	21	360.36	17160
M.Kawnpui	9	8.3	237.38	28600
Golasury	20	20.8	446.16	21450
Mainabapsora-I	7	4.1	76.21	18590
Semeisury	4	4	74.36	18590
Betbonya	3	3	55.77	18590
Lawngtlai-III	1	0.6	11.15	18590
Overall	**353**	**383.42**	**5976.25**	**13976.23**

Source: Field Survey 2018-2019

3.4.3 Mamit District, 2018

Mamit district produced the 42136.38 quintals of FFB from 34 villages comprising 641 household. The total area under the plantation is 816.5 hectare of land and the average productivity is 48,367.65 kilograms per hectare. The highest productivity found in the three villages such as Tuidam, Nalzawl and New W.Phaileng where the FFB production per hectare is 85,800 kilograms. There was no FFB production in Bungthuam village during the study period. Table 3.5 shows the area and production of FFB in Mamit District, 2018.

Table 3.5
Area and production of FFB in Mamit District, 2018

Village	No. of Household surveyed	Area in Ha	Production in Qtl.	Productivity (Kg/Ha)
Bawngva	2	6.3	450.45	71500
Bungthuam	17	20.5	0	0
Chhippui	17	7.1	304.59	42900
Damparengpui	20	21.8	311.74	14300
Darlak	18	31.9	2280.85	71500
Hmunpui	7	2.1	90.09	42900
Hreichuk	16	16	686.4	42900
Hriphaw	40	45	1930.5	42900

Kanhmun	3	5.5	235.95	42900
Kawrtethawveng	6	7	200.2	28600
Kawrthah	3	1.9	27.17	14300
Khawhnai	37	45.8	2619.76	57200
Lallen	18	5.8	331.76	57200
Lengpui	1	1	57.2	57200
Luimawi	4	25.2	1441.44	57200
Mamit 'N'	12	12.8	549.12	42900
Mamit 'S'	2	4.9	210.21	42900
Nalzawl	86	94	8065.2	85800
New W.Phaileng	25	29	2488.2	85800
Phuldungsei Vengthar	9	5.9	253.11	42900
Pukzing Vengthar	13	13	557.7	42900
Rengdil	2	2	85.8	42900
Rulpuihlim	8	5.3	227.37	42900
S.Sabual	15	8.5	364.65	42900
Saithah	10	10.2	437.58	42900
Sihthiang	36	36.2	1552.98	42900
Suarhliap	2	2	85.8	42900
Tuidam	21	21.2	1818.96	85800
Tuirum	26	22.2	952.38	42900
W.Bunghmun	104	210	9009	42900
W.Phaileng	8	6.2	443.3	71500
W.Serzawl	7	6.9	493.35	71500
Zamuang	7	29.5	1265.55	42900
Zawlnuam Borai	39	53.8	2308.02	42900
Overall	**641**	**816.5**	**42136.38**	**48367.65**

Source: Field Survey 2018-2019

3.4.4 Siaha District, 2018

Since Oil Palm plantation was started recently and practice in Siaha by a small number of population, only four villages were selected for case study in Siaha district. The total area under Oil Palm plantation in the district was 25.6 hectare of land. During the study period, the district has no production of FFB as shown in Table 3.6

Table 3.6
Area and production of FFB in Siaha District, 2018

Village	No. of Household surveyed	Area in Ha	Production in Qtl.	Productivity (Kg/Ha)
Siaha	2	2.3	0	0
Zero	27	15.2	0	0
Maubawk CH	11	5.6	0	0
Maubawk L	3	2.5	0	0
Overall	**43**	**25.6**	**0**	**0**

Source: Field Survey 2018-2019

3.4.5 Serchhip District, 2018

Oil Palm plantation cover the total area of 131.6 hectare of land in Serchhip district where 349 household practicing the plantation from the nine villages. The selected villages of Serchhip district produced 3328.18 quintals FFBs during in 2018. Thus, the average productivity of FFB in the district was 18907.78 kilograms per one hectare. The highest productivity was found in Khumtung village whereas Piler village has produced 18.018 quintals and it is the lowest productivity of 8580 kilograms per hectare of land as shown in Table 3.7

Table 3.7
Area and production of FFB in Serchhip District, 2018

Village	No. of Household surveyed	Area in Ha	Production in Qtl.	Productivity (Kg/Ha)
Serchhip	89	35.5	1015.3	28600
Thenzawl	78	27.6	868.296	31460
Khawlailung	11	6.3	117.117	18590
Piler	8	2.1	18.018	8580
Chhiahtlang	28	11	125.84	11440
Chhingchhip	12	4.9	63.063	12870
Khumtung	56	26.1	895.752	34320
Bungtlang	47	12.4	159.588	12870
Keitum	20	5.7	65.208	11440
Overall	**349**	**131.6**	**3328.18**	**18907.78**

Source: Field Survey 2018-2019

3.4.6 Kolasib District, 2018

Kolasib district was found to be the second largest producer of FFB next to Mamit district. The district produced 20,483.32 quintals of FFBs from 447.3 hectare of land. The average productivity (i.e 46,475 Kg/ha) was also the second highest among the district next to Mamit district. There were six villages having highest productivity in the district such as Bukvannei, Siahapui K, Siahapui 'V', New Khamrang, Khamrang and Buhchangphai on the one hand and Lungmuat and Bualpui 'N' village are the bottom villages on the other hand. Table 3.8 shows the area and production of FFB in Kolasib District, 2018.

Table 3.8
Area and production of FFB in Kolasib District, 2018

Village	No. of Household surveyed	Area in Ha	Production in Qtl.	Productivity (Kg/Ha)
Bairabi	5	2.2	125.84	57200
Bilkhawthlir	5	4.2	180.18	42900
Bualpui 'N'	20	14.1	201.63	14300
Bukpui	39	32	1372.80	42900
Bukvannei	47	26.5	1894.75	71500
Phaisen	37	23.5	1344.20	57200
Kawnpui	111	99.7	4277.13	42900
Kolasib	34	28.8	1647.36	57200
Lungmuat	15	8.2	117.26	14300
Meidum	10	8.7	497.64	57200
Mualkhang	18	11.6	663.52	57200
N.Chawnpui	14	8.4	360.36	42900
N.Hlimen	18	6.3	180.18	28600
Nisapui	9	9.5	271.70	28600
Phainuam	29	19.4	832.26	42900
Siahapui K	3	2.5	178.75	71500
Siahapui 'V'	9	7	500.50	71500
Saipum	13	5.7	163.02	28600
Thingdawl	15	6.6	188.76	28600
Thingthelh	42	24.7	706.42	28600
Vairengte	28	17.3	494.78	28600
Zanlawn	37	22.1	948.09	42900
Bilkhawthlir 'N'	9	8	228.80	28600
Buhchangphai	7	3.9	278.85	71500
Hortoki	18	14	600.60	42900
New Khamrang	1	0.5	35.75	71500
Rengtekawn	18	6.2	354.64	57200
Khamrang	30	25.7	1837.55	71500
Overall	**641**	**447.3**	**20483.32**	**46475**

Source: Field Survey 2018-2019

3.4.7 Lunglei District, 2018

Oil Palm Plantation has started in the year 2005 in Lunglei district. A huge population of the district practice the plantation. In 2018, the total area under Oil Palm plantation in the district cover 329 hectare of land from 547 households. In the same year, the total FFBs of Oil Palm produced by the district was 7,786.49 quintals

and the average productivity was 24,310 kilograms per hectare. The highest productivity (42900 kg/ha) was found in Tawipui, Lungsen, Phairuang, Rotlang, Sedailui, Thiltlang, Tipperaghat, Tlabung and Zawlpui villages whereas there is no FFB production in Rangte village. Table 3.9 shows the area and production of FFB in Lunglei District, 2018.

Table 3.9
Area and Production of FFB in Lunglei District, 2018

Village	No. of Household surveyed	Area in Ha	Production in Qtl.	Productivity (Kg/Ha)
Bualpui V	10	5.3	75.79	14300
Buarpui	28	11.9	170.17	14300
Bulongsury	8	5.6	80.08	14300
Bunghmun	24	18.6	319.18	17160
Changpui	18	8.6	122.98	14300
Lunglei	22	14.5	207.35	14300
Chawilung	48	16.7	238.81	14300
South Chawnpui	13	9.9	212.36	21450
Diblibagh	28	19.8	339.77	17160
Haulawng	19	12.8	292.86	22880
Hauruang	16	10.1	216.65	21450
Hnahthial	39	20.3	290.29	14300
Kanghmun S	14	4.9	105.11	21450
Leite	3	1.6	34.32	21450
Lungrang	13	8.1	173.75	21450
Lungsen	10	5.5	235.95	42900
Mualthuam S	10	4.7	100.82	21450
Pangtlang	10	5.9	126.56	21450
Phairuang	10	7.1	304.59	42900
Pukpui	6	3.8	48.91	12870
Putlungasih	10	8.4	180.18	21450
Rangte	9	6.1	0.00	0
Rawpui	8	5.9	101.24	17160
Rotlang	10	3.5	150.15	42900
Rualalung	4	5.5	94.38	17160
Sedailui	10	14	600.60	42900
Sihphir	1	1	21.45	21450
Tawipui	27	10.1	433.29	42900
Thiltlang	7	2.4	102.96	42900
Thualthu	8	3.9	111.54	28600
Tipperaghat	10	7.5	321.75	42900

Tlabung	8	10.8	463.32	42900
Tuipui D	4	2.3	32.89	14300
Tuisenchhuah	15	10.1	288.86	28600
Vanhne	9	3	85.80	28600
Zawlpui	14	10.9	467.61	42900
Zobawk	14	7.7	165.17	21450
Zodin	10	12.6	360.36	28600
Zohmun	20	7.6	108.68	14300
Overall	**547**	**329**	**7786.49**	**24310**

Source: Field Survey 2018-2019

3.4.8 District Wise Area and production of FFB in the Study Area, 2018

Table 3.10 shows the district wise area and production of FFBs in Mizoram. Among the 7 districts, Oil Palm production and productivity is the highest in Mamit district. Oil Palm plantation was introduced at Mamit district in 1 year and as it has a favourable climate and soil as well as locational advantages. The district attained the top achievement as compared to other. The district accounted for 52.74 % of the total Oil Palm plantation area of the study area. The district alone produced 36.10 % of the total FFBs production. Productivity is also highest among the selected district. On the other hand, there was no FFBs production during the study period in Siaha district because the district started plantation of oil palm a little bit late Due to past experience of the other districts, peoples are not much interest to start Oil Palm plantation and hence the cover area and people involved are very less as compared to other districts.

Table 3.10
District Wise Area and production of FFB in the Study Area, 2018

Districts	No. of Household surveyed	Area in Ha	Production in Qtl.	Productivity (Kg/Ha)
Aizawl	119.00	128.10	189.76	1341.18
Lawngtlai	353.00	383.42	5976.26	13976.23
Mamit	641.00	816.50	42136.38	48367.65
Siaha	43.00	25.60	0.00	0.00
Serchhip	349.00	131.60	3328.18	18907.78
Kolasib	641.00	447.30	20483.32	46475.00
Lunglei	547.00	329.00	7786.49	24310.00
Overall	**2693.00**	**2261.52**	**79900.39**	**21911.12**

Source: Field Survey 2018-2019

3.5 Classification of Villages on Oil Palm Plantation Area

All the villages were classified according to the area of Oil Palm Plantation (OPP) they have like less than 10 hectares, 10 to 20 hectares, 20 to 30 hectares, 30-40 hectares, 40 to 50 hectares and more than 50 hectares of land. The number of household having less than 10 hectare of land is highest comprising more than half of the total household selected (62.50%). The household having 10 to 20 hectares of land is the second highest in number accounting 20.11 percent of the total selected household which is followed by household having 20 to 30 hectares of land (11.96%), household having 30-40 hectare of land (2.17%), household having more than 5 hectares of land (2.17%) and household having 40 to 50 hectares of land (1.09%). Table 3.11 shows classification of villages on OPP area of households.

Table 3.11
Classification of Villages on OPP Area

Area in Ha	No. of village	No. of village in %
> 50	4	2.17
40 to 50	2	1.09
30 to 40	4	2.17
20 to 30	22	11.96
10 to 20	37	20.11
< 10	115	62.50

Source: Field Survey 2018-2019

3.6 Slope and Oil Palm Productivity

The entire study area is divided in to four categories according to slope degree such as 0 to 10 degree, 10 to 20 degree, 20 to 30 degree and more than 30 degree. There are 4 villages in 10 to 10 degree category. The maximum number of village (i.e., 93) falls under the slope category of 10 to 20 degree. The total 63 villages are under the category of 20 to 30 slope degree. The greatest or highest degree of slope found is more than 30 degree wherein 20 villages are included. The average productivity of FFB is highest in the slope category of more than 30 degree in which the average productivity of FFB is 31.80 quintal per one hectare of land. The second highest productivity found in the slope category of 20 to 30 where the average productivity is 24.76 quintal per hectare which is followed by the slope category of

10 to 20 and 0 to 10 where the average productivity is 14.73 and 9.50 quintal per hectare respectively.

Table 3.12
Slope and Oil Palm Productivity

Slope in Degree	Average Productivity	*No. of Village	No. of Village in %
above 30	31.80	20	11.11
20 to 30	24.76	63	35.00
10 to 20	14.73	93	51.67
0 to 10	9.50	4	2.22

Source: Field Survey 2018-2019

*No. of village excluding Siaha because there is no production at the time of survey

3.7 Altitudinal Zonation of Oil Palm Productivity

All the villages were classified in to five altitudinal zone such as below 100 meters, 100 meters to 300 meters, 300 meters to 600 hundred meters, 600 meters to 900 meters and above 900 meters from mean sea level. Most of the farmers practice oil palm plantation at an altitude between 600 to 900 meters above mean sea level. The other 20 percent of the total farmer do the plantation at an altitude below 100 meters and 100 to 300 meters above mean sea level. The highest altitudinal zone of plantation site accounts the least number of oil palm farmers. The highest productivity of Fresh Fruits Bunches (FFB) found in the altitude below 100 meter from mean sea level with having the average productivity of 35.31 kilograms per hectare of land. The second highest productivity found between 300 to 600 meters (28.09 Kg/Ha) followed by altitude of 600-900 meters (27.48 Kg/Ha) and altitude zone between 100 to 300 meters (25.99 Kg/Ha). The lowest productivity found in the altitudinal zone V where only 11/84 kilograms are harvested per one hectare of land.

Table 3.13
Altitude and Oil Palm productivity

Altitudinal Zone	Altitude in Meter	No. of villages	No. of village in %	Average Productivity
V	Above 900	28	15.56	11.84
IV	600-900	51	28.33	27.48
III	300-600	29	16.11	28.09
II	100 to 300	36	20	25.99
I	Below 100	36	20	35.31

Source: Field Survey 2018-2019
No. of village excluding Siaha because there is no production at the time of survey

3.8 Relationship between Altitude and Oil Palm productivity

The relationship between altitude and oil palm productivity is examined with the help of Pearson's Correlation method, the R value of -0.725 indicates that there is a high negative relationship between altitude and Oil Palm Productivity in the study area.

It means higher the altitude lesser is the Oil Palm Productivity and vice versa.

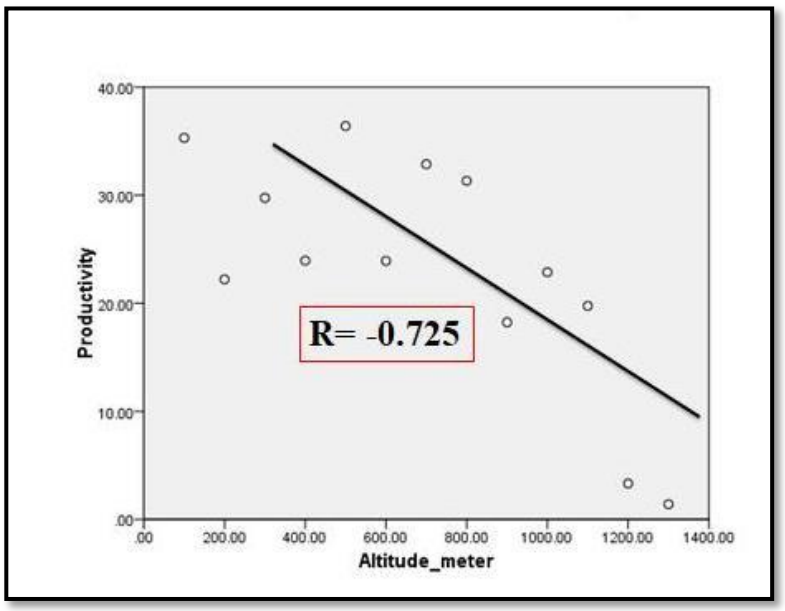

Fig.3.5 Relationship between Altitude and Oil Palm productivity

3.9 Soil Types and Oil Palm Productivity

Based on hand feeling test method, the three major types of soils viz., Clayey, Mud clayey and Sandy soil have been observed where oil palm plantation is practicing. Oil palm plantation is practice mainly in clayey soils which comprise 64.44 percent of the total plot of plantation. Mud clayey type of foil found in 59 plot of plantation accounting 32.78 percent of the total plantation plot. Only 2.78 percent of the total oil palm plot found in the Sandy type of soil. The average productivity is highest in Sandy soil type where production per hectare is 31.74 kilograms followed by clayey soils (26.06 Kg/Ha) and mud clayey soils (17.21 Kg/Ha).

Table 3.14
Soil Types and Oil Palm productivity

Soil Type	Average Productivity	*No. of Oil Palm Plantation Plot	No. of Oil Palm Plantation Plot in %
Sandy	31.74	5	2.78
Mud Clayey	17.21	59	32.78
Clayey	26.06	116	64.44

Source Field Survey, 2018-2019

No. of Oil Palm Plantation Plot excluding Siaha because there is no production at the time of survey

3.10 Conclusion

Under several schemes of central and state government, the area and production of oil palm in Mizoram had been increasing for up to 9 years when the plantation has been started. The growth rate of the area under the oil palm plantation was also high. However, the area and growth rate have declined in recent years due to many reasons. Production of Fresh Fruit Bunches (FFB) was also increasing till 2019- 2020. The growth rate of FFB fluctuates from time to time. Oil palm plantation has been practiced in the 7 districts of Mizoram such as Mamit, Kolasib, Aizawl, Serchhip, Lunglei, Lawngtlai and Saiha. Mamit district obtained the highest production and productivity of oil palm among the district. Early introduction, soils and climate favor the district. Mamit district accounts for 52.74 percent of the total oil palm plantation area in Mizoram. The district produced 36.10 percent of the total

FFBs production of the state. Productivity is also highest among the seven districts. Kolasib district is next to Mamit district and contribute significant values in terms of production. There is no FFB production in Saiha district. Generally, plantation area and production had been declining whereas productivity is still growing.

PHOTO PLATES:

Plate 1: Plantation of Oil Palm in Mamit District, Mizoram

Source: Author's photograph, 2018

Plate 2: Oil Palm Mill, Bukvannei, Kolasib District

Source: Author's photograph, 2018

Plate 3: Nursery of Oil Palm

Source: Author's photograph, 2018

Plate 4: Interaction with Oil Palm Farmers

Source: Author's photograph, 2018

Plate 5: Construction of Tanky under Oil Palm

Source: Author's photograph, 2018

Plate 6: Roadside Plantation, Khamrang, Aizawl District

Source: Author's photograph, 2018

Plate 7: Roadside Plantation, Tawipui, Lunglei District

Source: Author's photograph, 2018

Plate 8:Oil Palm Plantation, Nghalimlui, Lawngtlai District

Source: Author's photograph, 2018

Plate 9: Oil Palm Nursery, Nghalimlui, Lawngtlai District

Source: Author's photograph, 2018

Plate 10: Bawngva Collection Center, Mamit District, Mizoram

Source: Author's photograph, 2018

Plate 11: Oil Palm Seed Garden,West Serzawl, Mamit District

Source: Author’s photograph, 2018

Plate 12: Distribution of Oil Palm Harvesting Tools, West Serzawl, Mamit District

Source: Author's photograph, 2022

CHAPTER – 4

LIVELIHOOD OF OIL PALM FARMERS - A DISTRICT-WISE ANALYSIS

4.1 Introduction

During the past few decades, the Oil palm (*Elaeis guineensis*) has become one of the most rapidly expanding equatorial crops in the world, the total cultivated area now accounting for nearly one-tenth of the world's permanent cropland (FAO 2007; WRI 2007). Despite a recent fall in the price of Oil palm, prices are already recovering and growth in global demand is predicted to return to earlier levels of 2.2 million tons per year by 2010 (Index Mundi,2009; USDA-FAS 2009).

The rapid and massive expansion of Oil palm in the tropics, as well as other biofuels, has led to concern over impacts on natural habitats, biodiversity and the global climate (Fargione et al. 2008; James 2008; Koh and Ghazoul 2008; Butler and Laurance 2009). While this has been paralleled by alarm over the implications for national and global food security (Rahman et al., 2008), the broader social and livelihood implications of biofuel cultivation remain poorly understood (Sandker et al. 2008; CIFOR 2008, Rist *et al*. 2009). Several NGO reports have highlighted significant negative impacts on rural communities, incidents of human rights violations and 'land grabbing' in areas of Oil palm development(WRM 2001; Colchester and Jiwan 2006; Colchester et al. 2007; FOE 2008). Oil palm has been accused of negatively affecting human health, destroying cultural heritage and leading to the loss of autonomy and self sufficiency, in addition to impoverishment as a result of debts and low wages (FOE 2008).

4.2 Major Reasons of Oil palm production

One of the reasons to start thinking Oil palm cultivation is its high yielding in nature and the production of good quality fruits in various countries in the world. As shown in the Table 4.1, the main reasons to start Oil palm plantation in the study area includes unavailability of other occupational options (33.04%), hope for Oil palm is beneficial (28.61%), Govt. Scheme which means the government is offering start up program like free seedlings and other supports etc. (23.77%), friends motivation (6.86%) and started by chance (7.72%).

Table 4.1 Reason to Start Oil palm Plantation (among the farmers)

District	No other occupation	Hope for Oil palm is beneficial	Govt. Scheme	Friends motivation	Started by chance
Aizawl	39.50	17.65	26.05	13.45	3.36
Lawngtlai	34.28	28.90	26.06	9.63	1.13
Mamit	36.04	29.49	20.59	9.67	4.21
Siaha	30.23	27.91	23.26	6.98	11.63
Serchhip	28.08	27.79	26.93	3.44	13.75
Lunglei	40.40	35.28	19.01	2.38	2.93
Kolasib	22.78	33.23	24.49	2.50	17.00
Lunglei	40.40	35.28	19.01	2.38	2.93
Mizoram	**33.04**	**28.61**	**23.77**	**6.86**	**7.72**

Source: Field Survey, 2018-2019

As shown in the Table 4.1, one of the main reasons to start Oil palm plantation in the study area is government policy i.e., New Land use Policy (NLUP). The state government of Mizoram selected Oil palm as one of the crops to be planted under the NLUP**.** Since the programme was started, Oil palm development scheme was one of the most successful schemes in the state. Under the NLUP, a large number of farmers started Oil palm plantation. The scheme was divided into 4 phases. The total 3,114 farmers are benefitted by the scheme covering the six district excluding Siaha and Champhai districts. As shown in the Table 4.2, Lunglei district got the highest number of Oil palm beneficiaries comprising 34.18 per cent of the total beneficiaries followed by Kolasib district (23.73%), Mamit district (16.51%), Serchhip district (15.16%), Lawngtlai district (7.71%) and Aizawl district (2.09%).

Table 4.2 Number of Oil palm Beneficiaries under NLUP

District	1st Phase	2nd Phase	3rd Phase	4th Phase	Total
Aizawl	34	16	9	6	65
Lawngtlai	3	135	69	33	240
Mamit	168	185	116	45	514
Siaha	0	0	0	0	0
Serchhip	75	357	29	11	472
Kolasib	83	104	386	166	739
Lunglei	41	462	390	191	1084
Champhai	0	0	0	0	0
Total	**404**	**1259**	**999**	**452**	**3114**

Source: GOM, 2019

4.3 Facilities received from the Government

Some of the Oil palm farmer received aided/funds from the state government in terms of financials, machineries and seeds etc. As shown in Table 4.3, all the Oil palm farmers in Aizawl district received financial assistant from the state government whereas the others district do not received any financial help. All the farmers in the study area received Oil palm seedlings. Fertilizers and pesticides are also provided to all farmers in the whole state except Aizawl district where only 10.08 per cent of the total farmer received fertilizers and pesticides. Irrigation facilities have been provided to farmers of Aizawl district. No farmers received any kind of machine tools till the study period. Few of the farmers received facilities for construction of water storage tank such as Kolasib (62.78%), Mamit (50.16%) and Lunglei districts (3.06%). Other assistance including ladders, Net, Brush cutter, digging tools, half-moon terrace and terrace etc., are received by some Oil palm farmers in the study are such Aizawl (68.07%), Kolasib (62.78%) and Mamit (50.16%). However the other four districts do not received such kind of assistance from the state government.

Table 4.3 Number of Oil palm Farmers receiving Government Assistance

District	Cash	Seeds	Fertilizers	Pesticides	Irrigation Equipment	Machine Tools	Water Tanky	Others
Aizawl	100.00	100.00	10.08	10.08	100.00	0.00	0.00	68.07
Lawngtlai	0.00	100.00	100.00	100.00	0.00	0.00	0.00	0.00
Mamit	0.00	100.00	100.00	100.00	0.00	0.00	50.16	50.16
Siaha	0.00	100.00	100.00	100.00	0.00	0.00	0.00	0.00
Serchhip	0.00	100.00	100.00	100.00	0.00	0.00	0.00	0.00
Lunglei	0.00	100.00	100.00	100.00	0.00	0.00	3.06	0.00
Kolasib	0.00	100.00	100.00	100.00	0.00	0.00	62.78	62.78

Source: Field Survey, 2018-2019

4.3.1 Household Economy of Oil palm Farmer in Aizawl District, 2018

Household economy of Oil palm farmers in the study area have been studied by selecting 14 economic indicators such as percentage of permanent house (X_1), per capita per day income in rupees(X_2), percentage of household having television (X_3), percentage of household having refrigerator (X_4), percentage of household having washing machine (X_5), percentage of family having Long chair/Sofa (X_6), percentage of family having motor vehicle (X_7), percentage of family having two wheeler (X_8), percentage of family having water connection (X_9), percentage of family having LPG connection (X_{10}), number of mobile phone per household (X_{11}), percentage of household having computer (X_{12}), percentage of family having internet facilities (X_{13}) and percentage of family having newspaper subscription (X_{14}). Table 4.4 gives descriptive statistics of the 17 villages.

Table 4.4 Descriptive Statistics

Indicators	N	Minimum	Maximum	Mean	Std. Deviation
X_1	17	.00	16.00	2.882	4.35721
X_2	17	290.00	350.00	320.000	16.58312
X_3	17	50.00	125.00	81.371	22.91609
X_4	17	.00	100.00	52.816	29.52506
X_5	17	.00	100.00	53.769	27.52278
X_6	17	.67	1.00	.912	.13373
X_7	17	.00	.57	.364	.14274
X_8	17	.00	.71	.298	.19667
X_9	17	.00	100.00	63.4335	38.32998
X_{10}	17	30.77	433.33	111.9641	85.17739
X_{11}	17	1.25	3.50	2.2624	.59283
X_{12}	17	.00	.67	.3376	.20073
X_{13}	17	.00	100.00	66.2118	25.81940
X_{14}	17	.00	78.57	33.3076	24.34889
Valid N (listwise)	17				

In Aizawl district, the most common house type among the Oil palm farmer was Assam type house which accounted for 57.9 per cent of the total selected household. Semi-permanent (26.05%) and RCC (15.13%) type of house were also found whereas there was only one Bamboo type of house. Only 2.8 per cent of the total Oil palm farmers lived in permanent house (i.e., semi-permanent + RCC). The average per capita per day income of Oil palm farmer in the study area was Rs. 320. Aizawl South having 350 rupees per capita per day has obtained the highest position among all the villages whereas the lowest per capita per day income was found in Rulchawm village. More than 80 per cent of the Oil palm farmers in Aizawl district have Television (81.37%). More than half of the total households were reported to have refrigerator (52.82%). Only 0.37 per cent of the total Oil palm farmers have at least one kind of motor vehicle. This is one of the major problems faced by the farmer is since motor vehicle one of the primary requirement in the plantation especially in the harvesting period. Similarly, 0.3 per cent of the total farmers have any kind of two wheeler vehicle. 63.43 per cent of the total Oil palm farmer in Aizawl district is having water connection in their household.

All the households in Aizawl South, Thingsul Tlangnuam, Tlungvel, Keifang, N.Lungpher, Falkawn and Saitual villages have piped water connection. On the other hand, no farmer in Dilkhan, Sumsuih and Thiak village has water connection. Almost all the household in the district were using LPG (89%). There was no household living without Mobile Phone and, the average number of mobile phone per household was 2.26. Only 0.34 per cent of the total household have computer. Internet connection including mobile phone connectivity was found in 66.21 per cent of the total household.

After obtaining z-score of every indicator, the composite score of each village have been calculated as shown in the Table 4.4. Based on the composite score, the villages were classified into five levels such as Very High, High, Moderate, Low and Very Low on household economy of the Oil palm farmer (Table 4.5). Among all the villages 23.5 per cent of the total villages are classified under Very High status in household economy. Likewise 5.88% are High, 11.76% are Moderate, 17.65% are Low and the largest number accounting 41.18% are Very Low in Aizawl district.

Table 4.5 Village wise Composite Score on Household Economy

Village	Composite Score	Village	Composite Score
Aizawl South	0.94	Phulpui	0.06
Sairang	-0.30	Muallungthu	-0.29
Sesawng	-0.66	Sumsuih	0.09
Thingsul Tlangnuam	-0.02	Falkawn	0.68
Tlungvel	-0.30	Thiak	0.07
Rulchawm	-0.45	Sialsuk	-0.40
Keifang	0.68	Thingsulthliah	-0.54
N.Lungpher	0.29	Saitual	0.51
Dilkhan	-0.36		

Table 4.6 Levels of Household Economy of Oil palm Farmer, Aizawl District

Index	Levels in Household Economy	Village
Above 0.5	Very High	Sairang, Aizawl South, Sialsuk & Muallungthu
0.1 to 0.5	High	Saitual
0.1 to -0.1	Moderate	Thingsulthliah & Sesawng
-0.1 to -0.5	Low	Phulpui, Sumsuih & Falkawn
Below -0.5	Very Low	Thingsul Tlangnuam, N.Lungpher, Keifang, Thiak, Rulchawm, Dilkhan & Tlungvel

4.3.2 Household Economy of Oil palm Farmers in Lawngtlai District, 2018

Oil palm farmers in Lawngtlai district were found a little bit backward in household economy as compared to other districts. Most of the Oil palm farmers (64.02%) lived in Assam type house. Bamboo house is the second most common type of house next to Assam type of house followed by Semi-permanent (11.9%) and RCC (1.70%). Per capita per day income in the district was only 165 rupees. The highest per capita income was found in Lawngtlai III where the average per capita per day income of Oil palm farmer was 290 rupees. On the other hand, the lowest per capita per day income was 110 rupees per day in Fulsora village. Only 23 per cent of the total households earned rupees 200 per day per capita.

Only 37.24 per cent of the total Oil palm farmers have their own television in the house while the percentage of household having washing machine was 18.24% only. Most of the Oil palm farmer in the district did not have motor vehicle and two-wheeler. Only 0.17 and 0.23 per cent of the total household have their own motor vehicle and two-wheeler respectively. There were 19 villages (35.84%) where no Oil palm farmers have any kind of vehicle to support their livelihood and plantation. Like ways, no household have two-wheeler in 18 villages (33.96%). Piped water connection is one of the basic indicators explaining livelihood standard of the people. Among the Oil palm farmers in Lawngtlai district, only 27.40 per cent of the total households have access to water connection. The other 72.60 per cent depended on other sources of water such as spring, rainwater, wells, public water distribution etc. There were 35 villages (66.03%) where no household have proper water connection. LPG connection is now becoming the primary method for domestic cooking even in the remote part of the state. In Lawngtai district, more than half (66.36%) of the total Oil palm farmer used LPG for household cooking.

Mobile phone and internet connectivity are now common household materials in the whole state of Mizoram. The farmers also used significantly for communication and learning tools. In the district Lawngtlai, 32 per cent of the total households have 1 or 2 number of mobile phone in their family. The household having computer is very low among the Oil palm farmers. Only 0.09 per cent of the

total households have owned computers. In 27 villages of the district, no household was found to have owned computer. This explains that Oil palm farmers of the district are far behind of the modern world economically and educationally. More than half of the total household in the district access internet connection through broadband and mobile phone. Some of the farmers beneficially used internet facilities to improve plantation and harvesting methods. In the 12 villages (22.64%), all the household has internet facilities. On the other hand, no Oil palm farmers have any kind of internet facilities in five villages including Sumsilui, Bajeisora, Palenasora, Ulasury and Silbanga.

Table 4.7 depicts the number of villages, mean and standard deviation on selected 14 economic status indicators for the 53 villages in Lawngtlai district.

Table 4.7 Descriptive Statistics, Lawngtlai Disctrict

Indicators	N	Minimum	Maximum	Mean	Std. Deviation
X_1	53	.00	48.00	2.742	8.03794
X_2	53	110.00	290.00	165.000	41.55626
X_3	53	.00	100.00	37.237	27.69541
X_4	53	.00	100.00	43.073	29.03120
X_5	53	.00	100.00	18.239	26.95110
X_6	53	.00	1.00	.584	.32245
X_7	53	.00	1.00	.165	.19121
X_8	53	.00	1.00	.234	.25470
X_9	53	.00	100.00	27.403	40.34157
X_{10}	53	.00	100.00	66.363	31.34625
X_{11}	53	1.43	7.00	2.577	1.06075
X_{12}	53	.00	.50	.094	.12615
X_{13}	53	.00	100.00	56.299	31.26309
X_{14}	53	.00	100.00	19.307	28.80961
Valid N (listwise)	53				

After obtaining Z score of every 14 economic indicators, composite score (CI) of each village have been calculated to identify the levels of household economy among Oil palm farmers in different villages of the district (Table 4.8).

Table 4.8 Composite Score of the villages, Lawngtlai District

Village	CI	Village	CI	Village	CI
Adubangasora	-0.05	Khawmawi	0.17	Hmawngbu	-0.55
Sakeilui - II	-0.12	Rulkual	-0.11	Fulsora	-0.20
Sakeilui - I	-0.22	Diltlang	0.18	Saibawh	-0.14
Sumsilui	-0.89	Kawlchaw	0.73	Vaseikai	0.98
Ajasora - I	0.17	R.Vanhne	0.47	Damdep I	-0.28
Mondirasora	-0.16	Saikah	-0.08	Nghalimlui	-0.13
Old Bajeisora	0.43	L awngtlai III	1.01	Silbanga	-0.84
Bagapara	-0.29	College veng	1.93	Vaseitlang II	0.07
Jamersury	-0.05	Chawnhu	0.68	Damdep II	-0.29
Nalbonya	-0.53	Hmunnuam	-0.07	Gobasury	-0.17
Kamalanagar I	-0.04	Bungtlang	0.29	Bonduk Banga	-0.30
Kamalanagar II	0.33	Lunghauka	-0.56	M.Kawnpui	0.78
Bajeisora	-0.45	Ngengpuitlang	0.17	Golasury	-0.16
Palenasora	-0.71	Vaseitlang	-0.06	Mainabapsora-I	-0.38
Udalthana II	-0.41	Longpuighat	0.94	Semeisury	-0.30
Ajasora - II	-0.03	Tuidangtlang	-0.38	Betbonya	-0.58
Ulasury	-0.85	Hruitezawl	-0.40	Lawngtlai-II	1.85
Ngengpui	0.03	Tuithumhnar	-0.45		

Based on the composite score, the villages were classified into five levels of household economy such as Very High, High, Moderate, Low and Very Low. In the Very High category, there were 8 villages like College veng, Lawngtlai II, Lawngtlai-III, Vaseikai, Longpuighat, M.Kawnpui, Kawlchaw & Chawnhu. On the other hand, Very Low household economy comprises villages like Nalbonya, Hmawngbu, Lunghauka, Betbonya, Palenasora, Silbanga, Ulasury & Sumsilui.

Table 4.9 Levels of Household Economy of Oil palm Farmers, Lawngtlai District, 2018

Index	Levels of Household Economy	Village
Above 0.5	Very High	College veng, Lawngtlai II, Lawngtlai-III, Vaseikai, Longpuighat, M.Kawnpui, Kawlchaw & Chawnhu
0.1 to 0.5	High	R.Vanhne, Old Bajeisora, Kamalanagar II, Bungtlang, Diltlang, Ajasora – I, Khawmawi & Ngengpuitlang
0.1 to -0.1	Moderate	Vaseitlang II, Ngengpui, Ajasora – II, Kamalanagar III, Jamersury, Adubangasora, Vaseitlang, Hmunnuam & Saikah
-0.1 to -0.5	Low	Sakeilui II, Nghalimlui, Saibawh, Mondirasora, Golasury, Gobasury, Fulsora, Sakeilui I, Damdep I, Bagapara, Damdep II, Semeisury, Bonduk Banga, Mainabapsora I, Tuidangtlang, Hruitezawl, Udalthana II, Tuithumhnar & Bajeisora
Below -0.5	Very Low	Nalbonya, Hmawngbu, Lunghauka, Betbonya, Palenasora, Silbanga, Ulasury & Sumsilui

4.3.3 Household Economy of Oil palm Farmer in Mamit District

In Mamit district, more than half of the total Oil palm cultivators (51.95%) have Assam Type house. The other common forms of households were semi-permanent (29.17%), Bamboo (11.70%) and RCC (7.18%). The average per capita income per day in Mamit district was 190 rupees. Bungthuam village has the lowest per capita income with 120 rupees per day. Nearly half of the total households (56.96%) have television but all the Oil palm cultivators in Zawlnuam Borai village did not have television. In Mamit district, only 32.82 per cent of the total Oil palm cultivating household have washing machine.

Motor vehicle serves a lot of help to Oil palm farmers for transportation and harvesting. In Mamit district, only 0.17 per cent of the total Oil palm cultivating households reported to have any kind of vehicle. Although ownership of two-wheeler is relatively higher in comparison to any type of vehicle, only 0.32 per cent of the total households reported to have owned two-wheelers.

Most of the Oil palm farmers did not have household water connection in Mamit district. Only 34.18 per cent of the total households have access to piped water connection in their house. For domestic cooking, 69.74 per cent of the total households were using LPG. No household in Zawlnuam Borai village used LPG. Computer is not commonly available among the Oil palm farmers in the district. Only 0.12 per cent of the total household have computer. There were 13 villages (38.23%) where no household have computer. Generally, households get internet facilities through mobile phones and 70.29 per cent of the total household to internet connectivity.

Table 4.10 shows the number of village, minimum, maximum, mean and standard deviation on selected 14 economic indicators for the 34 villages in Mamit district.

Tale 4.10 Descriptive Statistics, Mamit District

Indicators	N	Minimum	Maximum	Mean	Std. Deviation
X_1	34	1.00	32.00	6.8529	6.43914
X_2	34	120.00	280.00	190.0000	25.46537
X_3	34	.00	150.00	56.9574	33.20784
X_4	34	.00	100.00	45.3215	25.08431
X_5	34	.00	233.33	32.8194	41.64237
X_6	34	.00	9.00	1.0076	1.47351
X_7	34	.00	.50	.1747	.15483
X_8	34	.00	1.00	.3165	.28276
X_9	34	.00	100.00	34.1774	41.92320
X_{10}	34	.00	100.00	69.7415	24.14378
X_{11}	34	.00	3.00	1.4971	.61565
X_{12}	34	.00	.67	.1171	.16460
X_{13}	34	.00	100.00	70.2912	23.75898
X_{14}	34	.00	100.00	31.7079	31.76116
Valid N (listwise)	34				

After obtaining Z score of every 14 economic indicators, composite score (CI) of each village have been calculated to identify the level of household economy among Oil palm farmers in different villages of the district as shown in Table 4.11.

Table 4.11 Composite Score of the Selected villages, Mamit District

Village	CI	Village	CI	Village	CI
Bawngva	-0.05	Lallen	-0.53	S.Sabual	-0.29
Bungthuam	-0.02	Lengpui	0.95	Saithah	-0.36
Chhippui	-0.41	Luimawi	-0.11	Sihthiang	-0.47
Damparengpui	-0.79	Mamit 'N'	1.09	Suarhliap	-0.31
Darlak	0.11	Mamit 'S'	0.37	Tuidam	0.59
Hmunpui	0.12	Nalzawl	-0.56	Tuirum	-0.37
Hreichuk	-0.35	New W.Phaileng	-0.27	W.Bunghmun	-0.30
Hriphaw	-0.51	Phuldungsei Vengthar	-0.24	W.Phaileng	0.46
Kanhmun	1.82	Pukzing Vengthar	-0.49	W.Serzawl	-0.05
Kawrtethawveng	0.48	Rengdil	0.91	Zamuang	0.51
Kawrthah	0.90	Rulpuihlim	-0.17	Zawlnuam Borai	-1.18
Khawhnai	-0.47				

Based on the composite score, all villages were classified into five levels of household economy such as Very High, High, Moderate, Low and Very Low. Very High constitute 20.58 per cent of the total surveyed villages such as Kanhmun, Mamit 'N', Lengpui, Rengdil, Kawrthah, Tuidam and Zamuang. On the other hand, Very Low level of household economy comprises Oil palm farmers in villages like Hriphaw, Lallen, Nalzawl, Damparengpui and Zawlnuam Borai. Table 4.12 clearly shows levels in household economy of Oil palm farmers, Mamit district.

Table 4.12 Levels in Household Economy of Oil palm Farmers, Mamit District

Index	Levels of Household Economy	Villages
Above 0.5	Very High	Kanhmun, Mamit 'N', Lengpui, Rengdil, Kawrthah, Tuidam, Zamuang
0.1 to 0.5	High	Kawrtethawveng, W.Phaileng, Mamit 'S', Hmunpui, Darlak
0.1 to -0.1	Moderate	Bungthuam, Bawngva, W.Serzawl,
-0.1 to -0.5	Low	Luimawi, Rulpuihlim, Phuldungsei Vengthar, New W.Phaileng, S.Sabual, W.Bunghmun, Suarhliap, Hreichuk, Saithah, Tuirum, Chhippui, Sihthiang, Khawhnai, Pukzing Vengthar
Below -0.5	Very Low	Hriphaw, Lallen, Nalzawl, Damparengpui, Zawlnuam Borai

4.3.4 Household Economy of Oil palm Farmer in Siaha District

In Siaha district, Assam type house was the most common type of house accounting for 58.14 per cent of the total selected household. Semi-permanent (34.88%) and RCC (6.98%) types of house were also found while 41.86 per cent of the total Oil palm farmers were living in permanent houses (i.e., semi-permananet+RCC). The average per capita per day income of Oil palm farmer in the district was 180 rupees. A little less than half of the total households (44.19%) of the Oil palm farmers have Television while less than half of the total household have refrigerators (34.88%). Washing machine is not found in most of the household of Oil palm farmers. Only 9.30 per cent of the total household have washing machine in their house.

In Siaha district, only 0.12 per cent of the total Oil palm farmers have any kind of motor vehicle. This is one of the major problems faced by the farmers since motor vehicle is one of the primary requirements in the plantation especially in the harvesting period. It was also found that 67.44 per cent of the total Oil palm farmers in Siaha district have water connection in their household. More than half of the total households used LPG in the district (69.77%).

All the selected households have mobile phones in the district. Only 0.09 per cent of the total household have computer in the district. Internet connection

including mobile phone connectivity was subscribed by 62.79 per cent of the total household.

Table 4.13 shows the number of village, minimum, maximum, mean and standard deviation on selected 14 economic status indicators for the 4 villages in Siaha district.

Table 4.13 Descriptive Statistics, Siaha District

Indicators	N	Minimum	Maximum	Mean	Std. Deviation
X_1	4	1.00	12.00	6.000	5.567
X_2	4	160.00	220.00	180.000	28.284
X_3	4	33.33	50.00	43.305	7.076
X_4	4	27.27	100.00	48.482	34.463
X_5	4	.00	50.00	16.625	22.597
X_6	4	.33	1.00	.740	.286
X_7	4	.00	.50	.175	.221
X_8	4	.00	.50	.217	.207
X_9	4	63.64	100.00	74.245	17.229
X_{10}	4	33.33	100.00	67.760	27.577
X_{11}	4	1.89	4.33	3.112	1.044
X_{12}	4	.00	.50	.165	.226
X_{13}	4	33.33	100.00	63.637	27.884
X_{14}	4	.00	50.00	24.872	20.516
Valid N (listwise)	4				

After obtaining Z score of every 14 economic indicators, a composite score (CI) of each village has been calculated to identify the levels of household economy among Oil palm farmers in different villages of the district as shown in Table 4.14.

Table 4.14 Composite Score, Siaha District

Village	CI
Siaha	1.09
Zero	-0.12
Maubawk CH	-0.25
Maubawk L	-0.72

Based on the composite score from every indicator, the villages were classified into three levels of household economy such as High, Moderate and Low.

Table 4.15
Levels of Household Economy of Oil palm Farmers, Siaha District

Index	Levels of Household Economy	Villages
Above 0.5	High	Siaha
-0.5 to 0.5	Moderate	Maubawk CH & Zero
Below -0.5	Low	Maubawk L

4.3.5 Household Economy of Oil palm Farmer in Serchhip District

Assam type and semi-permanent houses were the most common types of houses among Oil palm farmers in Serchhip district. Almost half of the total households (48.42%) were living in Assam type of house. RCC house constituted only 9.46 per cent of the total houses. The average per capita income per day in Serchhip district was 198 rupees. The highest per capita income was found in Serchhip where the average household income per capita was 230 rupees per day. The lowest per capita income found in Piler and Khumtung villages where one member of a family earned 180 rupees per day in average.

More than half of the total households (66.48%) reported to have owned television. Ownership of refrigerator among the Oil palm farmers was relatively high in Serchhip district where 67.91 per cent of the total household have refrigerator. The percentage of household having washing machine in the study was only 23.78% of the total household.

It was observed that only 0.18 per cent of the total households have any kind of vehicle in Serchhip district. The highest availability of motor vehicles was found in Serchhip town (0.25%) whereas the lowest availability found in Bungtlang village where 0.06 per cent of the total household have any kind of motor vehicles. More than half of the total Oil Pam farmers in Serchhip district have water connection where 60.74 per cent of the total household access proper water connection in their house. In Piler village, all the households did not have water connection. For domestic cooking, 78.22 % of the total households were using LPG.

In Serchhip district, all the households have at least 2 numbers of mobile phones. Computer was not found common among Oil palm farmers in the district. Only 0.13 per cent of the total household has computer facilities. Generally, the household get internet facilities through mobile phones. 88.33 per cent of the total household have accessed to internet connectivity.

Table 4.16 shows the number of village, minimum, maximum, mean and standard deviation on selected 14 economic status indicators for the 34 villages in Serchhip district.

Table 4.16 Descriptive Statistics, Serchhip District

Indicators	N	Minimum	Maximum	Mean	Std. Deviation
X_1	10	3.00	57.00	18.000	17.795
X_2	10	180.00	230.00	198.000	15.491
X_3	10	36.36	83.33	60.020	15.315
X_4	10	33.33	92.31	57.503	18.978
X_5	10	10.00	34.83	20.168	8.558
X_6	10	.73	1.06	.911	.081
X_7	10	.06	.25	.159	.059
X_8	10	.32	.67	.485	.125
X_9	10	.00	77.53	51.084	21.209
X_{10}	10	69.23	91.67	79.173	6.791
X_{11}	10	1.79	3.09	2.093	.364
X_{12}	10	.02	.22	.114	.070
X_{13}	10	63.64	97.44	82.665	10.203
X_{14}	10	4.26	44.94	22.167	13.888
Valid N (listwise)	10				

After obtaining Z score of every 14 economic indicators, composite score (CI) of each village has been calculated to identify the levels of household economy among Oil palm farmers in different villages of the district as shown in Table 4.17.

Table 4.17 Composite Score, Serchhip District

Village	CI
Serchhip	1.18
Thenzawl	0.73
Khawlailung	-0.27
Piler	-0.61
Chhiahtlang	0.13
Chhingchhip	0.28
Khumtung	-0.51
Bungtlang	-0.61
Keitum	-0.41
Khumtung	0.10

As shown in Table 4.18, all the villages are classified into five levels of household economy according to their composite score such as Very High, High, Moderate, Low and Very Low.

Table 4.18 Levels of Household Economy of Oil palm Farmers, Serchhip District

Index	Levels of Household Economy	Districts
Above 0.5	Very High	Serchhip & Thenzawl
0.1 to 0.5	High	Chhingchhip, Chhiahtlang
0.1 to -0.1	Moderate	Khumtung
-0.1 to -0.5	Low	Khawlailung & Keitum
Below -0.5	Very Low	Khumtung, Piler & Bungtlang

4.3.6 Household Economy of Oil palm Farmer in Kolasib District

Assam type was found to be the most common type of houses among Oil palm farmer in Kolasib district. More than half of the total households (50.23%) have Assam type of house. Among the village, Kawnpui has the highest percentage of permanent housing where 55 per cent of the total houses were permanent houses. On the other hand, there were no farmers living under permanent house in Siahapui K and New Khamrang villages. The average per capita income per day in the district was 195 rupees.

More than half of the total households (53.82%) have television while.51 per cent of the total households have refrigerators. No farmers in Bukvannei, Lungmuat, Meidum, Mualkhang, N.Chawnpui, Nisapui, Siahapui K and Siahapui 'V' have washing machine. It was also found that only 0.19 per cent of the total households have any kind of vehicle.

A little less than half of the total Oil Pam farmers (48.52%) in Kolasib district have water connection. The other households depended on other sources of water to support domestic requirements. Most of the Oil palm farmers (84.40%) in the district have LPG connection. It was also found that the average number of Mobile phone per household was 1 only. Most of the Oil palm farmers in the district did not have computer facilities. Only 0.19 per cent of the total household has computer facilities.

Table 4.19 shows the number of village, minimum, maximum, mean and standard deviation on selected 14 economic status indicators for the 34 villages in Kolasib district.

Table 4.19 Descriptive Statistics, Kolasib District

Indicators	N	Minimum	Maximum	Mean	Std. Deviation
X_1	28	.00	55.00	9.6786	11.31716
X_2	28	150.00	210.00	181.7857	15.16662
X_3	28	.00	100.00	48.1968	25.27166
X_4	28	11.90	200.00	53.5968	37.95722
X_5	28	.00	200.00	25.3029	41.55936
X_6	28	.33	1.00	.8054	.17591
X_7	28	.00	.60	.2186	.14544
X_8	28	.00	1.20	.4461	.27222
X_9	28	.00	100.00	40.1675	38.29227
X_{10}	28	33.33	102.70	79.8711	18.06835
X_{11}	28	.47	4.00	1.4168	.75204
X_{12}	28	.00	.78	.2321	.21478
X_{13}	28	33.33	100.00	70.4668	14.25899
X_{14}	28	.00	94.59	25.9150	29.31988
Valid N (listwise)	28				

Table 4.20 Composite Score, Kolasib District

Village	CI	Village	CI
Bairabi	1.18	Phainuam	-0.61
Bilkhawthlir	1.04	Siahapui K	-0.57
Bualpui 'N'	-0.21	Siahapui 'V'	-0.98
Bukpui	-0.30	Saipum	-0.58
Bukvannei	-0.51	Thingdawl	0.40
Phaisen	1.07	Thingthelh	-0.66
Kawnpui	0.67	Vairengte	0.33
Kolasib	0.10	Zanlawn	-0.15
Lungmuat	-0.49	Bilkhawthlir 'N'	0.63
Meidum	-0.62	Buhchangphai	0.46
Mualkhang	-0.31	Hortoki	0.18
N.Chawnpui	-0.27	New Khamrang	0.53
N.Hlimen	-0.34	Rengtekawn	0.31
Nisapui	-0.53	Khamrang	0.18

After obtaining Z score of every 14 economic indicators, a composite score (CI) of each village has been calculated to identify the levels of household economy among Oil palm farmers in different villages of Kolasib district as shown in Table 4.20.

Based on the composite score from every indicator, all the villages were classified into five levels of household economy such as Very High, High, Moderate, Low and Very Low as shown in Table 4.21. Very high levels in household economy among Oil Pam farmer was found in 6 villages like Bairabi, Phaisen, Bilkhawthlir, Kawnpui, Bilkhawthlir 'N' and New Khamrang which accounts 21.43 per cent of the total villages. On the other hand, eight villages constituting 28.57% of the total villages were classified under Very Low household economy.

Table 4.21 Levels of Household Economy of Oil palm Farmers, Kolasib District

Index	Levels of Household Economy	Towns/Villages
Above 0.5	Very High	Bairabi, Phaisen, Bilkhawthlir, Kawnpui, Bilkhawthlir 'N' & New Khamrang
0.1 to 0.5	High	Buhchangphai, Thingdawl, Vairengte, Rengtekawn, Hortoki & Khamrang
0.1 to -0.1	Moderate	Kolasib
-0.1 to -0.5	Low	Zanlawn, Bualpui 'N', N.Chawnpui, Bukpui, Mualkhang, N.Hlimen & Lungmuat
Below -0.5	Very Low	Bukvannei, Nisapui, Siahapui K, Saipum, Phainuam, Meidum, Thingthelh & Siahapui 'V'

4.3.7 Household Economy of Oil palm Farmer in Lunglei District

In Lunglei district, Assam type house was found to be the most common house type comprising of more than half of the total household (53.75%). In the meantime, some of the Oil Palm farmers were still living under Bamboo house (6.95%). here is no Bamboo house among 22 villages which is 56.41 per cent of the total villages. Semi-permanent (32.91%) and RCC (6.40%) type of house are also found. The average per capita per day income of Oil palm farmer in Lunglei district was 135 rupees. Half of the total households (50%) of the Oil palm farmers have Television. Less than half of the total household have refrigerator (40%). In Sihphir village all the households have refrigerator whereas no household have refrigerator in Sedailui village. Only 15.85 per cent of the total household have washing machine in their house.

In Lunglei district, only 0.24 per cent of the total Oil palm farmers have any kind of motor vehicle. Ownership of two-wheeler vehicle is very low as only 0.32 per cent of the total farmers have any kind of two-wheeler vehicle. Most of the Oil palm farmers in the district did not have piped water connection while more than half of the total households used LPG for cooking (75.67%).

There was no household without Mobile Phone in the district where every household has one to two numbers of mobile phones. Only 0.09 per cent of the total

household in the district have owned computer. Internet connection including mobile phone internet was subscribed by 67.31 per cent of the total household.

Table 4.22 Descriptive Statistics, Lunglei District

Indicators	N	Minimum	Maximum	Mean	Std. Deviation
X_1	39	.00	23.00	5.512	5.270
X_2	39	100.00	210.00	135.000	23.924
X_3	39	.00	79.49	40.810	1.297
X_4	39	.00	100.00	42.360	20.241
X_5	39	.00	50.00	15.854	14.384
X_6	39	.40	1.00	.797	.158
X_7	39	.00	.67	.241	.154
X_8	39	.00	.60	.323	.140
X_9	39	.00	100.00	32.355	35.943
X_{10}	39	42.86	100.00	75.671	16.709
X_{11}	39	1.00	4.00	1.740	.562
X_{12}	39	.00	.25	.094	.075
X_{13}	39	44.44	100.00	67.314	15.411
X_{14}	39	.00	51.28	13.123	18.130
Valid N (listwise)	39				

Table 4.22 shows the number of village, minimum, maximum, mean and standard deviation on selected 14 economic status indicators for the 34 villages in Lunglei district.

After obtaining Z score of every 14 economic indicators, a composite score (CI) of each village was calculated to identify the levels of household economy among Oil palm farmers in different villages of the district as shown in Table 4.23.

Table 4.23 Composite Score, Lunglei District

Village	CI	Village	CI	Village	CI
Bualpui V	-0.09	Leite	0.12	Sihphir	-0.03
Buarpui	0.03	Lungrang	-0.29	Tawipui	0.00
Bulongsury	-0.36	Lungsen	0.55	Thiltlang	0.89
Bunghmun	0.29	Mualthuam S	-0.08	Thualthu	-0.62
Changpui	-0.19	Pangtlang	-0.86	Tipperaghat	-0.85
Lunglei	1.23	Phairuang	-0.33	Tlabung	0.77
Chawilung	-0.19	Pukpui	1.25	Tuipui D	0.81
South Chawnpui	-0.45	Putlungasih	-0.68	Tuisenchhuah	-0.64
Diblibagh	-0.76	Rangte	-0.88	Vanhne	-0.09
Haulawng	1.28	Rawpui	-0.16	Zawlpui	-0.15
Hauruang	0.06	Rotlang	0.40	Zobawk	0.90
Hnahthial	1.49	Rualalung	-0.54	Zodin	-0.76
Kanghmun S	0.30	Sedailui	-1.09	Zohmun	-0.29

Based on the composite score from every indicator, villages were classified into five levels of household economy such as Very High, High, Moderate, Low and Very Low as shown in Table 4.24. Very High household economy comprises 9 villages such as Hnahthial, Haulawng, Pukpui, Lunglei, Zobawk, Thiltlang, Tuipui D, Tlabung and Lungsen accounting for 23.08 per cent of the total selected villages in the district. On the other hand, 25.64 per cent of the total villages Rualalung, Thualthu, Tuisenchhuah, Putlungasih, Zodin, Diblibagh, Tipperaghat, Pangtlang, Rangte and Sedailui formed Very Low category. Table 4.24 shows levels of household economy among Oil palm farmers in Lunglei district.

Table 4.24 Levels of Household Economy of Oil palm Farmers, Lunglei District

Index	Levels of Household Economy	Villages
Above 0.5	Very High	Hnahthial, Haulawng, Pukpui, Lunglei, Zobawk, Thiltlang, Tuipui D, Tlabung & Lungsen
0.1 to 0.5	High	Rotlang, Kanghmun S, Bunghmun & Leite
0.1 to -0.1	Moderate	Hauruang, Buarpui, Tawipui, Sihphir, Mualthuam S, Bualpui V & Vanhne
-0.1 to -0.5	Low	Zawlpui, Rawpui, Chawilung, Changpui, Lungrang, Zohmun, Phairuang, Bulongsury & South Chawnpui
Below -0.5	Very Low	Rualalung, Thualthu, Tuisenchhuah, Putlungasih, Zodin, Diblibagh, Tipperaghat, Pangtlang, Rangte & Sedailui

4.4 Livelihood Standard of Oil palm Farmers

Principal component analysis (PCA) was run in the computer software 'Statistical Package for Social Sciences' (SPSS) to extract components. Using Kaiser's criterion of taking eigenvalues more than 1, 4 components were extracted which altogether explain 74.02 per cent of total variation in the data set. The percentage of variation explained was considered good enough to carry forward the analysis.

After component loadings were estimated, the individual indicators with the highest component loadings were grouped into intermediate composite indicators. Since four components were extracted, there are also four intermediate composites as shown in the right hand side of Table 4.25.

The intermediate composites were normalized squared rotated component (factor) loadings. The squared factor loadings represented the proportion of the total unit variance of the indicator, which was explained by the component. The first intermediate composite includes Computer (with a weight of 0.91), %_W. Machine (0.88), %_Vehicle (0.87), %_ LPG (0.76), %_ Newspaper (0.71), Income (0.67) and %_TV (0.52). Likewise the second intermediate composite is formed by Housing (0.97), Chair/Sofa (0.82) and Internet (0.61). The third intermediate composite is

composed of Wheel_2l (0.83) and Refrigerator (0.44). The fourth intermediate component includes Mob_Phone (0.90), and Water (0.64). It may be seen that weights are normalized squared factor loadings and scaled to unity sum. The weight of the first variable Computer (0.91) is derived by the squaring of the highest loading of Computer variable (0.954) divided by the explained variance which is the portion of the variance of the first factor explained by the variable Computer. For e.g. 0.122 = (0.954 x 0.954)/7.402. In the same manner, the weights of the other variables were derived and included in the intermediate composite index.

The first column of Table 4.25 shows component loadings, the second column shows communalities and the third one shows the intermediate composite indices. The first component consists of variables like per centage of female graduate (F_Grad), per centage of population who have studied up to class 12 (Edu12), number of bank account per household (Bank), per centage of population who are engaged in professional and technical (Profe), per centage of male graduate (M_Grad), number of computer per household (Computer) and average monthly household income (Income). The component may be labelled as ‘socio-economic’ dimension. It is the most important component that determines variability in objective QOL as it explains 24.51 per cent of the total variance.

Table 4.25 Intermediate Composite Indices of Livelihood Standard

Rotated Component Matrix								
Indicators	Component				Squaring Factor Loading Scale to Unity Sum			
	1	2	3	4	1	2	3	4
X_{12}	**.954**	-.010	.198	.117	**0.91**	0.00	0.04	0.01
X_5	**.940**	.279	-.022	-.093	**0.88**	0.08	0.00	0.01
X_7	**.931**	-.013	.101	-.001	**0.87**	0.00	0.01	0.00
X_{10}	**.870**	.172	.361	.164	**0.76**	0.03	0.13	0.03
X_{14}	**.846**	.013	.064	.369	**0.71**	0.00	0.00	0.14
X_2	**.821**	.249	-.444	.149	**0.67**	0.06	0.20	0.02
X_3	**.720**	.632	.221	.133	**0.52**	0.40	0.05	0.02
X_1	.078	**.986**	.048	.033	0.01	**0.97**	0.00	0.00
X_6	.247	**.903**	.279	.153	0.06	**0.82**	0.08	0.02
X_{13}	-.177	**.781**	.578	.039	0.03	**0.61**	0.33	0.00
X_8	.161	.348	**.911**	-.055	0.03	0.12	**0.83**	0.00
X_4	.403	.594	**.662**	.101	0.16	0.35	**0.44**	0.01
X_{11}	.031	-.032	-.132	**.949**	0.00	0.00	0.02	**0.90**
X_9	.337	.381	.219	**.799**	0.11	0.15	0.05	**0.64**
% of explained var.	55.69	24.62	11.77	7.92				
Explain var.	7.402	3.272	1.564	1.052				
Explain Var/Total Var.	0.56	0.25	0.12	0.08				
Total Var.	13.29							

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]
a. Rotation converged in 6 iterations.

Once the intermediate composite indices have been constructed, they were aggregated by assigning a weight to each of them equal to the proportion of variance explained by the respective component. Weight Score (Wi) is obtained by multiplying the variable weight and weight of respective component. Finally, the resulting weight or final weight is obtained which is rescaled again to sum up to one to preserve comparability.

Table 4.26 Weight of the Indicators

Indicators	Domain Weight	Weight for respective factor	Weight Score (Wi)	Resulting weight (Wi=1)
X_{12}	.954	0.56	0.53	0.12
X_5	.940	0.56	0.52	0.12
X_7	.931	0.56	0.52	0.12
X_{10}	.870	0.56	0.48	0.11
X_{14}	.846	0.56	0.47	0.11
X_2	.821	0.56	0.46	0.10
X_3	.720	0.56	0.40	0.09
X_1	.986	0.25	0.24	0.06
X_6	.903	0.25	0.22	0.05
X_{13}	.781	0.25	0.19	0.04
X_8	.911	0.12	0.11	0.02
X_4	.662	0.12	0.08	0.02
X_{11}	.949	0.08	0.08	0.02
X_9	.799	0.08	0.06	0.01

After the final weights were obtained, the rank of each district was obtained by the product of normalized variable and the resulting weight. Each district was ranked and mapped as per their rankings as shown in Figure 4.1

Aizawl district obtained the first rank in household economy of Oil palm farmers. Oil palm farmers in Aizawl district are actually the rich people having a permanent occupation as compared to other district. As it is the city center, it serves as distribution center of funds and other facilities to the other district. Income and households assets of Oil palm farmer in the district are already quite good before planting Oil palm.

Serchip district is the second highest rank having the composite score of 0.43. Like in Aizawl district, Oil palm plantation has been started a little bit late than other district. the farmers who could started the plantation in the district usually have a sufficient income and other facilities. The number Oil palm farmers living under permanent house is high. The number of Oil palm farmers having television, refrigerator, water connection and LPG connection etc., is high making the district high levels of household economy.

Table 4.27 Levels of Livelihood Standard among Oil palm Farmer

Index	Levels in Livelihood Standard	Districts
Above 0.5	Very High	Aizawl
0.1 to 0.5	High	Serchhip
0.1 to -0.1	Moderate	Kolasib
-0.1 to -0.5	Low	Lunglei & Siaha
Below -0.5	Very Low	Lawngtlai & Mamit

Kolasib district scored the average among all the districts. The district is the pioneer of Oil palm plantation in the state as well as the largest producer of FFB till today. However it is, income and other household assets of the Oil palm farmer reach the moderate levels. Most of the Oil palm farmers in the district have no permanent occupation and income is less before production of Oil palm. The dependency on Oil palm is also higher in the district.

Oil palm farmers in Lunglei and Siaha obtained the second lowest status in household economy. Oil palm plantation has started a little bit late in the two district. In Lunglei district, Oil palm plantation largely practiced in the western part where Chakma population dominated the village. These peoples are backward in income and livelihoods already before production of Oil palm. Central and Northern part of the villages are more developed. Area and number of farers involved in the plantation is very less in Siaha district as compared to other district. There is no FFB production in the district till the study period. It indicates that all the farmers do not get any profit from Oil palm plantation. They are just in the plantation stage so that high expenditure without income results a low income and further result low household economy.

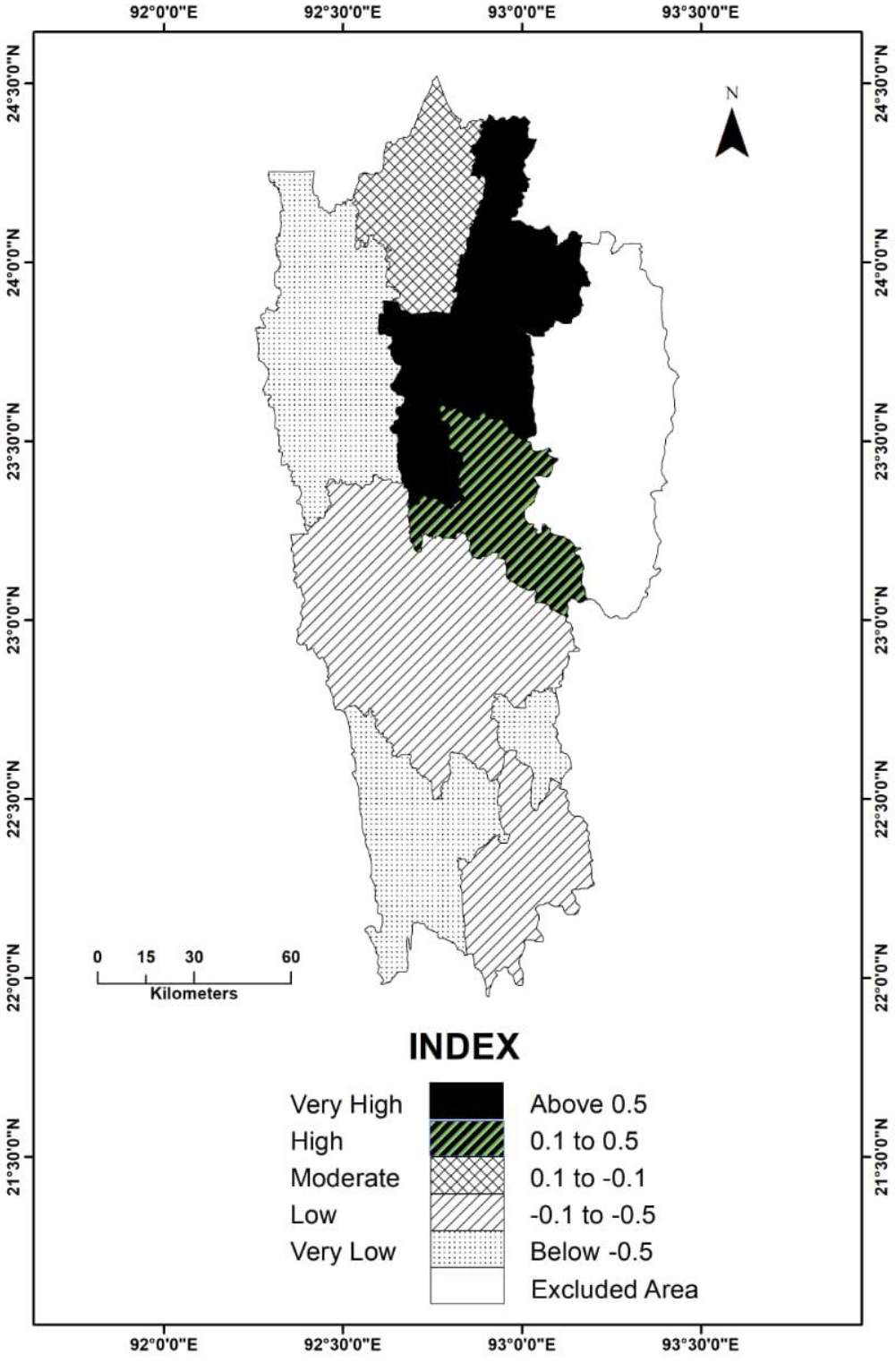

Figure 4.1 Levels of livelihood standard

The lowest household economy found in Lawngtlai and Mamit districts. In Lawngtlai district, household economy is very low because most of the Oil palm

farmers are immigrant who recently settled in the villages. They do not have any sufficient occupation and regular income. A household asset is very limited among them even some of the villages do not still have a proper land lease. In Mamit district, Oil palm plantation was started early with a large area and huge productions found today. Some of the farmers are the top producers among all the Oil Pam farmers in the state. Income and economy of those household are plentiful. On the other hand, many Oil palm farmers in the district belong to Bru family. They started plantation with a low budged. Family income could not support maintenance of the plantation to continue. Most of the farmers leave the plantation already. Thus the household's economy is also very low that makes the district status very low.

4.5 Conclusion

The study found that household economy of livelihood of Oil palm farmers in the Mizoram was relatively low. Only a few of the farmers have high level of household economy especially in the capital city as well as the bigger farmer. Generally, the Oil palm farmers scored very low in most of the selected indicators. Among the indicators, percentage of household having computer, percentage of household having washing machine and percentage of family having motor vehicle were the biggest factors which influence the levels of livelihood standard. Again these are the most significant factors causing inequality of farmers' livelihood standard. Percentage of family having LPG connection also have largely influence the levels of farmers' economy. On the other hand some commonly accessible and owned indicators like percentage of family having water connection, number of mobile phone per household, percentage of household having refrigerator and percentage of family having two wheelers did not have high impact on levels of livelihood standard among the Oil palm farmers. In other words, Oil palm farmers are more or less equal in these assets.

It is also observed that any profits gained from Oil palm production did not influence the livelihood standard of the farmers in Mizoram. It can be seen clearly from Mamit district where area, production and productivity of Oil palm were the highest among the districts of Mizoram have very low level of household economy.

On the other hand, the highest level of livelihood standard found in Aizawl district where Oil palm production is low as well as profit earned from Oil palm is low. Pearson coefficient of correlation value of -0.39 shows the low negative correlation between Oil palm productivity and score of household economy among Oil palm farmers in the study area. It explains why the household economy of Oil palm farmer is low where Oil palm productivity is high and vice versa. Therefore we can conclude that Oil palm production failed to improve the livelihood standard of the farmer.

CHAPTER-5

IMPACT OF OIL PALM ON LIVELIHOOD OF FARMERS

5.1 Introduction

Oil palm plantations have created so many controversies, particularly their impacts on the environment and the livelihood of the local communities. The controversies are usually raised by non-governmental organizations working on environmental and social-related issues. It finds out that those controversies are generally exaggerated. In general, economically the farmers benefit from the development of Oil palm plantations. It does not mean that the negative socio-economic impacts are absent, but those impacts are manageable and have been addressed seriously.

5.2 Farmer's Income, Mizoram 2018-2019

Oil palm Plantation was practiced at 197 villages of Mizoram in the year 2018-2019. Oil palm plantation was most popular in Lunglei district where 49 villages actively practicing the plantation followed by Lawngtlai district (46) Mamit district (42), Kolasib district (29), Serchhip district (15), Saiha district (10) and Aizawl district (6). The total 10843 farmers have actively practiced the plantation. In terms of farmers involved, Mamit district got the highest position where the total farmers involved to Oil palm plantation was 3042 (28.05 %). Mamit district was followed by Kolasib district (2155), Lawngtlai district (2007), Lunglei district (1803), Serchhip district (1390), Aizawl district (403) and Saiha district (43).

During 2018-2019, the whole state of Mizoram produced 21367.57 Metric ton of Fresh Fruits Bunches (FFB) of Oil palm from the total area of 25,923 hectare of land. The production of FFB was the highest in Mamit District where 10675.53 Metric ton which comprised 49.96 per cent of the total state production. Kolasib district was the second largest producing district after Mamit where the total FFB production was 9123.03 metric ton accounting for 42.70 per cent of the total state production. The two districts comprised as much as 92.66 per cent of the state total FFB production. Besides the two districts, Lunglei district was the next higher

producing district which produced 687.70 metric ton FFB followed by Lawngtlai district (624.28 MT), Serchhip district (248.26 MT) and Aizawl district (8.78 MT). There was no FFB production in Saiha district during this period.

From Oil palm production, the average monthly income of Oil palm farmer in Mizoram was 10838.48 rupees. Kolasib district was the highest income district where the average monthly income of Oil palm farmer was 23283.83 rupees which was followed by Mamit district(Rs.19301.58), Lunglei district (Rs.2097.81), Lawngtlai district (Rs. 1710.79), Serchhip district (Rs. 982.32) and Aizawl district (Rs. 119.77).

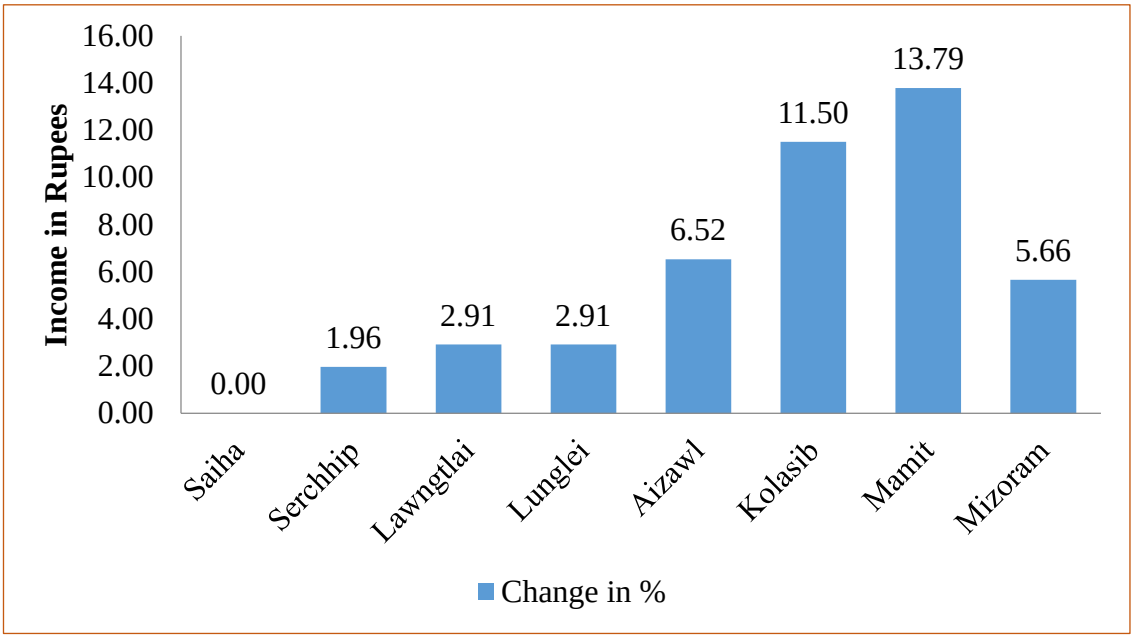

Fig 5.1 Change in monthly income of Oil palm cultivators (before and after)

5.2.1 Monthly Profit from Oil palm per Household

The average financial expenditure of Oil palm farmers in the plantation is Rs. 1000 per month. Farmers' expenditure was the highest in Aizawl district where Oil palm farmers spent Rs. 2000 per month to maintain Oil palm plantation. The monthly profit earned by Oil palm farmer in the study area was Rs. 748.43. The monthly profit was the highest in Mamit district where every Oil palm farmer profited Rs. 2856 per month. In contrary to this, there was no profit earned from Oil palm plantation among farmers of the two districts such as Serchhip and Saiha.

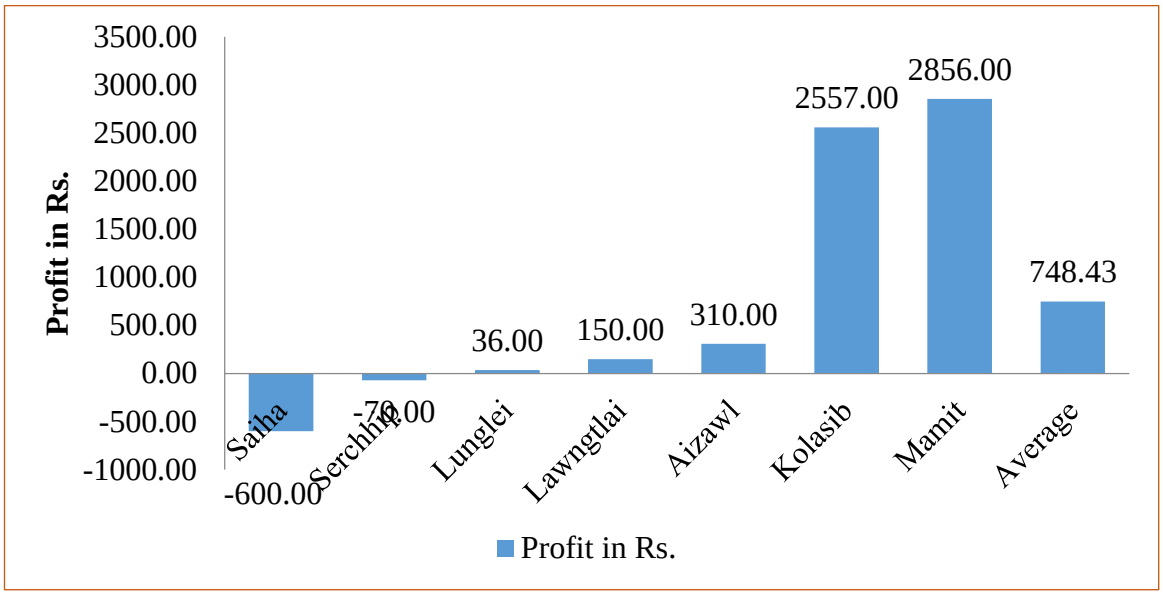

Fig 5.2 Monthly Profit from Oil palm per Household (in Rupees) (before and after)

5.2.2 Farmers' Household Income and Oil palm Plantation

All of the household involved in Oil palm plantation in the study area were classified in to three categories based on their monthly income from Oil palm with sources other than Oil palm. Most of the families (50.13%) have an income between Rs. 5000 to 10000 while 30.51 per cent of the total surveyed family earned more than Rs. 10000 per month whereas 19.36 per cent have income less than 5000 rupees. Lunglei district has the highest number of household with monthly income below Rs.

5000. On the other hand, Aizawl district has the highest number of household having monthly income of more than Rs.10000 (see Table 5.1).

Table 5.1Percentage distribution of Income class of Oil palm Cultivators, Mizoram

District	Monthly Income in Rs. (No. of family in %)		
	1000 to 5000	5000 to 10000	10000 above
Aizawl	0.00	36.44	63.56
Lawngtlai	18.00	43.43	38.57
Mamit	11.42	53.36	35.21
Saiha	6.74	62.92	30.34
Serchhip	1.05	70.96	27.99
Kolasib	28.31	61.12	10.58
Lunglei	69.98	22.66	7.35
Average	**19.36**	**50.13**	**30.51**

Source: Field Survey

5.3 Impact on House types

In this section, change of house type before and after Oil palm plantation is compared. There were four types of houses in the study area such as Thatch/Bamboo, Assam type, Semi-permanent and Reinforce cement Concrete (RCC). During the study period, there was no change in Bamboo type of house in Aizawl, Lawngtlai and Saiha districts. But, in the remaining four districts such as Mamit, Serchhip, Kolasib and Lunglei, the percentage composition of Bamboo house has declined.

The total number of Assam type houses has been decreased among the three districts such as Serchhip (5.16 %), Lunglei (2.93 %) and Kolasib (2.65 %). On the other hand increasing change has been found only in Mamit district (4.21 %). Among the three districts such as Aizawl, Lawngtlai and Saiha, there is neither increase nor decrease of Assam type houses. The percentage composition of Semi-permanent type of house has increased almost in all the districts except Lawngtlai and Saiha where there is no change before and after Oil palm production. The highest increase was found in Serchhip district where Semi-permanent type of houses has increased by

6.59 per cent. Reinforced Cement Concrete (RCC) type of house has increased in the all districts except Lawngtlai and Saiha districts.

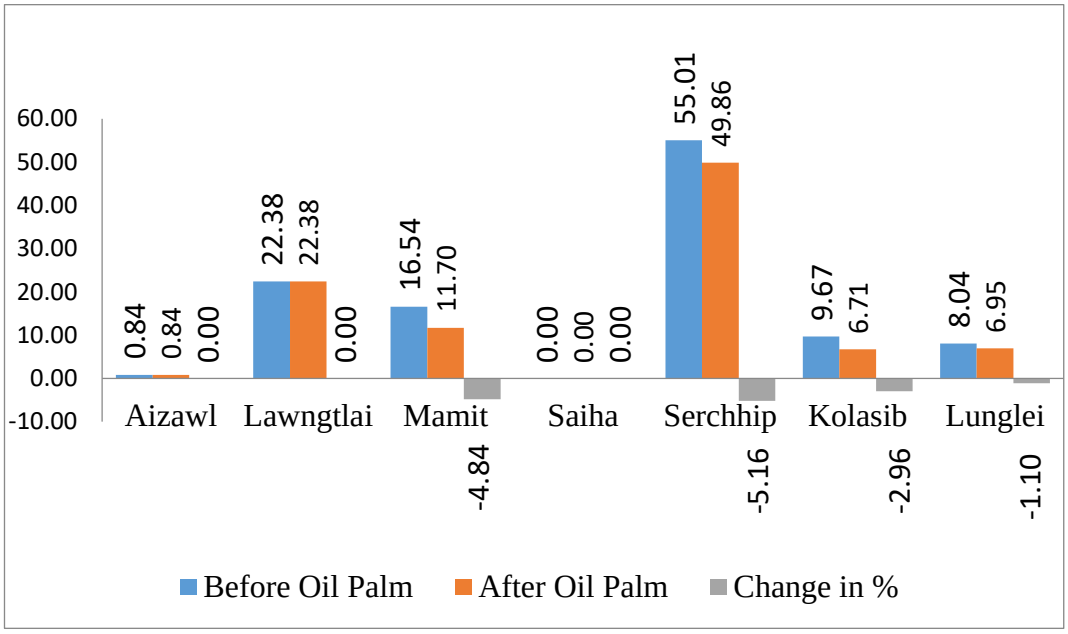

Fig.5.3 Change of House Types before and after Oil palm Production

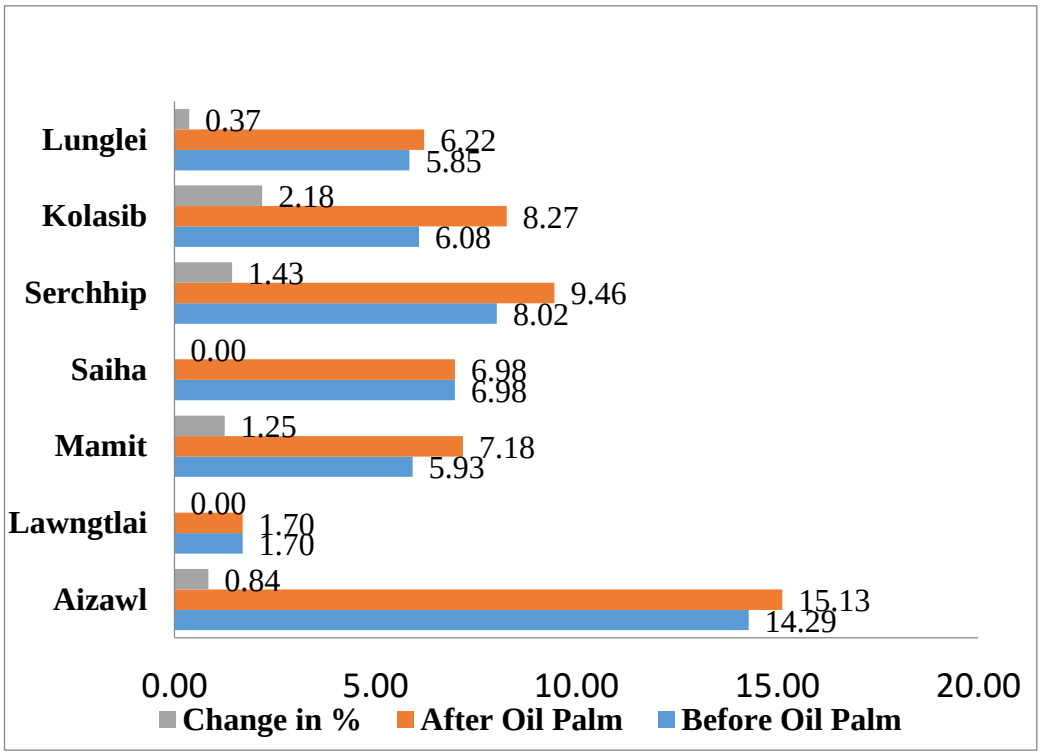

Fig.5.4 Change in Reinforce Cement Concrete (RCC) Home

5.4 Inter-district inequality in impact of Oil palm Plantation

5.4.1 Inequality on Household Assets

In this section, inequality in household assets of Oil palm farmers has been assessed at district level with the help of 12 different household indicators such as No. of Long chair per Household in %, No. of Household having water connection in %, No. of Household having LPG connection in %, No. of Motor vehicle per Household in %, No. of Two wheeler per Household in %, No. of TV per Household in %, No. of Refrigerator per Household in %, No. of Washing Machine per Household in %, No. of Household having computer in %, No. of Household having Internet Connection in %, No. of Mobile Phone per Household in % and No. of Household subscribing newspaper in %. Table 5.2 shows district wise information on the selected indicators.

Table 5.2 Indicator of inequality on Household assets

Indicators	Aizawl	Lawngtlai	Mamit	Saiha	Serchhip	Kolasib	Lunglei
X1	7.56	5.38	0.31	9.3	3.44	5.77	4.00
X2	6.72	25.5	41.19	0	4.58	10.61	0.00
X3	4.2	0	0	0	4.87	6.71	3.36
X4	6.72	30.31	42.9	0	1.15	4.52	15.96
X5	4.2	113.03	146.96	0	3.44	9.05	6.72
X6	16.81	6.8	7.02	4.65	5.73	7.96	4.20
X7	11.76	7.08	4.99	4.65	6.3	12.79	3.36
X8	10.92	1.42	2.5	0	2.87	5.46	1.68
X9	5.04	7.08	12.01	0	1.43	10.92	0.84
X10	13.45	0	0	4.65	4.01	10.45	3.36
X11	87.39	17	56.47	55.81	32.66	35.41	9.24
X12	4.2	5.95	0	4.65	0	8.58	0.00

Table 5.3 Descriptive statistics of the indicators

Indicators	N	Minimum	Maximum	Mean	Std. Deviation
X1	7	.31	9.30	5.1086	2.91913
X2	7	.00	41.19	12.6571	15.29788
X3	7	.00	6.71	2.7343	2.74883
X4	7	.00	42.90	14.5086	16.36688
X5	7	.00	146.96	40.4857	61.98912
X6	7	4.20	16.81	7.5957	4.27569
X7	7	3.36	12.79	7.2757	3.62763
X8	7	.00	10.92	3.5500	3.65527
X9	7	.00	12.01	5.3314	4.87846
X10	7	.00	13.45	5.1314	5.07898
X11	7	9.24	87.39	41.9971	26.73709
X12	7	.00	8.58	3.3400	3.42034

Obtaining composite score on the situation of farmers' household assets, Z-score of every indicator for each district have been found out. Table 5.3 shows district wise Z-score on the selected indicators.

Table 5.4 Z score of every indicator

Indicators	Aizawl	Lawngtlai	Mamit	Saiha	Serchhip	Kolasib	Lunglei
X1	0.84	0.09	-1.64	1.44	-0.57	0.23	-0.38
X2	-0.39	0.84	1.87	-0.83	-0.53	-0.13	-0.83
X3	0.53	-0.99	-0.99	-0.99	0.78	1.45	0.23
X4	-0.48	0.97	1.73	-0.89	-0.82	-0.61	0.09
X5	-0.59	1.17	1.72	-0.65	-0.60	-0.51	-0.54
X6	2.16	-0.19	-0.13	-0.69	-0.44	0.09	-0.79
X7	1.24	-0.05	-0.63	-0.72	-0.27	1.52	-1.08
X8	2.02	-0.58	-0.29	-0.97	-0.19	0.52	-0.51
X9	-0.06	0.36	1.37	-1.09	-0.80	1.15	-0.92
X10	1.64	-1.01	-1.01	-0.09	-0.22	1.05	-0.35
X11	1.70	-0.93	0.54	0.52	-0.35	-0.25	-1.23
X12	0.25	0.76	-0.98	0.38	-0.98	1.53	-0.98
Composite Score	**0.74**	**0.04**	**0.13**	**-0.38**	**-0.41**	**0.50**	**-0.61**

X_1=No. of Long chair per Household in %, X_2=No. of Household having water connection in %,X_3= No. of Household having LPG connection in %, X_4=No. of Motor vehicle per Household in %, X_5= No. of Two wheeler per Household in %, X_6=No. of TV per Household in %, X_7=No. of Refrigerator per Household in %, X_8=No. of Washing Machine per Household in %, X_9= No. of Household having computer in %, X_{10}=No. of Household having Internet Connection in %, X_{11}=No. of Mobile Phone per Household in %, X_{12}=No. of Household subscribing newspaper in %.

After obtaining composite score of every indicator, all districts were classified into five levels of development on household assets as shown in Table 5.3. The result shows that Aizawl district has the highest improvement in household assets. As Aizawl is the capital city of the state, Oil palm farmers scored relatively high in various indicators such as percentage of households having television, refrigerator, washing machine, number of mobile phone per household and

households having internet facilities. Kolasib and Mamit districts are the second highest performing districts. Oil palm farmers in Kolasib district scored relatively high in indicators like number of Long chair per household, household having LPG connections, household having refrigerators and household subscribes newspaper. While in Mamit district, household having water connection, number of two wheelers per household and household having computer are high among Oil palm farmers.

Saiha and Serchhip districts are moderately low in the composite index by scoring 0.47 and -0.51 respectively. Among the Oil palm farmers in Saiha district, number of household having computer, households subscribing newspaper, household having washing machine and household having water connection are very low. While in Serchhip district, Oil palm farmer scored very low in household having newspaper subscription and household having computer. Lunglei district is the lowest district where still there is no production of FFB and hence the farmers do not have any profit as well as household assets improvement from Oil palm production. Table 5.4 shows district wise level of improvement on household assets.

Table 5.5 Impact of Oil palm Production on Farmers' Household Assets

Index	Levels of Improvement	District
Above 5	High	Aizawl
0.1 to 0.5	Moderately High	Kolasib & Mamit
0.1 to -0.1	Moderate	Lawngtlai
-0.1 to -0.5	Moderately Low	Saiha & Serchhip
Below -0.5	Low	Lunglei

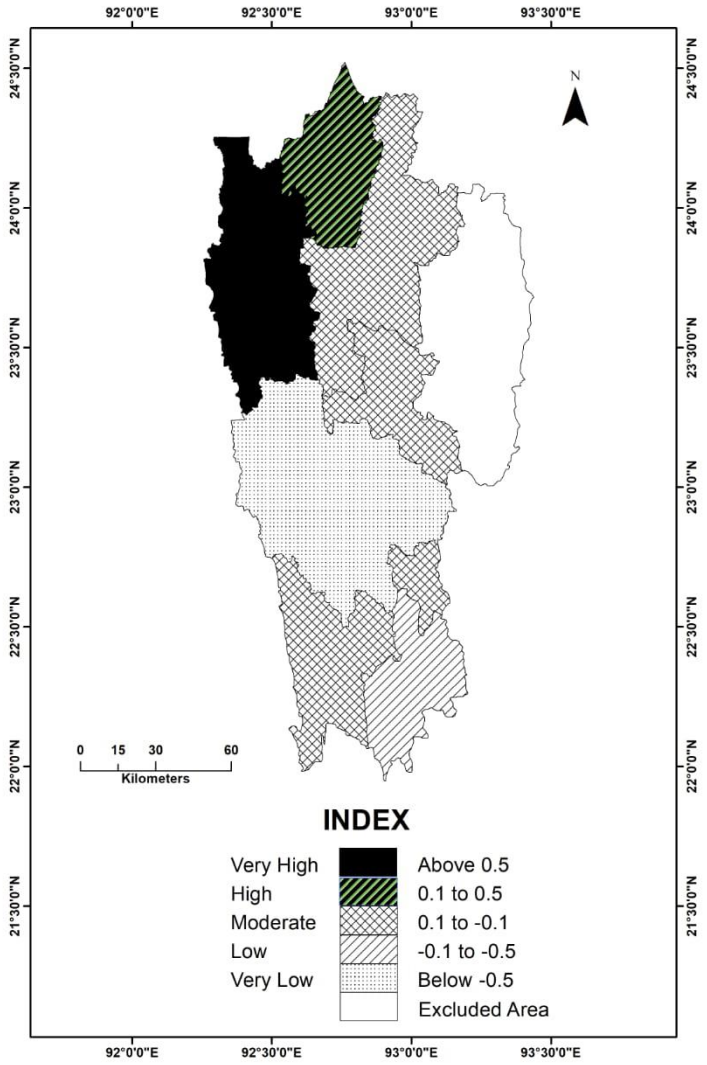

Fig. 5.5 District-wise level of Development of Oil palm cultivators

5.4.2 Perception on Oil palm cultivators

As shown in the Table 5.5, farmers perception on oil palm plantation have been collected through twelve indicators such as percentage of family who were aware oil palm plantation, percentage of family who start oil palm plantation by own choice, percentage of family thinking oil palm beneficial, percentage of family who think their children's education has improved due to oil palm production, percentage of family who beneficially used oil palm for other occupation, percentage of family

who do not find negative impact of oil palm on their farm soil quality, percentage of family who do not find negative impact of oil palm on their farm water quality, percentage of family who do not find negative impact of oil palm on source of water, percentage of family who do not find negative impact of oil palm on forest, percentage of family who do not find negative impact of oil palm on village climate, percentage of family who do not find negative impact of oil palm on human health and percentage of family who do not find negative impact of oil palm on other plants.

Table 5.6 Perception on Oil palm cultivators

Indicator	Aizawl	Lawngtlai	Mamit	Saiha	Serchhip	Kolasib	Lunglei
X1	51.26	34.28	67.86	25.58	37.82	65.68	26.51
X2	54.62	34.84	62.09	20.93	35.24	55.54	30.16
X3	37.82	33.71	61	13.95	19.48	49.14	8.96
X4	41.18	21.25	53.2	9.3	14.9	49.61	7.68
X5	26.05	18.13	50.39	11.63	14.61	48.36	5.85
X6	25.21	32.29	22.15	16.28	14.61	23.87	18.28
X7	23.53	35.13	21.84	34.88	25.5	24.34	16.45
X8	21.85	33.14	20.75	32.56	25.79	24.34	17.92
X9	20.17	34.56	22.31	25.58	32.95	18.25	17.92
X10	46.22	46.46	52.42	58.14	57.88	41.03	60.88
X11	78.15	68.27	80.66	79.07	84.53	82.06	79.16
X12	45.38	23.8	47.58	32.56	43.27	42.9	57.04

Then, the descriptive statistic of every indicators of the seven districts have been calculated such as minimum, maximum, average and standard deviation of every indicator for the seven districts have been calculated as shown in Table 5.6.

Table 5.7 Descriptive statistics of the indicators

Indicators	N	Minimum	Maximum	Mean	Std. Deviation
X_1	7	25.58	67.86	44.1414	17.65294
X_2	7	20.93	62.09	41.9171	15.42320
X_3	7	8.96	61.00	32.0086	19.08302
X_4	7	7.68	53.20	28.1600	19.38784
X_5	7	5.85	50.39	25.0029	17.75797
X_6	7	14.61	32.29	21.8129	6.06398
X_7	7	16.45	35.13	25.9529	6.82899
X_8	7	17.92	33.14	25.1929	5.80695
X_9	7	17.92	34.56	24.5343	6.82725
X_{10}	7	41.03	60.88	51.8614	7.47898
X_{11}	7	68.27	84.53	78.8429	5.13831
X_{12}	7	23.80	57.04	41.7900	10.73336
Valid N (listwise)	7				

X_1=% of family who were aware Oil palm Plantation, X_2= No. of family start who Oil palm Plantation by own choice, X_3=% of family thinking Oil palm is beneficial, X_4=% of family who consider their children's education has improved due to Oil palm production, X_5=% of family who beneficially used Oil palm for other occupation , X_6=% of family who do not find negative impact of Oil palm on their farm soil quality, X_7=% of family who do not find negative impact of Oil palm on their farm water quality, X_8= % of family who do not find negative impact of Oil palm on source of water, X_9=% of family who do not find negative impact of Oil palm on forest, X_{10}=% of family who do not find negative impact of Oil palm on village climate, X_{11}=% of family who do not find negative impact of Oil palm on human health, X_{12}=% of family who do not find negative impact of Oil palm on other plants

To obtain composite score on the situation of farmers' perceptions, Z-score of every indicator for each district have been found out. Table 5.7 shows district wise Z-score on the selected indicators.

Table 5.8 Z score of every indicator

Indicator	Aizawl	Lawngtlai	Mamit	Saiha	Serchhip	Kolasib	Lunglei
X1	0.40	-0.56	1.34	-1.05	-0.36	1.22	-1.00
X2	0.82	-0.46	1.31	-1.36	-0.43	0.88	-0.76
X3	0.30	0.09	1.52	-0.95	-0.66	0.90	-1.21
X4	0.67	-0.36	1.29	-0.97	-0.68	1.11	-1.06
X5	0.06	-0.39	1.43	-0.75	-0.59	1.32	-1.08
X6	0.56	1.73	0.06	-0.91	-1.19	0.34	-0.58
X7	-0.35	1.34	-0.60	1.31	-0.07	-0.24	-1.39
X8	-0.58	1.37	-0.77	1.27	0.10	-0.15	-1.25
X9	-0.64	1.47	-0.33	0.15	1.23	-0.92	-0.97
X10	-0.75	-0.72	0.07	0.84	0.80	-1.45	1.21
X11	-0.13	-2.06	0.35	0.04	1.11	0.63	0.06
X12	0.33	-1.68	0.54	-0.86	0.14	0.10	1.42
Composite Score	**0.06**	**-0.02**	**0.52**	**-0.27**	**-0.05**	**0.31**	**-0.55**

After obtaining Z-score of every indicator, the districts were classified into five levels such as Very Low, Low, Moderate, High and Very High levels of improvement in the livelihood of Oil palm farmers. Mamit districts obtained the highest position. Kolasib district attained high levels of improvement. Aizawl, Lawngtlai and Serchhip districts got moderate level. Saiha district attained low level and Lunglei district attained the lowest level. Table 5.8 shows the overall levels of improvement in livelihood after producing FFB among Oil palm farmers in Mizoram.

Table 5.9 Level of improvement of Oil palm cultivators

Index	Levels of Improvement	District
Above 0.5	High	Mamit
0.1 to 0.5	Moderately High	Kolasib
0.1 to -0.1	Moderate	Aizawl, Lawngtlai & Serchhip
-0.1 to -0.5	Moderately Low	Saiha
Below -0.5	Low	Lunglei

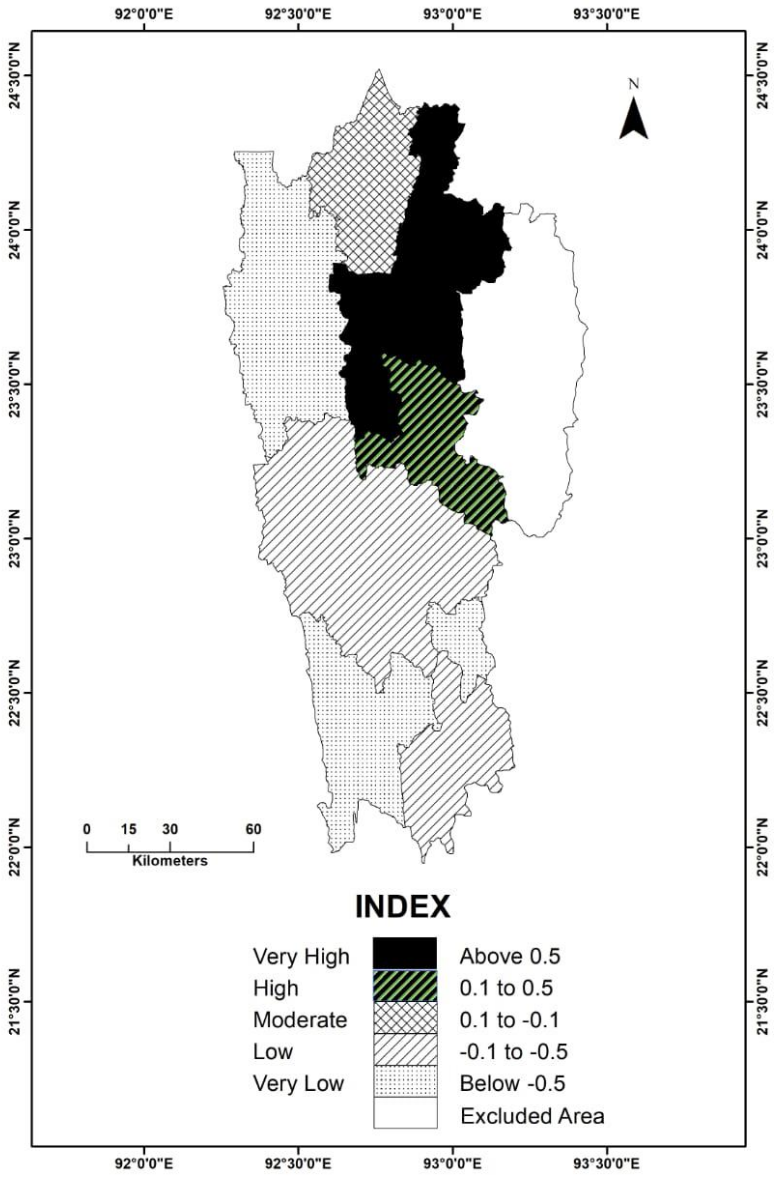

Fig. 5.6 District-wise level of improvement of Oil palm cultivators based on their perception

5.4.3 Overall Impact of Oil Palm cultivators on Livelihood

To calculate overall impact of oil palm plantation on livelihoods of the farmers including objective and subjective indicators, composite score from every indicator have been calculated. The descriptive statistics (Table 5.9) shows minimum maximum, mean and standard deviation of the indicators.

Table 5. 10 Descriptive Statistics

Indicators	N	Minimum	Maximum	Mean	Std. Deviation
X_1	7	.18	9.30	4.562	3.466
X_2	7	.00	41.19	12.657	15.297
X_3	7	.00	6.71	2.254	2.909
X_4	7	.00	42.90	12.724	16.855
X_5	7	.00	146.96	40.440	62.018
X_6	7	.91	16.81	7.125	4.853
X_7	7	4.39	12.79	7.422	3.459
X_8	7	.00	10.92	3.310	3.848
X_9	7	.00	12.01	5.211	5.015
X_{10}	7	.00	13.45	5.121	5.083
X_{11}	7	17.00	87.39	47.415	22.499
X_{12}	7	.00	8.58	3.340	3.420
X_{13}	7	25.58	67.86	44.141	17.652
X_{14}	7	20.93	62.09	41.917	15.423
X_{15}	7	8.96	61.00	32.008	19.083
X_{16}	7	7.68	53.20	28.160	19.387
X_{17}	7	5.85	50.39	25.002	17.757
X_{18}	7	14.61	32.29	21.812	6.063
X_{19}	7	16.45	35.13	25.952	6.828
X_{20}	7	17.92	33.14	25.192	5.806
X_{21}	7	17.92	34.56	24.534	6.827
X_{22}	7	41.03	60.88	51.861	7.478
X_{23}	7	68.27	84.53	78.842	5.138
X_{24}	7	23.80	57.04	41.790	10.733

X_1=No. of Long chair per Household in %, X_2=No. of Household having water connection in %,X_3= No. of Household having LPG connection in %, X_4=No. of Motor vehicle per Household in %, X_5= No. of Two wheeler per Household in %, X_6=No. of TV per Household in %, X_7=No. of Refrigerator per Household in %, X_8=No. of Washing Machine per Household in %, X_9= No. of Household having computer in %, X_{10}=No. of Household having Internet Connection in %, X_{11}=No. of Mobile Phone

per Household in %, X_{12}=No. of Household subscribing newspaper in %. X_1=% of family who were aware Oil palm Plantation, X_2= No. of family start who Oil palm Plantation by own choice, X_3=% of family thinking Oil palm is beneficial, X_4=% of family who consider their children's education has improved due to Oil palm production, X_5=% of family who beneficially used Oil palm for other occupation , X_6=% of family who do not find negative impact of Oil palm on their farm soil quality, X_7=% of family who do not find negative impact of Oil palm on their farm water quality, X_8= % of family who do not find negative impact of Oil palm on source of water, X_9=% of family who do not find negative impact of Oil palm on forest, X_{10}=% of family who do not find negative impact of Oil palm on village climate, X_{11}=% of family who do not find negative impact of Oil palm on human health, X_{12}=% of family who do not find negative impact of Oil palm on other plants

After computing all the objective and subjective indicators, the districts were classified into five levels such as Very Low, Low, Moderate, High and Very High levels of improvement in the livelihood of oil palm farmers. Kolasib and Aizawl districts obtained the highest land of improvements. Mamit district attained high levels of improvement as one of the senior and potential districts. Lawngtlai district got moderate levels of improvement. Serchhip district attained low levels of improvement. The least improved districts were Lunglei and Saiha where Oil palm plantations started later as compared to other districts. Table 5.10 shows the overall levels of improvement in livelihood after producing FFB among Oil palm farmers in Mizoram.

Table 5.11 Overall Level of improvement of Oil palm on Cultivators

Index	Levels of Improvement	District
Above 0.5	Very High	Kolasib & Aizawl
0.1 to 0.5	High	Mamit
0.1 to -0.1	Moderate	Lawngtlai
-0.1 to -0.5	Low	Serchhip
Below -0.5	Very Low	Lunglei & Saiha

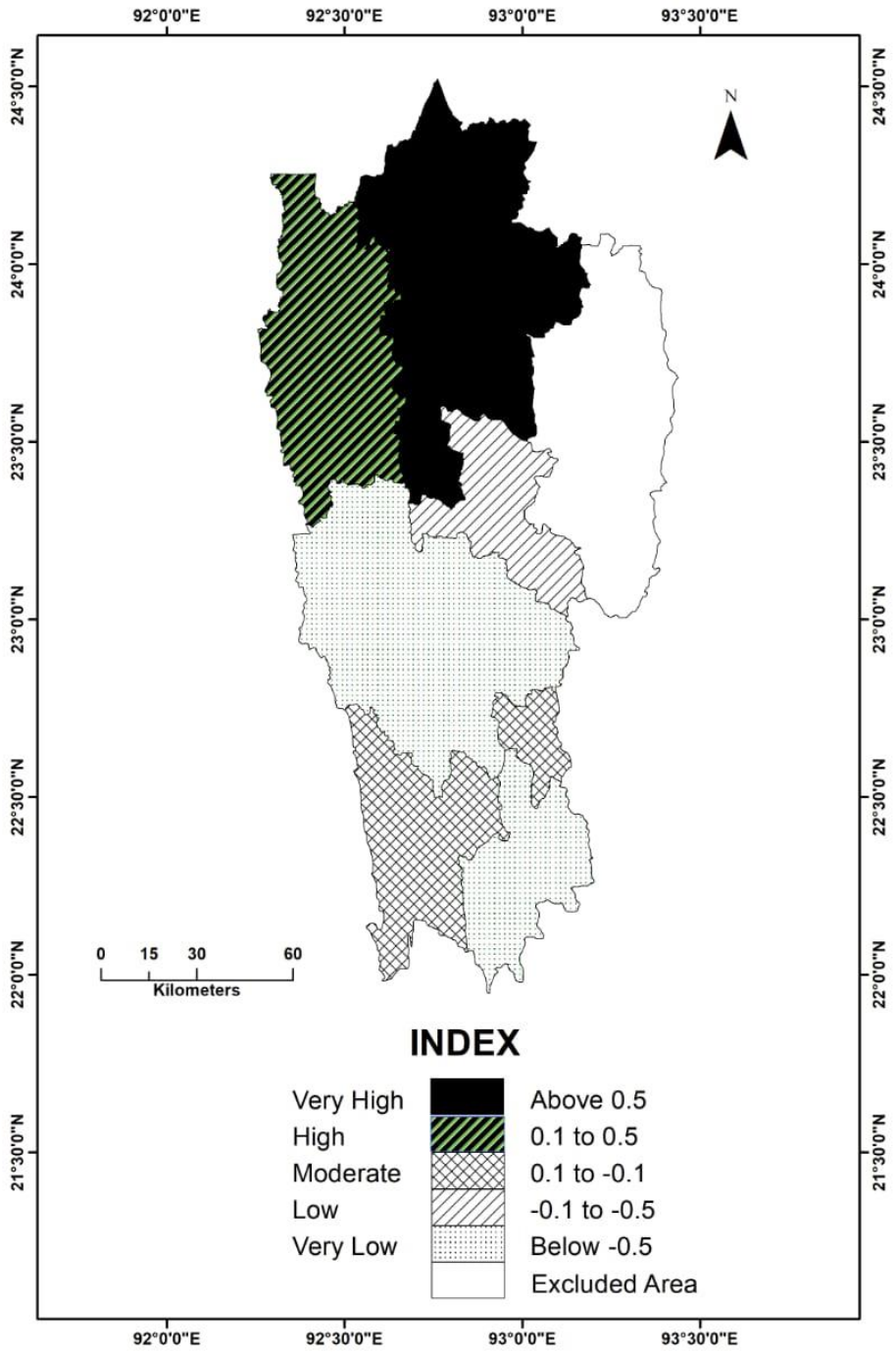

Fig. 5.7 District-wise overall level of improvement on livelihood of Oil palm cultivators.

5.4.4 Factor Analysis:

Factor Analysis (FA) was applied to find out the factor which effects in households assets development. FA was run in a computer software Statistical Package for Social Sciences (SPSS) to extract communalities and components. Using Kaiser's criterion of taking eigenvalues more than 1, four components were extracted which altogether explain 59.4 per cent of total variation in the data set. The percentage of variation explained is considered good enough to carry forward the analysis.

After component loadings were estimated, the individual indicators with the highest component loadings are grouped into intermediate composite indicators. Since we extracted four components, there are also four intermediate composites as shown in the right-hand side of Table 5.11. The intermediate composites were normalized squared rotated component (factor) loadings. The squared factor loadings represented the proportion of the total unit variance of the indicator, which was explained by the component. The weights are normalized squared factor loadings and scaled to unity sum.

Once the intermediate composite indices have been constructed, they were aggregated by assigning a weight to each of them equal to the proportion of variance explained by the respective component. Weight Score (Wi) is obtained by multiplying the variable weight and weight of respective component. Finally, the resulting weight or final weight is obtained which is rescaled again to sum up to one to preserve comparability (see Table 5.12).

Table 5.12 Factor Loading of the Component Indices

Indicators	Component				Squaring Factor Loading Scale to Unity Sum			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Water_Conn.	**0.96**	-0.07	-0.22	-0.16	**0.92**	0.01	0.05	0.02
N_Motor_Veh	**0.92**	-0.05	-0.36	-0.13	**0.85**	0.00	0.13	0.02
N_Computer	**0.90**	0.06	0.30	0.19	**0.81**	0.00	0.09	0.04
N_Two wheeler	**0.89**	-0.17	-0.40	-0.12	**0.79**	0.03	0.16	0.01
N_Longchair	**-0.73**	0.22	-0.19	0.61	**0.54**	0.05	0.03	0.38
N_Television	0.04	**0.93**	0.24	0.14	0.00	**0.86**	0.06	0.02
N_Phone	-0.17	**0.91**	-0.14	-0.16	0.03	**0.83**	0.02	0.03
N-Washing M	0.00	**0.84**	0.51	0.10	0.00	**0.71**	0.26	0.01
N_Internet	-0.41	**0.65**	0.54	0.32	0.17	**0.42**	0.29	0.10
LPG_ Conn.	-0.26	0.14	**0.95**	0.05	0.07	0.02	**0.91**	0.00
N_ Refrigerator	0.01	0.45	**0.72**	0.52	0.00	0.21	**0.52**	0.27
N_Newspaper	-0.09	-0.04	0.21	**0.97**	0.01	0.00	0.04	**0.94**
Expl. Var.	**5.94**	**3.06**	**1.65**	**1.08**				
Expl./Total Var.	**0.51**	**0.26**	**0.14**	**0.09**				
Total Var.	**11.73**							

"Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization."

a. Rotation converged in 6 iterations.

Table 5.13Weight of the Indicators

Indicators	Domain Weight	Weight for respective factor	Weight Score (Wi)	Resulting weight (Wi=1)
Water_Conn.	0.92	5.94	5.48	0.16
N_Motor_Veh	0.85	5.94	5.02	0.14
N_Computer	0.81	5.94	4.80	0.14
N_Two wheeler	0.79	5.94	4.72	0.13
N_Longchair	0.54	5.94	3.19	0.09
N_Television	0.86	3.06	2.64	0.08
N_Phone	0.83	3.06	2.55	0.07
N-Washing M	0.71	3.06	2.17	0.06
N_Internet	0.42	3.06	1.30	0.04
LPG_ Conn.	0.91	1.65	1.50	0.04
N_ Refrigerator	0.52	1.65	0.86	0.02
N_Newspaper	0.94	1.08	1.02	0.03

The highest factor which effects improvement of household assets is number of household having water connection. It also indicates development in the household is highly determined by water accessibility. The other factors contributing to development in household assets is households having motor vehicles with the total weight score of 0.14 followed by Household having computer, and Two wheeler per Household.

5.5 Conclusion

Oil palm Plantation in Mizoram has positive implication for livelihood development of Oil palm farmers but the impact is not significant in terms of income, profit earnd and improvement in household assets. Monthly income earned by the farmers has not significantly increased. Besides Mamit and Kolasib districts, increase in income is insignificant in other districts. The required expenditure for maintenance of Oil palm plantation is high and the farmers do not have much profit from Oil palm production. Household assets were generally improved among the farmers who

produced and sold the FFB but the positive impact is limited in a few districts like Aizawl, Mamit and Kolasib. In these districts, farmers beneficially used their profit from OPP to develop water connection, motor vehicles and computers. To achieve sustainable development of Oil palm plantation, it may be suggested that accessibility should be improved by connecting all the plantation areas with motorable road to reduce expenditure of the farmers. To increase profit earned from OPP, small farmers need to get assistance from the government. Government may give more incentives and assistance to the small farmers for clearing of plantation area, wages for manpower during harvesting, selling price of FFB, and adequateprotection from wild animals.

CHAPTER 6

PROBLEMS AND FUTURE PROSPECTS OF OIL PALM PLANTATION IN MIZORAM

6.1 Introduction

This section discusses the main problems associated with Oil palm plantation and the future prospects of the development of Oil palm in Mizoram. Oil palm cultivators were asked their main problems throughout the process of Oil palm plantation. Since majority of the farmers were small farmers with limited financial resources, their problems might be different from Oil palm farmers in other parts of the world. The result and analysis will be helpful for not only farmers but also for decision makers and policy planners to attain sustainable production of Oil palm in Mizoram.

6.2 Farmers Problems in Oil palm Plantation period

During the plantation period comprising of clearing of the land, terracing and planting of the seedlings, the biggest problem reported by Oil palm farmer is financial problem. As many as 37.29 per cent of the total Oil palm famers in Mizoram have reported financial problem as the main problem that they have faced. The other major problems include Animal attack (28.91%), insect's infection (14.62%), and accessibility and connectivity problem (11.93%). Some of the farmers have faced difficulty with the processing companies who hold the responsibility of like seedlings distribution and purchase of Oil palm fruits. Unavailability of labour is also a problem faced by 2.27 per cent of the total farmers. Government related problems like slow process of financial and other things are reported as the main problem by 1.66 per cent of the total farmers.

District level data shows that animal attack during the plantation period is a major problem in Lunglei district where 42.23 per cent of the total Oil palm farmers faced the problem. It is also a big problem in Kolasib district (33.23%) and Mamit district (32.92%). As stated above, financial difficulties the biggest problem faced by Oil palm farmers in the study area. Farmers in districts like Aizawl (42.86%), Lunglei (42.41%), Kolasib (41.19%), Serchhip (37.82%), Lawngtlai (35.13%) and

Saiha (30.23%) considered lack of finance as their biggest problems. Insects or pest infestation is also one of the major problems faced by farmers in Lawngtlai district. Problem of accessibility is faced by a large number of Oil palm farmers in some of the districts like Serchhip (27.79%), Saiha (18.60%) and Mamit (15.29%). Table 6.1 shows farmers problems during the period Oil palm plantation of the study area.

Table 6.1 Farmers Problems in Oil palm Plantation Period (in percentage)

District	Animal	Financial	Company	Government	Labour	Insects	Accessibility
Aizawl	23.53	42.86	2.52	1.68	2.52	17.65	9.24
Lawngtlai	27.76	35.13	3.12	1.70	1.42	24.93	5.95
Mamit	32.92	31.36	3.28	1.09	1.09	14.98	15.29
Saiha	18.60	30.23	4.65	4.65	6.98	16.28	18.60
Serchhip	24.07	37.82	3.72	0.86	1.72	4.01	27.79
Lunglei	42.23	42.41	2.74	0.55	0.91	7.31	3.84
Kolasib	33.23	41.19	3.28	1.09	1.25	17.16	2.81
Mizoram	**28.91**	**37.29**	**3.33**	**1.66**	**2.27**	**14.62**	**11.93**

Source: Field Survey, 2018-2019

6.3 Farmers' Problems in Marketing of Oil palm

Marketing includes harvesting of seeds, transportation, selling etc. The first and foremost problem faced by the farmers on marketing of Oil palm is low rate of selling price. Selling price fixed by the government and company was 5.5 rupees per kilogram at the time of the study. All the farmers have opined that the current selling rate of Oil palm was too low to make profit. Besides the selling price, more than half of the total farmers have faced unavailability of labour force (52.98%). More than half of the households among Oil palm farmers faced insufficient labour force in the four districts such as Serchhip (62.18%), Lawngtlai (60.34%), Aizawl (52.10%) and Lunglei (50.09%). The other remaining districts also have a big problem in it. During the harvesting period, most of the households did not get adequate agricultural labourers because they are fully dependent on human workforce. It was found that 26.50 per cent of the total farmers have faced transportation problems. Currently, availability of link road and approach road to the farmland is very minimal. Most of the farmers practiced head loads to transport bunch of Oil palm to the main road. 10.68 per cent of the total farmers have reported problems with the role of the processing companies on their slow processing of marketing and finance. Some of

the farmer also faced a problem on the system of selling (5.60%) and government support and policy (4.23%). Table 6.2 shows the problems of farmers in marketing of Oil palm.

Table 6.2 Farmers' Problems in Marketing of Oil palm

Districts	Transportation	Company	Labour	Government	Selling
Aizawl	28.57	10.92	52.10	1.68	6.72
Lawngtlai	27.48	5.95	60.34	4.53	1.70
Mamit	33.39	9.67	48.67	3.59	4.68
Saiha	27.91	13.95	48.84	6.98	2.33
Serchhip	17.48	12.03	62.18	3.44	4.87
Lunglei	29.80	11.15	50.09	4.39	4.57
Kolasib	20.90	11.08	48.67	4.99	14.35
Mizoram	**26.50**	**10.68**	**52.98**	**4.23**	**5.60**

Source: Field Survey, 2018-2019

Many farmers faced transportation problems during harvesting period. The farmers used head load to collect FFB and stock in the main road. Some of the farmers need to carry Oil palm fruits by head more than 5 kilometers. As shown in Table 6.3, all the households were classified in accordance to distance of the plantation area from motorable road. It was observed that more than 70 per cent of the total farmers need to walk 1 to 5 kilometers to reach their farms from the nearest motorable road. The other 16.87 per cent have to walk less than 1 kilometer and the remaining 12.39 per cent have to carry their Oil palm fruits by head load for more than 5 kilometers to reach the nearest motorable road. This is the big problem among the farmers that discourage the farmers to enlarge the plantation.

Table 6.3 Distance of Plantation Site from Motorable Road

District	< 1 kilometres	1 - 5 kilometres	> 5 kilometres
Aizawl	14.29	52.94	32.77
Lawngtlai	16.43	79.32	4.25
Mamit	26.37	58.03	15.60
Saiha	37.21	62.79	0.00
Serchhip	0.00	65.90	34.10
Kolasib	0.00	100.00	0.00
Lunglei	23.77	76.23	0.00
Average	16.87	70.75	12.39

Source: Field Survey, 2018-2019

6.4 Farmer's decision on continuation of Oil palm Plantation

All the farmers were asked whether they want to continue Oil palm plantation or not. For the entire state, 87.50 per cent of the total Oil palm farmers were willing to stop the plantation but 12.50 per cent still want to continue the plantation. Generally, most of the farmers want to stop Oil palm plantation. Serchhip district has the highest percentage of farmers who wanted to stop the plantation (Figure 6.1).

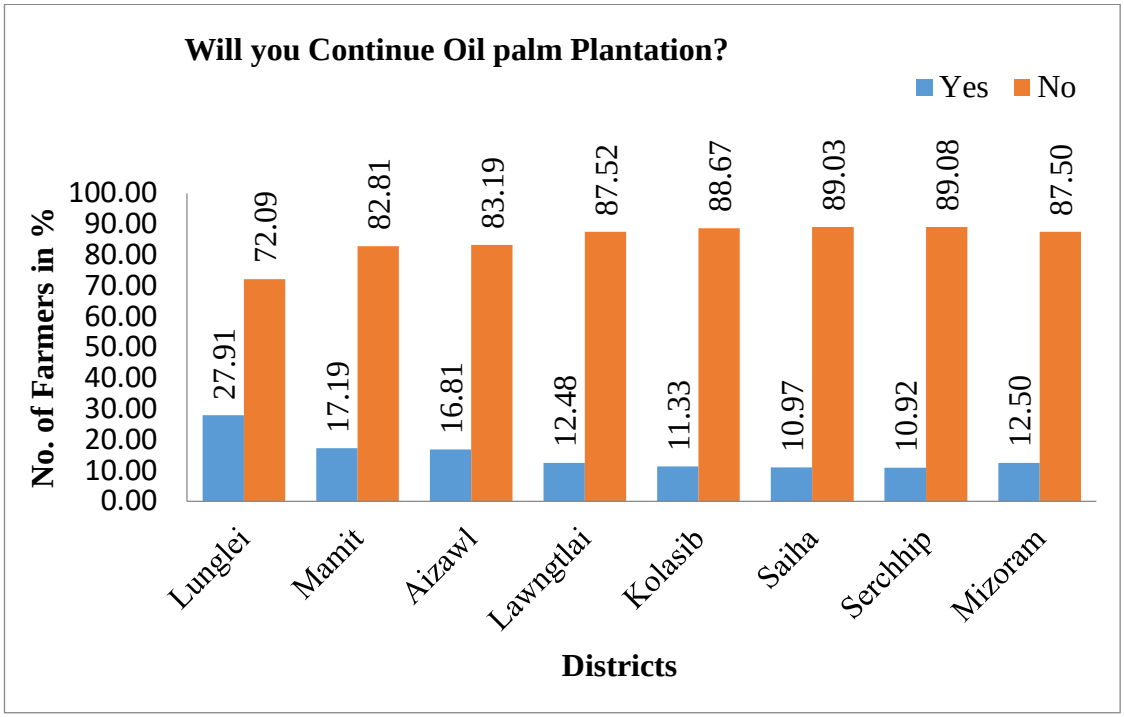

Figure 6.1 Farmer's decision on continuation of Oil palm Plantation

6.5 Reasons to stop Oil palm Plantation among the farmers

As shown in Table 6.4, 41.85 per cent of farmers who wanted to stop plantation cited low selling price as the main reason to stop Oil palm plantation. More than half of the total farmers in Aizawl district intended to leave Oil palm farming due to low selling price. A high number of farmers also reported the same problems in the district like Saiha (44.19%), Kolasib (41.65%), Lawngtlai (40.79%), Lunglei (39.58%), Mamit (38.22%), and Serchhip (37.82%). It is also found out that 28.73 per cent of the total farmers want to stop Oil palm plantation because of low profit. A large number of households wanted to stop the plantation due to low profit in the district of Lunglei (38.58%), Kolasib (36.51%) and Mamit (34.79%). Due to huge farm management, 17.15 per cent of the total farmers reported that they would

like to stop the plantation. The total 12.26 per cent decide to stop Oil palm plantation because they think Oil palm cause environmental degradation and it is highest in Aizawl district where 20.17 per cent of the total household thinks Oil palm plantation degrade environment quality.

Table 6.4 Reasons to stop Oil palm Plantation (%)

Districts	Farm Management	Low Selling price	Low profit	Environment degradation
Aizawl	16.81	50.42	12.61	20.17
Lawngtlai	27.20	40.79	22.10	9.92
Mamit	16.07	38.22	34.79	10.92
Saiha	11.63	44.19	27.91	16.28
Serchhip	21.49	37.82	28.65	12.03
Lunglei	14.26	39.85	38.57	7.31
Kolasib	12.64	41.65	36.51	9.20
Mizoram	**17.15**	**41.85**	**28.73**	**12.26**

Source: Field Survey, 2019

6.6 Future Prospects of Oil palm Plantation in Mizoram

Since the Oil palm Development Programme was started, Mizoram has been the leading state in Oil palm cultivation among the Northeast states of India. Out of the total potential areas of 61,000 hectares, 25,923 hectares have been developed for Oil palm cultivation. Thus, only 42.50 per cent of the total potential area has been utilized for Oil palm plantation in Mizoram. In Lunglei district which has the highest percentage of the potential area, as much as 62.22 per cent of the total potential area has been developed. On the other hand, Aizawl and Siaha districts have utilized less than 10 per cent of the total potential area because of late introduction of Oil palm. The study reveals that all the districts especially Aizawl and Saiha have high potential areas for plantation of Oil palm. Table 6.5 shows potential area and achievement of Oil palm plantation in Mizoram.

Table 6.5 Potential Area and Achievement of Oil palm Plantation in Mizoram

District	Potential Area (Ha.)	Area Covered (Ha.)	% of Area achieved
Aizawl	11,150	859	7.70
Lawngtlai	7,000	4,161	59.44
Mamit	10,500	5,612	53.45
Saiha	2,000	86	4.30
Serchhip	9,000	2,130	23.67
Kolasib	11,350	6,853	60.38
Lunglei	10,000	6,222	62.22
Mizoram	**61,000**	**25923**	**42.50**

Source: Agriculture, GOM, 2019

6.7 Towards Sustainable Oil palm Plantation

Livelihood is environmentally sustainable when it maintains or enhances the local and global assetson which livelihoods depend and is socially sustainable when it can cope with and recover from stress and shocks, and provide for future generations. It comprises people, their capabilities and their means of living, including food, income and assets where tangible assets consist of resources and stores, and intangible of claims and access (Chambers and Conway, 1992). Sustainable livelihoods are achieved through access to a range of livelihood resources (natural, economic, human and social capitals) which are combined in the pursuit of different livelihood strategies (agricultural intensification or intensification, livelihood diversification, and migration). It is maintained that the central to the framework is the analysis of the range of organizational and institutional factors that influence sustainable livelihood outcomes (Scoones, 1998).

Rural livelihood could be considered as a constructed form of a portfolio of resources or activities (Ellis and Unni, 1996). Socio-ecological adaptation of the individual is important where theories and practice could be combined to generate a new approach for adaptations (Berkes and Jolly, 2001). The advancement in technologyhas increased production and yields and now becomes a sustainable and renewable raw material for the world's food. It raised the standard of living and generates income and a key plank of the sustainability platform. Different stakeholders have joined hands with Oil palm industries to get a certification of sustainable Oil palm production that can be traced. There will be an increasing

demand for land as population increases and income from Oil palm production is still higher than that of productive forests. Due to this, the government has implemented a policy to stop deforestation. The Oil palm is eco-friendly in its nature as compared to other oil seedsand the higher yield of tenfold. It also used less land to produce consumable oils than other plantations. The big industries have to register themselves and act accordingly to produce Oil palm.

The relationship between the type of labour employed in the land and the size of land or farm shows that farmers employing labour only for maintenance have larger landholding. Regarding types of labour, family labour was used during harvesting, pruning and weeding while hired labour were used mainly for slashing and carrying of fresh fruit bunch (Bonsu *et al.,* 2009). It is suggested that farmer's need for labour must be based on economic considerations such as farm size, village wage rate, the structure of labour of the farmers and cost of other productive inputs. The activities that can be mechanized by Oil palm farmers were carrying FFB and slashing. Moreover, Oil palm can be a good opportunity for income generation. There is a need for people's participation through the implementation of free, prior and informed consent to reduce the conflicts. The need for NGOs' involvement to support sustainable productions that supports the desire of local communities was also highlighted (Levang, *et al.* 2010).

The study suggests some important step towards sustainable Oil palm plantation in Mizoram. Market rate of Oil palm must be increased by at least 7 rupees per kilogram. It will make Oil palm plantation profitable and economically viable. There must be an in depth research to realize effects of Oil palm on environment including biodiversity, soils, water and forest degradations. Based on that the farmers and the government can make the right decision whether to stop or continue the plantation. The government should give more efforts to the farmers supporting mechanization of the plantation process. They have to know and must solve the problems faced by the farmers and find a market solution with the existing company. Partnerships must start in the right way and fulfill the conditions to be a success. It is possible to improve global value chains through partnerships and supplements evidence to demonstrate the success and failure of suchattempts.

6.8 Conclusion

The study finds almost all the farmers is going to stop Oil palm plantation if there is no change in the rate and the present problems are not solve. The study also finds that only the big farmers who were relatively richer before planting Oil palm are getting financial profit from Oil palm. The small farmers who are economically poor before and fully depend on Oil palm plantation do not get any profit from Oil palm. Based on their experiences, the farmers believed that Oil palm is not healthy for environment which degrades biodiversity, soils, water and forest. Many of the farmers found that farm management is also very tough especially during the plantation period and harvesting period. By viewing these, almost all the Oil palm farmers (87.5%) like to stop the plantation.

The study offered suggestions to improve theroad conditions and minimize transportation problems as well as to maximize access to resources and material. Cooperative society must be formed among the processors. This will strengthen them in accessing modern technologies and equipment and thus reduce the extraction cost. Electricity must be regular and piped water supply should beprovided. The supply of machinery by the government in subsidized rates would also be much helpful for the processors.

CHAPTER 7
SUMMARY AND CONCLUSION

Oil Palm Plantation was started at Mizoram in the year 2005. Since plantation was started, the total area under oil palm plantation in Mizoram was 110 hectare of land. The plantation area was increased by every year in a different rate. The area under the plantation was continuously increasing till the year 2013-2014 and reaches the maximum increased in that year. There was the declining pattern of plantation area from the year 2013-2014. Average growth of Oil Palm Plantation area in Mizoram during 2005-2020 is 73.39 (in Ha). The highest growth rate (615.67) found during the year 2007-2008 when oil palm plantation was reach the third years. The high growth rate was found again the next two years i.e., 2008-2009 and 2009-2010 where the growth rate crossed 177.27 and 106.88 respectively. From the year 2007-2008, the growth rate has been declined every year even though the area is still increased but in a small scale. From the year 2008-2009, the farmers have started harvesting oil palm. During the year, the first producing year the state produced the total 2.2 metric ton of FFB. The amount of FFB production was increased every year except 2019-2020. The state attained the maximum FFB production in the year 2018-2019 where the total production reach 5298.4 metric ton. From the year 2017, there is a declining trend of the production during the year 2019-2010. Among the 7 districts, oil palm production and productivity is highest in Mamit district. The plantation was introduced at Mamit district and as it has a favourable climate and soils as well as locational advantages, the district attained the top achievement as compared to other. The district accounts 52.74 percent of the total oil palm plantation area of the study area. The district alone produces 36.10 per cent of the total FFBs production. Productivity is also highest among the selected district. Beside this, Kolasib district contribute a significant values in terms of production.

The study examine growth and development patterns of oil palm plantation, livelihoods of oil palm farmers, implication of oil palm plantation on livelihood of oil palm farmers, problems and future prospects of oil palm plantation in Mizoram. The study covers all the districts of Mizoram where oil palm plantation is practicing

such as Aizawl, Kolasib, Mamit, Serchhip, Lunglei, Lawngtlai and Saiha. Primary survey was conducted during 2018-2019 covering 2,693 oil palm farmers from 184 villages which accounts 28.4 percent of the total oil palm farmers in Mizoram. House to house interview has been conducted through adopting the well framed scheduled. Secondary information was also collected from agriculture department, government of Mizoram. The collected data were analyzed by using the statistical techniques such as Principal Component Analysis (PCA), Factor analysis, Z-score standardized techniques and Pearson coefficient of correlation. Maps have been constructed by Arc GIS 10.1.

Accessibility and productivity have a low relationship where the distance of motor able road from main road to plantation is less oil palm productivity is high but not much. Oil Palm productivity is highest in 400-500 Meters MSL in the study area (13 villages) where the average productivity is 36.41 quintal per hectare. Lowest Productivity found in above 1200 meter where average productivity is 1.4 quintal per hectare (2 villages). There is a high negative correlation (-0.725) between Altitude and Oil Palm Productivity

The study finds livelihood standard of oil palm farmer in the study area is considerably low and moderate. Few of the farmers have a high level of livelihood economy especially in the capital city as well as the bigger farmer. Most of the farmers in the study area score very low in most of the selected indicators. Among the indicators, percentage of household having computer, percentage of household having washing machine and percentage of family having motor vehicle are the biggest factors which influence the levels of livelihood quality. Percentage of family having LPG connection and percentage of family having newspaper subscription have largely influence the levels of farmer's economy. On the other hand some indicators like percentage of family having water connection, number of mobile phone per household, percentage of household having refrigerator and percentage of family having two wheelers does not have a high impact on levels of livelihood economy among the oil palm farmer. In other words, oil palm farmers are more or less equal in these assets.

Aizawl district obtained the first rank in livelihood quality of oil palm farmers among the seven districts. Oil palm farmers in Aizawl district are actually the rich people having a permanent occupation as compared to other district. As it is the city center, it serves as distribution centre of funds and other facilities to the other district. Income and households assets of Oil Palm farmer in the district are already quite good before planting oil palm.

Serchip district is the second highest rank having the composite score of 0.43 in livelihood analysis. Oil Palm plantation has been started a little bit late than other district. The farmers who could start the plantation in the district usually have a sufficient income and other facilities. Most of the oil palm farmers are living under permanent house. The number of oil palm farmers having television, refrigerator, water connection and LPG connection etc., is high which make the district high levels of household economy.

Kolasib district score the average level of livelihood among all the districts. The district is the pioneer of oil palm plantation in the state as well as the largest producer of FFB till today. However it is, income and other household assets of the farmer reach the moderate levels. Most of the oil palm farmers in the district have no permanent occupation. Income earned is very less before having production of oil palm. The dependency on oil palm is also higher in the district.

Oil palm farmers in Lunglei and Saiha obtained the second lowest status in livelihood quality. Oil palm plantation has started a little bit late in the two districts. In Lunglei district, Most of the oil palm farmers are backward in income and livelihoods already before production of oil palm. Area and number of farers involved in the plantation is very less in Saiha district as compared to other district. There is no FFB production in the district till the study period. It indicates that all the farmers do not get any profit from oil palm plantation. They are in the plantation stage so that high expenditure without income results a low profits and further result lower livelihood standard.

The lowest livelihood found in Lawngtlai and Mamit districts. In Lawngtlai district, livelihood of oil palm farmer is very low because most of the farmers are

immigrant who recently settled in the villages. They do not have any sufficient occupation and regular income. A household asset is very limited among them even some of the villages do not still have a proper land lease. In Mamit district, oil palm plantation was started early with a large area and huge productions found today. Some of the farmers are the top producers among all the oil palm farmers in the state. Income and economy of those household are plentiful. On the other hand, many oil palm farmers in the district belong to Bru family. They started plantation with a low budged. Family income could not support maintenance of the plantation to continue. Most of the farmers leave the plantation already.

Oil palm farmers in Aizawl district received financial assistant from the state government whereas the others district do not received any financial help. All the farmers in the study area received oil palm seedlings. Fertilizers and pesticides are also provided to all farmers in the whole state except Aizawl district. Profits gained from oil palm production do not influence household economy of the farmers in the study area. Pearson coefficient of correlation value of -0.39 shows the low negative correlation between oil palm productivity and score of household economy among oil palm farmers in the study area. It explains household economy of oil palm farmer is low where oil palm productivity is high and vice versa. Therefore we can say oil palm production do not highly livelihood quality of the farmer.

Monthly income earn by the farmers is not highly increase after having oil palm production (OPP). Besides Mamit and Kolasib district, income increase is very minimal in the other districts. Expenditure for maintenance of Oil Palm plantation is high and the farmers do not have much profit from Oil Palm production. The average annual income of oil palm farmers in the study area before oil palm production was Rupees 28485.71 while after oil palm production is rupees 30234.14, which was increased by rupees 1748.43 i.e., 5.66 per cent. The highest income change was found in Mamit district where the annual income of oil palm farmer was increased by 13.79 percent which is followed by Kolasib district (11.50%), Aizawl district (6.52%), Lunglei district (2.91%), Lawngtlai district (2.91%) and Serchhip district (1.96%). Farmers have no income earn from oil palm in Saiha district. The monthly profit earn by oil palm farmer in the study area is rupees 748.43. Mamit district

obtain the highest position in it where every oil palm farmer get profit of rupees 2856 rupees per month. Mamit district is followed by Kolasib district (Rs. 2557), Aizawl (Rs. 310), Lawngtlai district (Rs. 150) and Lunglei district (Rs. 36). In contrary to this, there is no profit earn from oil palm plantation among farmers of the two district such as Serchhip and Saiha. In Serchhip and Saiha district, the monthly expenditure of oil palm farmers is higher than the return income by rupees 70 and Rs 600 respectively. Most of the families (50.13%) among the oil palm farmers have an income of 5000 to 10000 rupees. 30.51 per cent of the total surveyed family having more than rupees 10000 per month whereas 19.36 per cent have income less than 5000 rupees.

Improvement of Bamboo house to other higher standard type of houses found very less and found only in the three districts such as Aizawl, Lawngtlai and Saiha. Assam type of house has been improved largely to higher standard type of house like semi-permanent and RCC. The number of Semi-permanent type of house is increase almost in all the districts except Lawngtlai and Saiha where there is no change before and after oil palm production. The number of Reinforce Cement Concrete (RCC) type of house is increased among the five districts such as Kolasib (2.18 %), Serchhip (1.43 %), Mamit (1.25 %), Aizawl (0.84 %) and Lunglei (0.37 %).

Household assets were generally improved among the farmers who produced and sold the FFB but it is concentrated very limited to some few districts like Aizawl, Mamit and Kolasib. Farmers beneficially used profit from OPP to develop water connection, motor vehicles and computers. Improvement of household assets after oil palm production is highest in Aizawl District which is followed by Kolasib and Mamit. Whereas it is lowest in Lunglei District. The study finds oil palm Plantation have economically positive implication for livelihood development among oil palm farmer but not high in terms of income, profit earns and household assets.

Based on farmers perception, Oil Palm impact on Livelihood is positively high in Mamit and Kolasib district whereas it is low in Saiha and Lunglei District. For overall, Livelihood development from oil palm production is highest in Kolasib and Aizawl which is followed by Mamit, Lawngtlai, Serchhip, Lunglei and Saiha.

One of the reasons to start thinking oil palm cultivation is its high yielding in nature and the production of good quality fruits in various countries in the world. As shown in the table 6.3 the main reasons to start oil palm plantation in the study area are the farmer have no other occupational options (33.04%), hope for oil palm is beneficial (28.61%), Govt. Scheme which means the government is offering start up program like free seedlings and other supports etc. (23.77%), friends motivation (6.86%) and started by chance (7.72%).

During the plantation period (i.e., clearing of the land, terracing and planting of the seed links), the biggest problem faced by oil palm farmer is financial related problems which accounts 37.29 per cent of the total problems faced by the farmers. The other major problems come from Animals attack (28.91%), insect's infection (14.62%), and accessibility mainly known as link road to connect the farmland from the main road (11.93%). Some of the farmers have a difficulty in the company who hold the responsibility of the plantation like seed links distribution etc. which comprise 3.33 per cent of the total farmers. Unavailability of labour is also a problem faced by 2.27 per cent of the total farmers. Government related problems like slow process of financial and other things are faced by 1.66 per cent of the total farmers. Marketing includes harvesting of seeds, transportation, selling etc. The first and foremost problems faced by the farmers for marketing of oil palm is low rate of selling price which is fixed by the government and company i.e., 5.5 rupees per kilogram.

Many farmers faced transportation problems during harvesting period. The farmers used head load to collect FFB and stock in the main road. Some of the farmers need to load FFB by head more than 5 kilometers. For overall of the state, 87.50 per cent of the total oil palm farmers want to stop the plantation whereas 12.50 per cent still want to continue the plantation. Generally, most of the farmers want to stop oil palm plantation.

Among all the farmers who want to stop plantation, most them (41.85%) want to leave the oil palm plantation because of low selling price. The other reasons why the farmers want to stop the plantation are low profit gained from OPP (28.73%),

high management of the plantation (17.15%) and degradation of environment ((12.26%).

The study recommended that the extension workers should intensify efforts to educate the farmers on improved oil palm production management practices. The farmers should be motivated to form cooperative societies to solve the tripartite problems of inadequate information and cultivation knowledge about oil palm, lack of funds and lack of land, by pooling their resources together. The groups formed can be made use as mediums, targets and change agents. Action restructuring the infrastructure, training, credit linkage and cooperative formation must be taken. The cultivation of oil palm steadily increased the area of cultivation and there is a need to extend the area of cultivation according to the requirements. There is a need to take initiative and efforts towards higher productivity through using of fertilizer, manures, and micronutrients. There is a need to focus more on innovative growth strategies such as marketing of high-grade derivatives, biomass utilization and branding of palm oil as a healthy cooking medium. The existing schemes of the central government should be made use to develop and improve oil palm cultivation in their respective zones in order to introduce modern technology and innovations. Harvesting machines must be provided as it is difficult for the aged farmers and the tax on oil palm must be exempted under VAT. Entrepreneurs should play an important role in oil palm development in their respective allotted zones for effective transfer of production technologies and all thrust areas shall be taken care of through the cooperation of all agencies.

The study suggests achieving sustainable oil palm plantation that accessibility to farms should be improved to reduce the expenditure of the farmers. Moreover, small farmers need to get assistance from the government to increase the profit earn from OPP. The government may give more assistance to the farmers in terms of cleaning of plantation area, wages for manpower during harvesting, the selling process of FFB, and protection from wild animals, especially for the new plantation. Market rate of oil palm must be increased by at least 7 rupees per kilogram. It will make oil palm plantation profitable and economically viable. There must be a deep

research to realize effects of oil palm on environment including biodiversity, soil, water and forest degradation. Based on that the farmers and the government can make the right decision whether to stop or continue the plantation. The government should give more efforts to the farmers. They have to know the problems faced by the farmers and find a market solution with the existing company.

APPENDIX
Questionnaire

PART A: GENERAL INFORMATION

District : ..... Block ……..
: .....Local Council ……Locality…….
Village ……

A.1 Respondent's name :

A.2 Age :

A. 3 Sex : □ M □ F

A. 4 Are you the head of your household? □ Yes □ No

A. 5 Household head's relationship: □ Husband □ Wife □ Children □ Other

A. 6 Please provide the following information?

Sl. No.	Name	Sex (M/F)	Age	Relationship with head	Education	Religion C-Christian B-Buddhist H-Hindu	Mother Tongue	Occupation (be specific)	Monthly Income (in Rs.)
1									
2									
3									
4									
5									
6									
7									
8									

PART B. LAND

B.1 Do you own any type of land in your village/town**?** Yes No, If Yes, Tick any appropriate one

Owned Land use	Area (Ha.)	Certificate (Tick any)				Obtained since (year)	Obtained through (a) given by Chief (b) given by VC (c) bought from others	Current Value of land
		LSC	Periodic Patta	VC Pass	Others (Speci-fy)			
Homestead								
Jhum								
WRC								
Plantation								
Leipui								
Terrace								
Other								

PART C: SOURCE OF LIVELIHOOD

C.1 Which activities do you consider as your main and secondary sources of livelihood? Put'M'as main and 'S'as secondary.

Agriculture Agricultural labour Plantation Animal husbandry

Fisheries Services Business Others

C.2 Are you a beneficiary of NLUP?

Yes No

C.3 Do you used your oil palm plantation as NLUP trade?

Yes No

C.4 Under what farming system oil palm is cultivated?

ContractFarming CaptiveFarming Traditional Farming

PART D: STATUS ON OIL PALM PLANTATION

D.1Give the following questionsfor their oil palm plantation.

Year of plantation	Area	Distance from home	Distance from motorable road	Slope Gradient	Compact/ Individual (isolated) area	Source of water

D.2 Consumption and income from Oil Palm (in term of Rupees or Man work)

Year	Maintenance/ Weeding (MW)	Input of labor (Rs.)	Input of fertilizers	Harvesting& transport	Government aid (cash)	Income
Before harvesting						
1st yr of harvesting						
2nd yr of harvesting						
3rd yr of harvesting						
4th yr of harvesting						

D.3 What facilities are received under oil palm plantation from the state government or contractor?

Items	How many times	Years	Quantity (Rs./kg)	Satisfactory level	Remarks
Cash					
Seeds					
Fertilizers					
Pesticide					
Water tank					
Irrigation equipment					
Machine tools					
Other					

D.4 Method of Selling Oil Palm product:

□Through Cash Payment

□Through bank

□Other:

D.5 . Is there any problem of marketing Oil Palm?

□□□Yes □ No

If yes, specify:

D.6 Is there any problem of cultivation of oil palm?

□Yes □No

If yes, specify:

D.7 Do you think cultivation of oil palm is more profitable as compare to other existing crops in Mizoran?

□Yes □No

If yes, specify:

If no, specify:

PART E: IMPACT OF OIL PALM ON LIVELIHOOD

E.1 Please specify the number of Assets you have

Household Assets	Before Oil Palm Production	After Oil Palm Production
House Type		
TV		
Refrigerator		
Washing Machine		
Long chair		
Motor vehicle		
Two wheeler		
Water connection		

LPG connection		
Mobile Phone		
Computer		
Internet facilities		
Newspaper		

E.2 Please mention monthly family Income and Expenditure in rupees

Indicators	**Before Oil Palm Production**	**After Oil Palm Production**
Monthly income		
Monthly Expenditure		

E.3 Please answer the following questions

Question	**Yes**	**No**
Do you aware Oil Palm Plantation?		
Do you start Oil Palm Plantation by own choice		
Is your family thinking Oil Palm beneficial		
Is your family improve children's education due to Oil Palm production		
Is your family beneficially used Oil Palm for other occupation		
Is your family do not find negative impact of Oil Palm on your farm soil quality		
Is your family do not find negative impact of Oil Palm on your farm water quality		
Is your family do not find negative impact of Oil Palm on your source of water		

Is your family do not find negative impact of Oil Palm on forest		
Do you find negative impact of Oil Palm on village climate		
Do you find negative impact of Oil Palm on human health		
Dou you find negative impact of Oil Palm on other plants		

Part F: Problems & Prospects of Oil Palm Plantation

F.1 Please tick the answer

Why do you start Oil palm Plantation	No other occupation	Hope for oil palm is beneficial	Govt. Scheme	Friends motivation	Started by chance

F.2 Please tick the answer

Why are the main problems faced during Oil palm Plantation	Animal	Financial	Company	Government	Labour	Insects	Accessibility

F.3 Please tick the answer

Why are the main problems faced for marketing Oil palm	**Animal**	**Financial**	**Company**	**Government**	**Labor**

F.4 Please answer the following question

Question	Yes	No
Do you want to continue oil palm plantation		
If No, please mention the reason		

References:

Ahmad R. (1998): *Perkebunan Dari NES ke PIR Puspa Swara*, Jakarta

Ajani, E. N. Onwubuyam, E.A. & Nwalieji, H.U. (2012). Assessment of oil palm production and processing among rural women in Enugu North agricultural zone of Enugu State, Nigeria. *International Journal of Agricultural Sciences*, Vol. 2(12), 322-329.

Akangbe, J.A. Adesiji, G.B., Fakayode, S.B. & Aderibigbe, Y.O. (2011). Towards palm oil self- sufficiency in Nigeria: consneedtraints and training needs nexus of palm oil extractors. *Journal of Human Ecology*, Vol. 33, 139-145.

Amponsaha, C.O. Vissera, L. Nsiahb, J.A. Struikc, P.C. Dawsond, O.A. & Stomphc, T.J. (2012). Processing practices of small-scale palm oil producers in the Kwaebibirem. *Wageningen Journal of Life Sciences*, Vol. 60, 49-56.

Anaglo, J.N. Boateng, S.D. and Swanzy, K.M. (2014). The Influence of Adoption of Improved Oil Palm Production Practices on the Livelihood Assets of Oil Palm Farmers in Kwaebibirem District of Ghana. *Journal of Biology, Agriculture and Healthcare*, Vol.4, No.1, 88-94.

Ashley C. and Maxwell S. (2001): Rethinking Rural Development, *Development Policy Review Vol.19*, pp. 395-425.

Belcher, B., Imang, N. & Achdiawan, R. (2004). Rattan, rubber, or oil palm: Cultural and financial, consideration for farmers in Kalimantan. *Economic Botany*, 58 (1), 77–87.

Booysen, F. (2002). An Overview and Evaluation of Composite Indexes of Development, *Social Indicators Research*, Vol. 59, pp. 115-151.

Budidarsono, S., Dewi, S. Sofiyuddin, M. & Rahmanulloh, A. (2012). *Socio-economic Impact Assessment of Palm Oil Production*. Technical Brief No. 27: palm oil series, World Agroforestry Centre - (ICRAF), SEA Regional Office, Bogor, Indonesia.

Cahyadi, E.R. & Waibel, H. (2013). Is Contract Farming in the Indonesian Oil Palm Industry Pro-poor? *Journal of Southeast Asian Economies*, Vol. 30 (1), 62-76.

Cahyadi, E.R. Waibel, H. (2016): Contract farming and vulnerability to poverty among oil palm smallholders in Indonesia. *The Journal of Development Studies* 52(5), 681–695.

Chatfield, C. and Collins, A.J. (1980). *Introduction to Multivariate Analysis*, London and New York, Chapman and Hall.

Clark, D. Davies, W.K.D. and Johnston, R.J. (1974). The Application of Factor Analysis in Human Geography, *The Statistician*, Vol. 23 (3/4), pp. 259-281.

Constello, A.B. and Osborne, J.W. (2005). Best Practices in Explanatory Factor Analysis Four Recommendations for getting the most from your analysis, *Practical Assessment Research and Evaluation,* Vol.10 (7), pp.1-9.

Cramb, R. (2016) The Political Economy of large scale oil palm development in Sarawak, In R. Cramb & J.F. MC Carthy (Eds.), *The oil palm complex: Smallholders, Agribusiness and the state in Indonesia and Malaysia,* (pp 78-108). Nus Press, Singapore.

Cramb, R. and Curry, G.N. (2012). Oil palm and rural livelihoods in the Asia–Pacific region: *An overview. Victoria University of Wellington*, doi: 10.1111/j.1467-8373.2012.01495.x.

Damoah, A.R. (2012). The effects of Benso oil palm plantation smallholder farmers' scheme on rural poverty reduction in the Mpohor Wassa east district of Ghana (Thesis). *University of Science and Technology, Commonwealth Executive Masters of Business Administration. District, Ghana*. doi: I 10.1007/s10531-009-9760-x.

Dano, G. (2013). Commercial oil palm cultivation in Ghana: an outline. *Pro journal of agricultural science research (PASR),* Vol. 1(3), 22-41.

De Vries, *et al* (2010): Resource use efficiency and Environmental Perfomance of Nine Major Biofuel crops, Processed by First- generation Conversion techniques, *Biomass and Bioenergy*, Vol 34, No.5, (online) available at http://www.sciencedirect.com/science/article/pii/S0961953410000024, assessed on 19/7/2017, 04:35 p.m, pp.588-601.

Dev, M. (2002): Small Farmers in India: Challenges and Opportunities, *Indira Gandhi Institute of Development Research*, Mumbai.

Dib, J.B. et. al. (2018): Land-use change and livelihoods of non-farm households: The role of income from employment in oil palm and rubber in rural Indonesia. *Land Use Policy 76, 828-838.*

Donald P. (2004): Issues in International Conservation *Biodiversity Impacts of Some Agricultural Commodity Production, Conservation Biology*, Vol.18, pp. 17-38

FAO (2009). *FAO-STAT online statistical service. United Nations Food and Agriculture Organization (FAO),* Rome. Available via http://faostat.fao.org., Accessed 15 June 2009.

Faruk (2013). Effects of Oil-Palm Plantations on Diversity of Tropical Anurans. *Society for Conservation Biology*, Vol. 27 (3), 615-624.

Feintrenie, L. Chong, W.K. & Levang, P. (2010). Why do Farmers Prefer Oil Palm? *Lessons Learnt from Bungo District, Indonesia.* Small-scale Forestry, Vol. 9 (3), 379–396.

Feintrenie, L. et. al (2010): Why do farmers prefer oil palm? *Lessons learnt from district,m Indonesia.* Small-scale Forestry 9 (3), 379–396.

Field, A. (2000). *Discovering Statistics Using SPSS for Widows, Sage Publication,* New Delhi.

Flitzherbert E.B *et al* (2008): How Will Oil Palm Expansion Affect Biodiversity? *Trends in Ecology and Evolution,* Vol 23, No.10, pp.538-545.

Food and Agriculture Organization (2009): Global Forest Resources Assessment, *Progress Towards Sustainable, Forest Management.*

Gatto, M. *et al* (2017): Oil palm boom, contract farming, and rural economic development: *Village-level evidence from Indonesia. World Development 95, 127–140.*

Gatto, M. Wollni, M. & Qaim M. (2015). Oil palm boom and land-use dynamics in Indonesia: *The role of policies and socio-economic factors. Land Use Policy 46 (2015) 292–303.*

Giggs, J.A. and Mather, P.M. (1975). Factorial Ecological and Factor Invariance*, An Investigation, Economic Geography, Vol. 51 (54),* pp. 366-382.

Government of India (2019) Press Information Bureau, Ministry of Agriculture & Farmers Welfare, Categorizations of Farmers, (online) *https://pib.gov.in/Pressreleaseshare.aspx?PRID=1562687 accessed on 19.01.2023 Govt. of Mizoram, (2020): Unpublished Document, Department of Agriculture, Mizoram*

Greyling, T. (2013). A Composite Index of Quality of Life for the Gauteng City Region, *A principal Component Analysis Approach,* Occasional Paper 07, The Gauteng City-Region Observatory, South Africa.

Hayashi, K. (2007). Environmental impacts of palm oil industry in Indonesia. *Proceedings of International symposium on Ecotopia Science 2007,* ISETSO7.

Ho, R., (2014). Handbook of Univariate and Multivariate Data Analysis with IBM SPSS, New York, CRC Press.

Hutcheson, G. and S. Zofroniou, N. (1999). *The Multivariate Social Scientist, Introductory Statistics Using Generalized Linear Models*, Thousand Oaks, CA, Sage Publication.

Ibitoye & Jimoh, S. (2014). Economic analysis of palm oil marketing in Dekina local government area of Kogi state, Nigeria, *Asian Journal of Social Sciences, Arts and Humanities,* Vol. 2(1), 1-19.

Ibitoye, O.O. Akinsorotan, A.O. Meludu, N.T. & Ibitoye, B.O. (2011). Factors affecting oil palm production in Ondo state of Nigeria, *Journal of Agriculture and Social Research (JASR),* Vol. 11 (1), 97-105.

ITS Global (2011*). The Economic Benefits of Palm Oil in Papua New Guinea.* International Trade Strategies Pty Ltd, trading as ITS Global, Melbourne, Australia.

Izahi, S.C. Angayei, C.N. & Ohimaini, E.I. (2016). Environmental Impacts of Oil Palm Processing in Nigeria. *Biotechnology Reserve,* Vol. 2(3), 132-141.

Jelsma, I. et. al (2017): Unpacking Indonesia's independent oil palm smallholders: An actor-disaggregated approach to identifying environmental and social performance challenges. *Land Use Policy* 69, 281–297. development: Village-level evidence from Indonesia. World Development 95, 127–140.

Jenks, G.F. (1967). *The Data Model Concept in Statistical Mapping,* International Yearbook of Cartography, Vol. 7, pp.186-190.

Kaiser, H.F. (1970). A Second Generation Little Jiffy, *Psychometrika,* Vol. 35, pp. 401-415.

Kaiser, H.F. and Rice, J. (1974). Little Jiffy, Mark IV, *Educational and Psychological Measurement,* Vol 34, pp. 111-117.

Knox, P.L. and Pinch, S. (2010). Urban Social Geography, *An Introduction, Pearson Publication, London.*

Koczberski G. *et al* (2001): Improving productivity of the Smallholder Oil Palm Sector in Papua New Guinea; a Socio-Economic Study of the Hoskins and Popondetta Schemes, *The Australian National University Department of Human Geography Research School of Asian and Pacific Studies, Canberra, Letter,* Vol 1, pp.60-64.

Koczberski G. (2007): Loose Fruit Mamas; *Creating Incentives for Smallholder Women in Oil Palm production in Papua New Guineas, World Development,* Vol 35, No.7, pp.1172- 1185.

Kongsager, R. and Reenberg, A. (2012): Contemporary land-use transitions: *The global oil palm expansion, GLP International Project Office, GLP Report no 4*

Krishnan, V. (2010). *Constructing an area-based socio-economic index,* A principal Components Analysis Approach, Edmonton, Alberta, Early Child Development Mapping project.

Laschinger, C. (2013). Sustainability and Social-Ecological Systems Navigating Oil Palm Cultivation and Sustainable Livelihoods: A Case Study in Karaket Sub-District, Nakhon Si Thammarat Province, Thailand. *Master of Science in International Development and Management, Department of Human Geography, Lund University, Sweden.*

Lee, J.S. Ghazoul, J. Obidzinski, K. & Koh, L.P. (2014). Oil palm smallholder yields and incomes constrained by harvesting practices and type of smallholder management in Indonesia. Agron. Sustain. *Agronomy for Sustainable Development, Vol. 34(2), 501-513.*

Meijaard, E. & Sheil, D. (2019): The moral minefield of ethical oil palm and sustainable development. *Frontiers in Forests and Global Change 2, 22.*

Mingorria, S. Gamboa, B. & Lopez, B.M. (2014). The oil palm boom*: socio-economic implications for Q'eqchi' households in the Polochic valley, Guatemala, Environ Dev Sustain, Vol. 16, 841–87, doi: 10.1007/s10668-014-9530-0.*

Murphy, J.D. (2014) : The future of Oil Palm as a major global crop: *Opportunities and Challenges, Journal of Oil Palm Research, 26(1) : 1-14.*

Nicoletti, G. Scarpetta, S. and Boylaud, O. (2000). Summary Indicators of Product Market Regulation with an Extension to Employment Protection legislation, *Economic Department Working Papers No.226, OECD.*

Nkongho, R.N., Feintrenie, L. & Levang, P. (2013). Strengths and weaknesses of the smallholder oil palm sector in Cameroon. *Oilseeds and fat crops and lipids OCL, Vol. 21(2), 1-9.*

Norwana, B.D. *et al*. (2011). *The local impacts of oil palm expansion in Malaysia An assessment based on a case study in Sabah State. Working Paper 78,* Center for International Forestry Researchor Dayang, Norwana.

Ntsiful, A.K. (2010). *Out grower oil palm plantations scheme by private companies and poverty reduction in Ghana*. (Ph.D Thesis), St Clements University, Turks and Caicos Islands.

O'Connor, B.P. (2000). SPSS and SAS programs for Determining the Number of Components using Parallel Analysis and Velicer's Map Test, *Behaviour Research Methods, Instruments and Computers*, Vol. 32 (3), pp. 396-402.

Obidzinski, K. Andriani, R. Komarudin, H. & Andrianto, A. (2012). Environmental and Social Impacts of Oil Palm Plantations and their Implications for Bio-fuel Production in Indonesia. *Ecology and Society*, Vol. 17 (1), doi:10.5751/ES-04775-170125.

Okungbowa1, A. Oghorodi, C. I. & Omofonmwan, E.I. (2014). Profitability of palm oil marketing in Ethiope east Local government area of delta state, Nigeria. *Nigerian Journal of Agriculture, Food and Environment, Vol. 10 (4), 119-122.*

Olagunju, F. (2008). Economics of Palm Oil Processing in Southwestern Niger *International Journal of Agricultural Economics & Rural Development,* Vol. 1 (2), 69-77.

Organisation for Economic Co-operation and Development, (2008). *Handbook on Constructing Composite Indicators,* Methodology and User Guide.

Owolarafe, O.K and Arumudhan, C (2007): A review of Oil Palm Fruit Plantation under the Contract-Growers Scheme in Andhra Pradesh, Tamil Nadu State of India, Agriculture Engineering International: *CIGR Journal, 9: 1-16.*

Petrenko, C. Paltseva, J. & Searle, S. (2016). *Ecological impacts of palm oil expansion in Indonesia*. White paper, International Council on Clean Transportation, Street NW Suite, Washington, DC, USA.

Phil, S. (2002): *Overview of Small Holder Contract Farming in Developing Countries. ESA Working Paper No. 02-04,* Agricultural and Development Economics Division, The Food and Agriculture Organization of the United Nations.

Prasad, M.V. Sarkar, A. & Jameema, J. (2010). Performance of Oil Palm Production Technologies. *Indian Research Journal of Extension Education*, Vol. 10 (3), 10-15

Purnomo, H. et. al. (2020): Reconciling oil palm economic development and environmental conservation in Indonesia: *A value chain dynamic approach. Forest Policy and Economics 111, 102089.*

Qaim, M. (2020): Environmental, economic, and social consequences of the oil palm boom. *Annual Review of Resource Economics 12.*

Rao, N.V. (2013): Oil Palm Cultivation in Andhra Pradesh – *A study of the Problem and Prospect. Indian Journal of Research, 2 (7): 399-400*

Rist, L. Feintrenie, L. & Levang, P. (2010). The livelihood impacts of oil palm: Smallholders in Indonesia. *Biodiversity and Conservation,* 19 (4), 1009–1024.
doi: 10.1007/s10531-010-9815-z.

Ritcher, B.D. (2009). Re-thinking environmental flows: from allocations and reserves to sustainability boundaries. *River research and applications,* Vol. 26(8), 1052-1063. https://doi.org/10.1002/rra.1320.

Rummel, R.J. (1970). *Applied Factor Analysis, Evanston, IL,* Northwestern University Press.

Saitluanga Benjamin L. (2017). Himalyan Quality of Life, *A Study of Aizawl City, Springer Publication, pp.35-53.*

Sayer, J. (2012): Oil palm expansion transforms tropical landscapes and livelihoods *Global Food Security* 1 (2), 114–119.

Sayer, J., Ghazoul, J. Nelson, P. & Boedhihartono, A.K. (2012). Oil palm expansion transforms tropical landscapes and livelihoods. *Global Food Security, Vol. 1(2012), 114–119.*

Schultz T.W. (1964): *Transforming traditional agriculture,* Yale University Press, New Haven.

Singh, S. (2000): Contract Farming for Agricultural Diversification in the Indian Punjab*: A Study of Performance and Problems, Indian Journal of Agricultural Economics,* 56 (3) :283-94.

Singh, S. (2003): Contract Farming In India: *Impact on Women and Child Labour, Gatekeeper, Series No.111,2(3): 1-16, London.*

Soyebol, K.O. Farinde, A.J. & Dionco-Adetayo, E. D. (2005). Constraints of Oil Palm Production in Ife Central Local Government Area of Osun State, Nigeria. Journal of Social Science, Vol. 10(1), 55-59. Phil, S. (2002): *Overview of Small Holder Contract Farming in Developing Countries. ESA Working Paper No. 02-04, Agricultural and Development Economics Division, the Food and Agriculture Organization of the United Nations.*

Streiner, D.L. (1998). Factors Affecting Reliability of Interpretations of Scree Plots, *Psychological Reports, Vol. 83, pp. 687-694.*

Sunderlin, W.D. (2005): Livelihoods, forests, and conservation in developing countries: an overview. *World Dev.* 33 (9), 1383–1402.

Swain, B.B (2009): *An Evaluation Of Constrains of Contract Farming System: A case study of Orissa*, MPRA Paper No. 18683.

Tabachnick, B.G., and Fidell, L.S. (2013). Using Multivariate Statistics, *Pearson Publication, London*

Tailliez B. (not available): Scientific Research for Sustainable Agricultural Production, CIRAD. *The Livelihood Impacts of Oil Palm: Smallholders in Indonesia April 2010 Biodiversity and Conservation* 19(4):1009-1024. DOI:10.1007/s10531-010-9815-z

Tucker, L.R. and MacCallum, R.C. (1997). *Exploratory Factor Analysis (unpublished Manuscript),* Columbus, Ohio State University.

Ugwu, D.S. (2009). Problems and Prospects of Commercial Small and Medium Scale Cocoa and Oil Palm Production in Cross River State, Nigeria. *Journal of Applied Sciences Research,* Vol. 5(7), 827-832.

Vangchhia Lalrinpuia & Sati Vishwambhar Prasad (2017): Impact of Oil Palm on Rural Livelihood: *A case study of Mamit and Kolasib District, Mizoram, North East India, Natural Resources Management for Sustainable Development and Rural Livelihood, Todays & Tomorrow publisher, New Delhi, pp.413-423.*

Vermeulen, S., & Goad, N. (2006). Towards better practice in smallholder palm oil production. *Natural Resource Issues Series No. 5, International Institute for Environment and Development, London, UK.*

Vorley B. and Fox T. (2004): *Global food chains; constraints and opportunities for smallholders DfID,* London.

Wilcove, D.S., Koh, L.P. (2010): Addressing the threats to biodiversity from oil-palm agriculture. *Biodiversity Conservation.* 19 (4), 999–1007.

World Growth (2011). The economic benefits of oil palm to Indonesia. *A Report by World Growth: Palm oil green development campaign.*

Yamane, T. (1967). *Statistic: An introductory Analysis, 2nd ed.,* Harper and Row, New York.

Yengoh, G.T. Armah, F.A. (2016): Land access constraints for communities affected by large-scale land acquisition in Southern Sierra Leone. *Geojournal 81 (1), 103–122.*

Young, A.G. and Pearce. S. (2013). A Beginner's Guide to factor Analysis, Focusing on Exploratory Factor Analysis, *Tutorials in Quantitative methods for Psychology*, Vol 9 (2), pp.79-94.

Yuliani (2018). *Keeping the land indigenous communities' struggle over land use and sustainable forest management in Kalimantan, Indonesia, Ecology and Society*, Vol. 23 (4), 49- 60.

Zen (2016). Interventions to promote smallholder oil palm and their socio- economic development in Indonesia. In R. Cramb & J.F. MC Carthy (Eds.), *The oil palm complex: Smallholders, Agribusiness and the state in Indonesia and Malaysia, (pp 78-108).* Nus Press, Singapore.

Zwick, W.R. and Velicer, W.F. (1986). Comparison of Five Rules for Determining the Number of Components to Retain, *Psychological Bulletin, Vol. 99, pp. 432-442.*

BIO-DATA

Name	:	Lalherliana Sailo
Father's Name	:	Lalsanglura Sailo
Date of Birth	:	18/04/1988
Sex	:	Male
Marital Status	:	Unmarried
Address	:	Chawnpui, Aizaawl, Mizoram
Contact	:	9862378724
Email	:	herlianasailo7@gmail.com

Educational Qualification:

Master of Science (Geography)

Educational Records (from Matriculation Onward)

Sl. No	Class	Subject	%	Year of passing	Board or University
1	HSLC	-	60.2	2005	MBSE
2	HSSLC	Geography	51	2007	MBSE
3	B.A	Geography	51.6	2011	M.Z.U
4	M.Sc	Geography	63.6	2014	M.Z.U

Journal Publication:

Paper Title	Journal/Books	Date
Problems of Oil Palm Plantation in Mizoram	Geographic, Journal of GAM	Jul, 16, 2021, Vol.16
Cultivation of Oil Palm and Programme in Mizoram	Book chapter "Natural Resources Management for Sustainable Development and Rural Livelihoods"	2017, Vol.2

Paper Presentation:

Title of paper	Name of Seminar	Name of organizer
Cultivation of Oil Palm and in Mizoram	"Natural Resources Management for Sustainable Development and Rural Livelihoods"	Department of Geography and Resource Management, Mizoram University

Particulars of the candidate

NAME OF CANDIDATE : Lalherliana Sailo

DEGREE : Doctor of Philosophy (Ph.D.)

DEPARTMENT : Geography and Resource Management

TITLE OF THESIS :Implication of Contract Farming on Livelihood with reference to Oil Palm Plantation in Mizoram

DATE OF ADMISSION : 31.08.2015

APPROVAL OF RESEARCH PROPOSAL

1. DEPARTMENTAL RESEARCH COMMITTEE : 31-08-2015
2. BOARD OF STUDIES : 08-04-2016
3. SCHOOL BOARD : 13-04-2016

MZU REGN. NO. : 15 of 2009-10

Ph.D REGN. NO. & DATE : MZU/Ph.D./ 860 of 13.04.2016

EXTENSION : 12-04-2023
No. 16-2/MZU (Acad/20/431-33)
Dated 31st August 2021

Head
Department of Geography and Resource Management

ABSTRACT

IMPLICATION OF CONTRACT FARMING ON LIVELIHOOD WITH REFERENCE TO OIL PALM PLANTATION IN MIZORAM

AN ABSTRACT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

LALHERLIANA SAILO

MZU REGISTRATION NO.: 15 OF 2009-10

Ph.D. REGISTRATION NO: MZU/Ph.D./860 of 13.04.2016

DEPARTMENT OF GEOGRAPHY AND RESOURCE MANAGEMENT

SCHOOL OF EARTH SCIENCES AND NATURAL RESOURCES MANAGEMENT

APRIL, 2023

IMPLICATION OF CONTRACT FARMING ON LIVELIHOOD WITH REFERENCE TO OIL PALM PLANTATION IN MIZORAM

BY

LALHERLIANA SAILO

Department of Geography and Resource Management

Supervisor

Prof. P. RINAWMA

Joint Supervisor

Prof. BENJAMIN L. SAITLUANGA

Submitted

In partial fulfillment of the requirement of the Degree of Doctor of Philosophy in Geography of Mizoram University, Aizawl.

ABSTRACT

Implication of contract farming on livelihood with reference to oil palm plantation in Mizoram

Contract farming can be defined as an agreement between farmers and processing and/or marketing firms for the production and supply of agricultural products under forward agreements, frequently at predetermined prices. The arrangement also invariably involves the purchaser in providing a degree of production support through, for example, the supply of inputs and the provision of technical advice. The basis of such arrangements is a commitment on the part of the farmer to provide a specific commodity in quantities and at quality standards determined by the purchaser and a commitment on the part of the company to support the farmer's production and to purchase the commodity.

`In an age of market liberalization, globalization and expanding agribusiness, there is a danger that small-scale farmers will find difficulty in fully participating in the market economy. The oil palm (Elaeis guineensis) originated from West Africa, where evidence of its use as a staple food crop dates as far back as 5,000 years. There is even evidence in Egyptian tombs of people being buried with casks of palm oil, reflecting the high societal value attributed to the product. While palm oil was ubiquitous in West Africa, the use of palm oil in the international market expanded significantly as a result of the Industrial Revolution and the expansion of overseas trade. From candle-making to industrial lubricants, palm oil was a driving force behind the expansion of industrial production, while nutrient rich red palm oil became a vital asset on long sea-faring voyages. With the increasing demand, Europeans began investing in palm oil production, first in West Africa and then expanding to Southeast Asia.

A combination of European settlers and entrepreneurs, seeing the opportunity for commercial palm oil production to produce soaps, lubricants and edible oils lead to a dramatic expansion of oil palm plantations throughout Sub-Saharan Africa and

Southeast Asia. The first commercial scale plantation in Malaysia was founded in 1917 and established in Tennamaran Estate in Selangor.

Presently, palm oil has penetrated global markets (including food, toiletries, cleaning products, and biofuel) because it is efficient (in terms of the amount of land required), versatile, and relatively cheap compared to other vegetable oils. It has been described as a ‘golden crop’, lifting many poor farmers from poverty.

Palm oil is currently the world’s most consumed vegetable oil, with its main consumers being India, China, and European Union (EU). Besides food, palm oil is widely used in other commodities such as detergents, plastics, cosmetics, and biofuels. Thus, profits from palm oil have attracted many industrial-scale palm oil producing companies, both regional and international.

However, India is home to two global biodiversity hotspots and only 4.90 percent of its entire land is under protected area status (Ministry of Environment, Forest and Climate Change. These sensitive areas, especially in the northeastern states are under increased threat from unguided oil palm expansion, due to the lack of robust studies on the feasibility of oil palm plantations and potential threats to the biodiversity and livelihoods of indigenous communities in this region. Moreover, substantial amounts of land in the northeastern states are community owned and managed. But, because of oil palm expansion, states such as Mizoram have instituted New Land Use Policies with a focus to replace traditional shifting cultivation with settled agriculture. This has resulted in social unrest with communities opposing the proposed New Land Use Policies in Manipur, stating that it is harmful for their ecologically sustainable traditional land-use management systems Similarly, conservation scientists working in Arunachal Pradesh have also cautioned against oil palm establishment in the state highlighting deficiencies in the governments’ oil palm policies, such as lack of sufficient dialogue with stakeholders, low transparency with the policies, biased experimental studies, and non-evidence based actions.

In Mizoram, oil palm plantations started in 2004 and still practicing in 7 districts of the state such as Aizawl, Kolasib, Mamit, Serchhip, Lunglei, Lawngtlai and Saiha. Area and Production are increasing during the starting period whereas it is a decline in the recent years. It is observed that oil palm is beneficial for only big and already settled farmers but not fruitfully beneficial for small/marginal farmers to their livelihood. Many farmers want an abandoned plantation of oil palm due to many factors. Currently, the study of livelihood development from oil palm production is highly important. The present study attempts to analyses growth and development of oil palm plantation in Mizoram and its implications on livelihood of oil palm farmers and problems and prospect of oil palm plantation in Mizoram.

The rapid increase of land degradation due to jhumming, deforestation, loss of biodiversity and productivity are leading to an ecological crisis affecting livelihood options for Jhumia families. This suggests inter-alia policy to encourage and support plantation of Oil Palm to overcome these constraints. Oil Palm stands as an ideal crop capable of achieving conservation of soil and moisture, repair of degraded land, provide ecological balance, food and security of rural and urban poor. The Government of Mizoram aims to implement and action programme with an objective of placing Oil Palm as a key component in the plan to generate employment and mitigate environmental degradation and to strengthen the process of Oil Palm Development**.**

Regional backwardness is the main issue of concern in Mizoram. Lack of adequate rural infrastructure, sectoral investment and research backup facilities are the main bottleneck of sustainable and accelerated growth of agriculture sector. By diversification of agriculture farming, private corporate investment through contract farming system is expected to accelerate the rural economy by expanding the rural – urban trade for domestic processing and promoting exports.

The study of contract farming on oil palm plantation may helped farmers to become better farmers, gave more reliable income, provided new skill of farming, this way patron-client relationship between large and small producers. So the topic is

chosen to study the helpfulness of contract farming in solving the problems of input supplies, marketing of produce income increasing product etc.

Followings are the main objectives of the study

1. To highlights Status of Oil Palm Plantation in Mizoram
2. To study Spatial- temporal change of Oil Palm Plantation in Mizoram
3. To find out Impact of Oil Palm Production on Livelihood in Mizoram
4. To find out Problems and Prospects of Oil Palm Plantation in Mizoram

The study covers seven districts of Mizoram as per 2011 Census where oil palm plantation is practicing such as Aizawl, Lawngtlai, Mamit, Saiha, Serchhip, Lunglei and Kolasib districts. Champhai District is not included as they do not practice Oil Palm plantation. During the study period i.e., 2018-2019, the total 10843 farmers are practicing Oil Palm plantation. Mamit district got the higest number of Oil palm farmer i.e. 3042 followed by Kolasib (2155), Lawngtlai (2007), Lunglei (1803), Serchhip (1390), Aizawl (403) and Saiha (43). The study covers 184 villages from seven districts comprising 2693 household/ Oil palm farmers. The total Oil Palm plantation area is 2261.52 Hectares.

The state is increasingly promoting oil palm plantation in these districts with multiple aims of generating jobs, benefiting farmers and attracting edible oil makers. It has earmarked 1, 33,000 hectares of land in Mizoram for oil palm plantation as the region's climatic and geographical conditions are suitable for its growth.

Methodology of the present study includes selection of the study area, preparation of scheduled, sampling design and sample size, collection of data, data processing viz., data entry, tabulation, analyze and interpretation with application of statistical techniques and graphical works. The study was mainly based on primary data collected by author during the year 2018-2019. Since the main intention of the present study implication of oil palm plantation on rural livelihood of Mizoram, the study covers all the district of Mizoram where oil palm cultivation is practicing such as Aizawl, Lawngtlai, Mamit, Saiha, Serchhip, Kolasib and Lunglei. The study is

based on both primary and secondary data. Applying the sampling method given by Yamane, 1967, 2693 oil palm farmers were selected from 184 villages covering 28.4 percent of the total oil palm farmers of Mizoram by purposive random sampling techniques**.** The Primary data has been collected from seven districts by sampling method as under.

The required sample size is determined with the help of the following formulae given by Yamane (1967).

$$\mathbf{n = \frac{N}{1 + N\,(e)^2} = \frac{10843}{1 + 10843\,(0.05)^2} = 387.25}$$

Where n is the sample size, N is the population size and e is the level of precision with 95 percent confidence level.

The estimated sample size is 387 for the entire state of Mizoram. By taking District as strata, the total sample size will be divided among the seven Districts with 'Disproportionate Stratified Sampling Method'. In the end, the following number of the sample was collected from each seven district.

Each district is proportionately stratified again on the basis of RD block by following the same procedure and, household survey has been done from the selected villages. Selection of villages from each RD block will be ascertained after obtaining data on the number of oil palm planters from the villages.

The Secondary data are collected from Department of Agriculture Mizoram and the three companies Godrej Agroved Ltd., Ruchi Soya Industries Ltd. And 3F Oil Palm Agrotech Pvt Ltd. for oil palm development in Mizoram. High Resolution Satellite imagery will be used to identify the potential areas of oil palm plantation.

Data collection has been done during the year 2018-2019. Before conducting case study, a pilot survey was undertaken first to select the villages and appropriate variables to be included in the study. Those variables which have no relationship were excluded from further analysis. Thereafter a structured scheduled was framed and face to face interviewed have been conducted. Household to house survey has

been done in each village during the said period. Oil palm plantation area has also been visited as much as possible in the villages.

To analyze the collected data statistical techniques like Z score standardize techniques, Principal Component Analysis (PCA), Factor Analysis (FA) and Pearson's coefficient of correlation statistics have been applied. Principal Component Analysis and Factor Analysis are dominant multivariate statistical techniques. India map shape files or Vector Data have been downloaded from open sources like DIVA-GIS, IGISMAP, and Bhukosh Geological Survey of India. The study area and other Coropleth maps have been constructed by using Arc GIS 10.1. Other figures were also prepared through Statistical Package for Social Science (SPSS) and Microsoft excel, 2010.

Oil Palm Plantation was started at Mizoram in the year 2005. Since plantation was started, the total area under oil palm plantation in Mizoram was 110 hectare of land. The plantation area was increased by every year in a different rate. The area under the plantation was continuously increasing till the year 2013-2014 and reaches the maximum increased in that year. There was the declining pattern of plantation area from the year 2013-2014. Average growth of Oil Palm Plantation area in Mizoram during 2005-2020 is 73.39 (in Ha). The highest growth rate (615.67) found during the year 2007-2008 when oil palm plantation was reach the third years. The high growth rate was found again the next two years i.e., 2008-2009 and 2009-2010 where the growth rate crossed 177.27 and 106.88 respectively. From the year 2007-2008, the growth rate has been declined every year even though the area is still increased but in a small scale. From the year 2008-2009, the farmers have started harvesting oil palm. During the year, the first producing year the state produced the total 2.2 metric ton of FFB. The amount of FFB production was increased every year except 2019-2020. The state attained the maximum FFB production in the year 2018-2019 where the total production reach 5298.4 metric ton. From the year 2017, there is a declining trend of the production during the year 2019-2010.

Among the 7 districts, oil palm production and productivity is highest in Mamit district. The plantation was introduced at Mamit district and as it has a

favourable climate and soils as well as locational advantages, the district attained the top achievement as compared to other. The district accounts 52.74 percent of the total oil palm plantation area of the study area. The district alone produces 36.10 per cent of the total FFBs production. Productivity is also highest among the selected district. Beside this, Kolasib district contribute a significant values in terms of production. Accessibility and productivity have a low relationship where the distance of motor able road from main road to plantation is less, oil palm productivity is high but not much. Oil Palm productivity is highest in 400-500 Meters MSL in the study area (13 villages) where the average productivity is 36.41 Qtl./Ha. Lowest Productivity found in above 1200 meter where average productivity is 1.4 quintal per hectare (2 villages). There is a high negative correlation (-0.725) between Altitude and Oil Palm Productivity.

The study finds livelihood standard of oil palm farmer in the study area is considerably low and moderate. Few of the farmers have a high level of livelihood economy especially in the capital city as well as the bigger farmer. Most of the farmers in the study area score very low in most of the selected indicators. Among the indicators, percentage of household having computer, percentage of household having washing machine and percentage of family having motor vehicle are the biggest factors which influence the levels of livelihood quality. Percentage of family having LPG connection and percentage of family having newspaper subscription have largely influence the levels of farmer's economy. On the other hand some indicators like percentage of family having water connection, number of mobile phone per household, percentage of household having refrigerator and percentage of family having two wheelers does not have a high impact on levels of livelihood economy among the oil palm farmer. In other words, oil palm farmers are more or less equal in these assets.

Aizawl district obtained the first rank in livelihood quality of oil palm farmers among the seven districts. Oil palm farmers in Aizawl district are actually the rich people having a permanent occupation as compared to other district. As it is the city center, it serves as distribution centre of funds and other facilities to the other

district. Income and households assets of Oil Palm farmer in the district are already quite good before planting oil palm.

Serchhip district is the second highest rank having the composite score of 0.43 in livelihood analysis. Oil Palm plantation has been started a little bit late than other district. The farmers who could start the plantation in the district usually have a sufficient income and other facilities. Most of the oil palm farmers are living under permanent house. The number of oil palm farmers having television, refrigerator, water connection and LPG connection etc., is high which make the district high levels of household economy.

Kolasib district score the average level of livelihood among all the districts. The district is the pioneer of oil palm plantation in the state as well as the largest producer of FFB till today. However it is, income and other household assets of the farmer reach the moderate levels. Most of the oil palm farmers in the district have no permanent occupation. Income earned is very less before having production of oil palm. The dependency on oil palm is also higher in the district.

Oil palm farmers in Lunglei and Saiha obtained the second lowest status in livelihood quality. Oil palm plantation has started a little bit late in the two districts. In Lunglei district, Most of the oil palm farmers are backward in income and livelihoods already before production of oil palm. Area and number of farers involved in the plantation is very less in Saiha district as compared to other district. There is no FFB production in the district till the study period. It indicates that all the farmers do not get any profit from oil palm plantation. They are in the plantation stage so that high expenditure without income results a low profits and further result lower livelihood standard.

The lowest livelihood found in Lawngtlai and Mamit districts. In Lawngtlai district, livelihood of oil palm farmer is very low because most of the farmers are immigrant who recently settled in the villages. They do not have any sufficient occupation and regular income. A household asset is very limited among them even some of the villages do not still have a proper land lease. In Mamit district, oil palm plantation was started early with a large area and huge productions found today.

Some of the farmers are the top producers among all the oil palm farmers in the state. Income and economy of those household are plentiful. On the other hand, many oil palm farmers in the district belong to Bru family. They started plantation with a low budged. Family income could not support maintenance of the plantation to continue. Most of the farmers leave the plantation already.

Oil palm farmers in Aizawl district received financial assistant from the state government whereas the others district do not received any financial help. All the farmers in the study area received oil palm seedlings. Fertilizers and pesticides are also provided to all farmers in the whole state except Aizawl district.

Profits gained from oil palm production do not influence household economy of the farmers in the study area. Pearson coefficient of correlation value of -0.39 shows the low negative correlation between oil palm productivity and score of household economy among oil palm farmers in the study area. It explains household economy of oil palm farmer is low where oil palm productivity is high and vice versa. Therefore we can say oil palm production do not highly livelihood quality of the farmer.

Monthly income earn by the farmers is not highly increase after having oil palm production (OPP). Besides Mamit and Kolasib district, income increase is very minimal in the other districts. Expenditure for maintenance of Oil Palm plantation is high and the farmers do not have much profit from Oil Palm production. The average annual income of oil palm farmers in the study area before oil palm production was Rupees 28485.71 while after oil palm production is rupees 30234.14, which was increased by rupees 1748.43 i.e., 5.66 per cent. The highest income change was found in Mamit district where the annual income of oil palm farmer was increased by 13.79 percent which is followed by Kolasib district (11.50%), Aizawl district (6.52%), Lunglei district (2.91%), Lawngtlai district (2.91%) and Serchhip district (1.96%). Farmers have no income earn from oil palm in Saiha district.

The monthly profit earn by oil palm farmer in the study area is rupees 748.43. Mamit district obtain the highest position in it where every oil palm farmer get profit of rupees 2856 rupees per month. Mamit district is followed by Kolasib district (Rs.

2557), Aizawl (Rs. 310), Lawngtlai district (Rs. 150) and Lunglei district (Rs. 36). In contrary to this, there is no profit earn from oil palm plantation among farmers of the two district such as Serchhip and Saiha. In Serchhip and Saiha district, the monthly expenditure of oil palm farmers is higher than the return income by rupees 70 and Rs 600 respectively.

Most of the families (50.13%) among the oil palm farmers have an income of 5000 to 10000 rupees. 30.51 per cent of the total surveyed family having more than rupees 10000 per month whereas 19.36 per cent have income less than 5000 rupees.

Improvement of Bamboo house to other higher standard type of houses found very less and found only in the three districts such as Aizawl, Lawngtlai and Saiha. Assam type of house has been improved largely to higher standard type of house like semi-permanent and RCC. The number of Semi-permanent type of house is increase almost in all the districts except Lawngtlai and Saiha where there is no change before and after oil palm production. The number of Reinforce Cement Concrete (RCC) type of house is increased among the five districts such as Kolasib (2.18 %), Serchhip (1.43 %), Mamit (1.25 %), Aizawl (0.84 %) and Lunglei (0.37 %).

Household assets were generally improved among the farmers who produced and sold the FFB but it is concentrated very limited to some few districts like Aizawl, Mamit and Kolasib. Farmers beneficially used profit from OPP to develop water connection, motor vehicles and computers. Improvement of household assets after oil palm production is highest in Aizawl District which is followed by Kolasib and Mamit. Whereas it is lowest in Lunglei District.

The study finds oil palm Plantation have economically positive implication for livelihood development among oil palm farmer but not high in terms of income, profit earns and household assets. Based on Farmers perception, Oil Palm impact on Livelihood is positively high in Mamit and Kolasib district whereas it is low in Saiha and Lunglei District. For overall, Livelihood development from oil palm production is highest in Kolasib and Aizawl which is followed by Mamit, Lawngtlai, Serchhip, Lunglei and Saiha.

One of the reasons to start thinking oil palm cultivation is its high yielding in nature and the production of good quality fruits in various countries in the world. As shown in the table 6.3 the main reasons to start oil palm plantation in the study area are the farmer have no other occupational options (33.04%), hope for oil palm is beneficial (28.61%), Govt. Scheme which means the government is offering start up program like free seedlings and other supports etc. (23.77%), friends motivation (6.86%) and started by chance (7.72%).

During the plantation period (i.e., clearing of the land, terracing and planting of the seed links), the biggest problem faced by oil palm farmer is financial related problems which accounts 37.29 per cent of the total problems faced by the farmers. The other major problems come from Animals attack (28.91%), insect's infection (14.62%), and accessibility mainly known as link road to connect the farmland from the main road (11.93%). Some of the farmers have a difficulty in the company who hold the responsibility of the plantation like seed links distribution etc. which comprise 3.33 per cent of the total farmers. Unavailability of labour is also a problem faced by 2.27 per cent of the total farmers. Government related problems like slow process of financial and other things are faced by 1.66 per cent of the total farmers.

Marketing includes harvesting of seeds, transportation, selling etc. The first and foremost problems faced by the farmers for marketing of oil palm is low rate of selling price which is fixed by the government and company i.e., 5.5 rupees per kilogram. Many farmers faced transportation problems during harvesting period. The farmers used head load to collect FFB and stock in the main road. Some of the farmers need to load FFB by head more than 5 kilometers.

For overall of the state, 87.50 per cent of the total oil palm farmers want to stop the plantation whereas 12.50 per cent still want to continue the plantation. Generally, most of the farmers want to stop oil palm plantation. Among all the farmers who want to stop plantation, most them (41.85%) want to leave the oil palm plantation because of low selling price. The other reasons why the farmers want to stop the plantation are low profit gained from OPP (28.73%), high management of the plantation (17.15%) and degradation of environment ((12.26%).

The study recommended that the extension workers should intensify efforts to educate the farmers on improved oil palm production management practices. The farmers should be motivated to form cooperative societies to solve the tripartite problems of inadequate information and cultivation knowledge about oil palm, lack of funds and lack of land, by pooling their resources together. The groups formed can be made use as mediums, targets and change agents.

The study offered suggestions for restructuring the infrastructure, training, credit linkage and cooperative formation. The cultivation of oil palm steadily increased the area of cultivation and there is a need to extend the area of cultivation according to the requirements. There is a need to take initiative and efforts towards higher productivity through using of fertilizer, manures, and micronutrients. There is a need to focus more on innovative growth strategies suchas marketing of high-grade derivatives, biomass utilization and branding of palm oil as a healthy cooking medium. The existing schemes of the central government should be made use to develop and improve oil palm cultivation in their respective zones in order to introduce modern technology and innovations. Harvesting machines must be provided as it is difficult for the aged farmers and the tax on oil palm must be exempted under VAT. Entrepreneurs should play an important role in oil palm development in their respective allotted zones for effective transfer of production technologies and all thrust areas shall be taken care of through the cooperation of all agencies.

The study suggests achieving sustainable oil palm plantation that accessibility to farms should be improved to reduce the expenditure of the farmers. Moreover, small farmers need to get assistance from the government to increase the profit earn from OPP. The government may give more assistance to the farmers in terms of cleaning of plantation area, wages for manpower during harvesting, the selling process of FFB, and protection from wild animals, especially for the new plantation.

Market rate of oil palm must be increased by at least 7 rupees per kilogram. It will make oil palm plantation profitable and economically viable. There must be a deep research to realize effects of oil palm on environment including biodiversity,

soil, water and forest degradation. Based on that the farmers and the government can make the right decision whether to stop or continue the plantation. The government should give more efforts to the farmers. They have to know the problems faced by the farmers and find a market solution with the existing company.