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Oil palm cultivation in Mizoram: A study of Kolasib District

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Abstract

Mizoram has entered into the bandwagon of oil palm cultivation since 2004 when the Mizoram oil palm (regulation of production and processing) act, 2004 was enacted. The geo-climatic condition of the state is favourable for development of oil palm cultivation. Many of the plants have not started yielding since oil palm cultivation is of recent activity in the state of mizoram and have started since 2004-2005 during the tenth plan period under ISOPOM. However, a good number of plants are being harvested. Substantial quantities of FFBS were purchased by Godrej Agrovet ltd. from the farmers, while the latter have received regular income from the produces. The paper confirms that oil palm cultivation is showing development and in anticipation of all the plants reaching production stage and the existing net income and frequency of sale, oil palm plantation could fetch substantial and sustainable income for the farmers. These papers also study the actual conditions of oil palm cultivation in Mizoram, such as, benefits accrued to the farmers, problem and prospects of the Oil Palm cultivation, besides for academic purpose, will provide roadmap in formulation of better development programmes. It further tries to analyse the socio-economic condition of farmers, examine the farmers' performance on plant management and farming practices, Institutional arrangement for cultivation and marketing in Mizoram and analyse the impact of Oil Palm cultivation on the income of the farmers. The study also analyse the Land Ownership Status, Cultivation Practice, Marketing and the General Perceptions & Problems of the Oil Palm Farmers and the chance of sustainability of Oil Palm cultivation in Mizoram.

Keywords: Fresh fruit bunch, market, mizoram, oil palm, production

1. Introduction

The rapid increase of land degradation due to jhumming, deforestation, loss of biodiversity and productivity, increasing flood 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 an 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 (Economic Survey Mizoram, 2012-13).

A high level committee headed by Dr. K. L. Chadha identified potential areas of 61,000 ha with gentle slope (25-33 per cent) with favourable climatic condition and the state government decided to undertake cultivation of Oil Palm in a large scale from 2004-05 during the Xth Plan period. Dr. P. Rethinam Committee later in 2011 earmarked an additional area of 40,000 ha for Oil Palm cultivation, and thus, the total identified potential area for Oil Palm cultivation became 1,01,000 hectares in Mizoram.

Oil Palm is cultivated on approximately 15 million hectares across the world (Koh and Ghazoul, 2008; Koh and Wilcove, 2008). To promote Oil Palm cultivation in Mizoram, the Ministry of Agriculture & Cooperation has sanctioned Oil Palm Development Programme under Integrated Scheme of Oilseeds, Pulses, Oil Palm and Maize (ISOPOM) since 2005-2006 at the cost sharing of 75:25 between Central and State Government till 2011-12. The Oil Palm Development Programme has also been taken up under Rashtriya Krishi Vikas Yojana (RKVY for Oil Palm Area Expansion) from 2011-12 to 2012-13 and National

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Mission on Oilseeds and Oil Palm (NMOOP) from the year 2014-2015. In addition, The Mizoram Oil Palm (Regulation of Production & Processing) Act, 2004 was passed in Mizoram Legislative Assembly on the 2nd December, 2004 (The Mizoram Gazette, 2004) with a provision for the emergence of contract system for seed supply and marketing of the produces. Under the Oil Palm Act, 2004, The Government of Mizoram signed Memorandum of Understanding with three companies for Oil Palm development (seed supply and marketing of produces). These Companies have established their own nurseries in their respective districts supplying the planting materials to the farmers, while they buy back the produce of the farmers from their respective districts allotted to them. As per the provision of under the Oil Palm Act, 2004, Price Fixation Committee was constituted to fix the rate of Fresh Fruit Bunch. Oil Palm Development in Mizoram has been taken up in the Public – Private Partnership mode between the Government, the Companies and the Farmers.

Various studies confirmed that Oil Palm famers made profit and improved their income (Owolarafe, *et al.* 2007; Damoah, 2012; Beggs, *et al.* 2013; Ibotoye, *et al.* 2014). The ever-growing edible oil demand necessitates increased domestic production in India. Mizoram with its vast potential area is also committed to promote Oil Palm cultivation. However, lack of research-based information in the state necessitated the present study to analyse the situation and to identify the factors influencing the Oil Palm production in the state to make it a profitable venture for the farmers.

2. Materials and Method

2.1 Study Area: The present study analyses the performance of the Oil Palm farmers in Kolasib District with potential area of 17350 hectares, occupying notable position in Oil Palm cultivation as the State's first "Oil Palm District" declared by the State Government on 9th May, 2014. Many of the farmers were already reaping the harvests and started selling the FFB to the Mill at Bukvannei. Thus, selection of Kolasib District as a case area for the study is considered most appropriate for the study on the performance of oil palm farmers in Mizoram.

2.2 Sample Size: Kolasib district comprises two Rural Development Blocks viz Thingdawl and Bilkhawthlir. Stratified random sampling was adopted using the two RD Blocks as strata. A total number of 3 villages were randomly selected from Thingdawl RD Block and 4 villages from Bilkhawthlir RD Blocks. Selection was done based on the simple principle of availability with production of FFBs making the sample size (households) at 90. Field Survey was conducted during the months of September and October, 2016.

2.3 Analytical method: Secondary data were collected from sources like official publications, Census, Directorate of Economics & Statistics, Agriculture Department, Oil Palm Mill (Godrej Agrovet Ltd.), etc. Journals, articles, academic literatures, published and unpublished research works in the field were also consulted. During the survey, relevant data were collected using interview schedules on the Socio-Economic Conditions of the Oil Palm Farmers; Land

Ownership Status; Cultivation Practice; Marketing; General Perceptions & Problems of the Oil Palm Farmers. The initial costs and annual costs on cultivation of Oil Palm were obtained. At the same time, Sales of FFBs were calculated on the basis of one year. The data collected from the survey and other sources were analysed using statistical measures like mean, percentage, standard deviation, etc.

3. Results and Discussion

3.1 Profile of Oil Palm farmers

3.1.1 Age: The average age of the sampled farmers was 60.41 years. Among the respondents, there were none below the age of 30 and only 18.89 percent were aged 50 year and below. Most of the Oil Palm farmers (58.89 percent) were at the age range between 51 – 70 years.

3.1.2 Workforce: The total number of workers from the 90 sampled families was 247 (48.62 percent) and 261 (51.38 percent) were dependents. Among the dependents, 38.47 percent were children below the age of 14 and students above 14 year of age comprised 46.36 percent; 13.79 percent were aged and 1.15 percent was disabled. These are shown in Table 1.

Table 1: Demographic characteristics of the Farmers (N=90)

Variables	Frequency	Percent
Age of the Respondents		
< 30	0	0
31-40	3	3.33
41-50	14	15.56
51-60	30	33.33
61-70	23	25.56
71 and above	20	22.22
		Mean Age = 60.41
Total Population	508	
Female	255	50.20
Male	253	49.80
Worker	247	48.62
Dependents	261	51.38
No. of Dependents	261	
Below 14 years	101	38.70
Students above 14 yrs	121	46.36
Aged	36	13.79
Disabled	3	1.15

Source: Field Survey, September & October, 2016

3.1.3 Educational Levels: Table 2 shows the educational level of the respondents who were basically the owners of the Oil Palm plantation. Among the farmers interviewed, 73 (81.11 percent) were male whereas only 17 (18.89 percent) were female. As many as 6.85 percent of male and 5.88 percent of female respondents were illiterate, making an overall illiteracy rate of 6.67 percent. 30.14 percent of male and 47.06 percent of female were of primary level education. This means that almost half of the female respondents were at the primary level education. A total of 58.91 percent of male respondents were at the middle level education and below; the figure for female is 82.35 percent. Among the male respondents 31.51 percent attained high school level of education whereas only 17.65 percent of female attained the same. About 4.10 percent of male respondents were Graduate and above, while no female respondents were found to attain higher secondary.

Table 2: Educational Level of Respondents

Education	Sex		Female	%	Total	%
	Male	%				
Illiterate	5	6.85	1	5.88	6	6.67
Primary	22	30.14	8	47.06	30	33.33
Middle	16	21.92	5	29.41	21	23.33
High School	23	31.51	3	17.65	26	28.89
Higher Secondary	4	5.48	0	0	4	4.45
Graduate and Above	3	4.1	0	0	3	3.33
Total	73		17		90	

Source: Field Survey, September & October, 2016

3.1.4 Annual Income: Table 3 shows the annual income range of the Oil Palm farmers of the study area. Annual income from all sources is very much diverse ranging from Rs.15000 to Rs. 9,60,000 and it was classified into 5 categories, from less than 2,00,000 to more than 8,00,000. Most of the farmers (71.11 percent) were at the income range of less than Rs. 2,00,000 and 22.22 percent of the farmers were at an income range between Rs. 2,00,000 to Rs. 4,00,000 while only 6.66 percent were at the income level of more than Rs. 4,00,000.

Table 3: Annual Income of the Oil Palm Farmers from all sources

Categories	Frequency	Percent
less than 200000	64	71.11
200000<400000	20	22.22
400000<600000	1	1.11
600000<800000	4	4.44
800000 and above	1	1.11
Total	90	100

Source: Field Survey, September & October, 2016

3.1.5 Main source of Income: Table 4 shows the main sources of income of the Oil Palm Farmers. The data shows that only 27.78 percent of the farmers adopted Oil Palm as their main source of income, the rest adopted other activities such as, daily wage, other crops, government jobs, household or cottage industries, livestock and others.

Table 4: Main Source of Income as indicated by the respondents

Main Source of Income	Frequency	Percent
Oil Palm Plantation	25	27.78
Others	19	21.11
Daily Wage	17	18.89
Other Crops	15	16.67
Government Jobs	9	10.00
Household/Cottage Industries	3	3.33
Livestock	2	2.22

Source: Field Survey, September & October, 2016

3.1.6 Land ownership status: Table 5 shows the land ownership status of the farmers. From the total landholdings of the respondents, 47.78 percent were having Periodic Patta, 42.22 percent were having VC Pass ^[1] and 10 percent were having LSC.

Table 5: Land Ownership Status

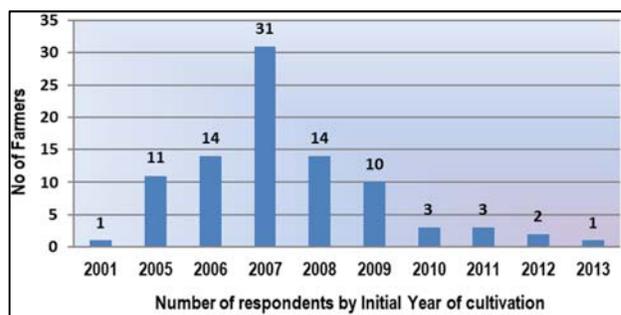
Status of Landholdings	Frequency	Percent
VC Pass	38	42.22
Periodic Patta	43	47.78
LSC	9	10.00
Total	90	100

Source: Field Survey, September & October, 2016

3.1.7 Total Land Holdings: Table 6 shows the total landholdings and the area under Oil Palm cultivation. The total landholding of the respondents was 518.20 hectares with average landholdings of 5.76 hectares. However, 56.67 percent of the respondents were having less than 5 hectares while 30 percent were having land area of 5 to 9.9 hectares. Those who were having land area of more than 10 hectares were only 13.33 percent whereas their total landholdings of 199.80 hectares was more than the total landholdings of those 56.67 percent small holders whose total landholdings was 137.30 hectares and the total landholdings of the medium landholders consisting of 30 percent of the respondents with 181.10 hectares. It was observed that large area of land was concentrated at the hands of few farmers.

3.2 Cultivation Practice:

3.2.1 Years of Starting & Numbers Planted: Among the 90 Farmers interviewed, only 1 started cultivation in 2001, 11 started growing Oil Palm in 2005, 14 in 2006, 31 in 2007, 14 in 2008, 10 in 2009 and continuously fell and only 1 in 2013. Maximum number of farmers was found in 2007 with 34.44 percent of all the farmers interviewed. Less new farmers were found in recent years as shown in Figure 1.



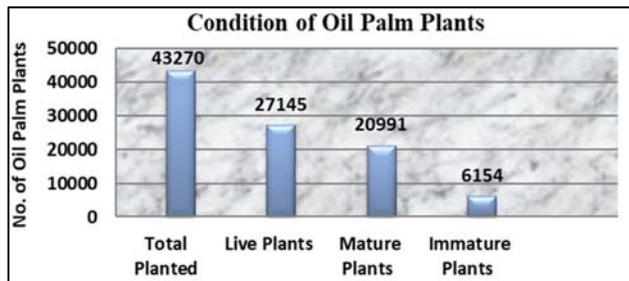
Source: Field Survey, September & October, 2016

Fig 1: Number of respondents by initial year of cultivation

3.2.2 Conditions of Oil Palm Plants: Among the 90 respondents, the total number of Oil Palm Seedling planted was 43270 as shown in Fig. 2, out of which live plants accounted for 27145, which was 62.73 percent of the total planted. As per the information received from the respondents, most of the loss of plants was caused by

¹ The Lushai Hills District (Village Council) Act 1953 authorised the Village Council to allot a particular region within the boundaries of each village for jhums each particular year. However, the Village Council used to issue VC Pass for allotment of site for plantations, which has no legal back up, but very commonly practiced.

animals' attack. Further, number of mature plants was 20991, which was 77.33 percent of the live plants. Out of the 27145 live plants, 6154 were immature or not yet bearing fruits which accounted for 22.67 percent of the live plants.



Source: Field Survey, September & October, 2016

Fig 2: Condition of Oil Palm Plants

3.2.3 Area under Oil Palm Cultivation: The total area of Oil Palm cultivation of the 90 respondents was 203.9 hectares and 3.33 percent of them were cultivating less than 1 hectare, 31.11 percent were cultivating 1 hectare to less than 2 hectares. Majority of the farmers consisting of 36.67 percent were cultivating 2 hectares to less than 3 hectares and 17.78 percent were cultivating 3 hectares to less than 4 hectares. Only 11.11 percent were cultivating 4 hectares and above. The average cultivated area of Oil Palm per farmer was 2.7 hectares. Therefore, the Oil Palm farmers of the area were small and marginal farmers.

Table 6: Total Landholdings and Area of Oil Palm Cultivation

Total Landholdings in hectares:			
	Frequency	Percent	Total area (ha)
< 5	51	56.67	137.3
5 - 9.9	27	30.00	181.1
> 10	12	13.33	199.8
Total Landholdings in hectares			518.2
Average Landholdings			5.76
Area under Oil Palm Cultivation:			
less than 1	3	3.33	2.00
1 - <2	28	31.11	37.3
2 - <3	33	36.67	68.4
3 - < 4	16	17.78	50.5
4 and above	10	11.11	45.7
Total Area under Oil Palm			203.9
Average landholdings			2.27

Source: Field Survey, September & October, 2016

3.2.4 Cost of cultivation: Table 7 shows the initial costs of establishment and annual costs of maintenance of the Oil Palm Plantation which include land preparation and planting costs. Oil Palm seedlings were supplied free of cost by the government under the Oil Palm Development Programme. Among the respondents, 85.56 percent were spending less than Rs. 30000.00 for land preparation and the same amount for planting. The total expenditure on Land preparation is Rs. 1578800.00 while the total expenditure on Planting was Rs. 1445000.00 which was almost 92 percent of the cost of

land preparation. The large share of expenditure on planting was due to the transportation problems of the potted seedlings. Besides, many of the plantations were located far from the motor-able road and seedlings had to be transported using manual labor enhancing the cost of planting.

Annual costs include weeding, harvesting, pruning, hiring of vehicle or manual labor for transportation of the FFBs and miscellaneous expenditure like cost of fertilizer, herbicides, pesticides, irrigation, etc. The total annual costs including weeding, harvesting, miscellaneous and transportation cost is Rs. 3748706.00 only for the 90 farmers out of which harvesting accounts for Rs. 1783650.00 only, i.e. 47.58 percent of the total annual costs. Weeding accounts for 32.55 percent, vehicle hiring or manual labor (some respondent included this in the cost of harvesting) accounts for 13.31 percent and miscellaneous expenditure accounts for 6.56 percent.

From the results, expenditure on agricultural inputs like fertiliser, herbicide, insecticide, etc. are very small implying that there is a very great scope for improvement of the harvest by improving the expenditure on such items. Besides, increase in the application of more herbicides, etc. will increase the yield as well as reducing the expenditure on weeding.

Table 7: Initial Costs of Establishment and Annual Costs of Maintenance

Initial Costs:	Land Preparation		Planting	
Expenditure (Rs.)	Frequency	Amnt (Rs.)	Frequency	Amnt (Rs.)
< 30000	77 (85.56)	886300	77 (85.56)	801000
30000 – 59999	10 (11.11)	410000	10 (11.11)	392000
> 60000	3 (3.33)	282500	3 (3.33)	252000
Total	90 (100)	1578800	90 (100)	1445000
Av. Expdr. (Rs.)		17542		16056
Annual Costs - I:	Weeding		Harvesting	
Expenditure (Rs.)	Frequency	Amnt (Rs.)	Frequency	Amnt (Rs.)
< 30000	84 (93.33)	938200	74 (82.2)	968900
30000 – 59999	5 (5.56)	209900	12 (13.3)	480200
> 60000	1 (1.11)	72000	94(4.4)	334550
Total	90 (100)	1220100	90 (100)	1783650
Av. Expdr. (Rs.)		13557		19818
Annual Costs -2:	Miscellaneous		Vehicle	
Expenditure (Rs.)	Frequency	Amnt (Rs.)	Frequency	Amnt (Rs.)
No Expenditure	24 (26.67)	0	33 (36.7)	0
< 30000	65 (72.22)	215976	56 (62.2)	468980
30000 – 59999	1 (1.11)	30000	1 (1.1)	30000
> 60000	0	0	0	0
Total	90 (100)	245976	90 (100)	498980
Av. Expenditure. (Rs.)		2733		5544

Source: Field Survey, September & October, 2016 Figures in the parentheses indicates %

3.2.5 Sources of labor: The total expenditure on labors were about Rs. 3040500, out of which Rs. 1417610 (46.62 percent) were met from family labor whereas Rs. 1622890 (53.38 percent) were met from hired labor. In all levels of expenditures, hired labors outnumbered family labor. Among the respondents, 3.33 percent depended fully on hired labor whereas, 13.3 percent did not hire any labor and fully depended on family labor as shown in table 8.

Table 8: Source of Labor

Labor Cost Expenditure (Rs.)	Family labor		Hired Labor	
	Frequency	Amnt (Rs.)	Frequency	Amnt (Rs.)
No Expenditure	3 (3.33)	0	12 (13.3)	0
< 30000	72 (80)	740460	59 (65.6)	668540
30000 – 59999	12 (13.34)	456350	13 (14.4)	516200
> 60000	3 (3.33)	220800	6 (6.7)	438150
Total	90 (100)	1417610	90 (100)	1622890
Av. Expdr. (Rs.)		15751		18032

Source: Field Survey, September & October, 2016, Fig in the parentheses indicates %

3.2.6 Application of Agricultural Inputs: The data confirmed that management of Oil Palm Plantation is lacking agricultural inputs as shown in table 9. Among the farmers, 70 percent claimed that they apply fertilizers, which were supplied at subsidized rate. However, it was observed that the quantity of fertilizers applied is less than prescribed quantity as the supply is less. Many of the respondents have stopped application of fertilizers as the supply had been stopped. Many farmers have reduced harvest was due to lack of fertilizers.

Irrigation was practiced by only 17.78 percent of the farmers and 82.22 percent did not irrigate their plants with the opinion that with abundant rainfall in the area, rain water was sufficient for the plants. However, it was observed that Oil Palm farmers harvested FFBs for about 6 to 8 months in a year, implying that there were about 4 to 6 unproductive months in a year.

Herbicide was applied by 73.33 percent while another 26.67 percent did not apply herbicide. Manual labor was used to clear the weeds. Pesticide was applied by only 20 percent and 80 percent of the Oil Palm Farmers did not use pesticide. Intercropping was practiced by 52.22 percent and 47.78 percent grown only Oil Palm. It was found that most of the Oil Palm farmers were lacking the technical knowledge about the cultivation and management techniques of the Oil Palm cultivation.

Table 9: Application of Agricultural inputs

Response	Fertiliser		Irrigation		Herbicide		Pesticide		Intercropping	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
No	27	30.00	74	82.22	24	26.67	72	80	43	47.78
Yes	63	70.00	16	17.78	66	73.33	18	20	47	52.22

Source: Field Survey, September & October, 2016

3.2.7 Spacing: The study found that 57.78 percent of the farmers planted the seedling at a spacing of 9mx9mx9m as recommended. However, 41.11 percent of them planted at less than the recommended spacing and 1.11 percent planted at more than the recommended spacing.

3.3 Marketing

As per the Mizoram Oil Palm (Regulation of Production & Processing) Act, 2014 the FFBs harvested were sold to the Godrej Agrovet Ltd. Oil Palm Mill at Bukvannei. The rate of FFB was fixed at Rs.5.50 per Kg. The costs of FFBs were transferred to the farmers' bank accounts.

During the period up to May, 2014, the total FFBs purchased by the factories/companies amounts to 140.0995 metric tonnes worth Rs.322548.75 only. Godrej Agrovet Pvt. Ltd. Purchased Oil Palm FFBs weighing 65.592 metric tonnes worth Rs. 311562.00 from Kolasib district as shown in Table 10.

Table 10: Fresh Fruit Bunches Harvested in Mizoram (up to May, 2014)

Sl No.	Name of District	Companies	Qty Purchased (MT)	Amount (Rs.)
1	Kolasib	Godrej Agrovet Pvt. Ltd	65.592	311562.00
2	Mamit	Godrej Agrovet Pvt. Ltd	67.905	322548.75
3	Lunglei	Ruchi Soya Industries Ltd	6.6025	31363.00
4	Serchhip	3F Oil Palm Agrotech Pvt. Ltd	-	-
Total			140.0995	665473.75

Source: Department of Agriculture, Government of Mizoram.

3.3.1 Annual production and sale of FFBs: The total annual production of the respondents was 10475.69 quintals as shown in table 11. The average production of FFBs per farmer is 116.40 quintals or 11.64 metric tonnes. The total area of Oil Palm cultivation of the respondents is 197 hectares. Therefore, the average productivity is 53.18 quintals per hectare or 5.32 metric tonnes per hectare, which is very low in comparison to other producing countries of the world. The number of farmers producing less than 100 quintals consists of 53.34 percent of the respondents. They produced only 22.77 percent of the total FFBs production. There were 31.11 percent of farmers who produced 100 to 199 quintals per year and the total production of the section is 3808 quintals or 36.35 percent of the total production of the respondents. 98.85 percent of the total harvest collected had been sold to the company and 1.15 percent had not been sold to the Company.

Table 11: FFB Harvests and FFBs Sold

FFB qty. in quintals	FFB Harvest per Year			FFB Sold Per Year		
	Frequency	Percent	Qty (Qtls.)	Frequency	Percent	Qty (Qtls.)
<100	48	53.34	2384.99	49	54.45	2404.99
100 - 199	28	31.11	3808	27	30	3668
200 - 299	9	10	2207.7	9	10	2207.7
300 - 399	2	2.22	615	2	2.22	615
400 - 499	2	2.22	960	2	2.22	960
500 and above	1	1.11	500	1	1.11	500
	90	100	10475.69	90	100	10355.69

Source: Field Survey, September & October, 2016

3.3.2 Net Income: From the study, it was observed that 81.11 percent of the respondents were having net income of less than Rs. 50000 per annum from Oil Palm cultivation. 12.22 percent were making net income between Rs. 50000 and Rs. 99999. Another 3.33 percent had an income range between Rs.100000 to Rs. 149999 and 1.11 percent had an income of Rs. 150000 to Rs. 199999. There were only 2.22 percent of respondents who were at the income range above Rs.200000. The per capita Net Income from Oil Palm was Rs. 37188.00 only. However, the per capita Gross Income from Oil Palm was Rs.65821.00 only; a large portion of the difference between the Gross Income and the Net Income was spent on cost of labor.

The total income of respondents from all sources is Rs. 14425160.00, and the per capita annual income from all sources is Rs. 160280.00 only. The per capita Net Income of Rs.37188.00 from Oil Palm is very much lower than the average per capita annual income of the respondents as available at table 12.

Table 12: Annual Net Income from Oil Palm Cultivation

Net income	Frequency	Percent	Amount (Rs.)
less than 50000	73	81.11	1586405
50000 - 99999	11	12.22	759455
100000 - 149999	3	3.33	399810
150000 - 199999	1	1.11	178500
200000 and above	2	2.22	422710
Total	90	100	3346880
Average Net Income per farmer			37188.00

Source: Field Survey, September & October, 2016

3.3.3 Benefit-Cost analysis of Oil Palm cultivation: One of the significant indicators of the economy of any economic activity is its sustainability in terms of benefit-cost (B-C) or cost-benefit ratio. The indicator of benefit being adopted is net annual income per hectares, while annual maintenance cost (recurring) is taken as cost. To avoid duplication in the estimation, it is decided to exclude the initial expenditure in the calculation of B-C ratio. It may also be noted that all the estimates are averages. The result of the analysis is presented in Table 13.

Table 13: Analysis of Benefit-Cost Ratio of Oil Palm Cultivation in Kolasib District

Sl. No.	Particulars	Value
1	Average Area under Cultivation (Ha)	2.27
2	No. of Seeds Planted Initially	43270
3	No. of Seeds Survived till date	27145
4	No. of Mature Plants	20991
5	Total Initial Cost per Ha (Rs)	14801
6	Annual Maintenance Cost per Ha (Rs)	14072
7	Net Annual Income per Ha (Rs)	16382
8	Estimated cost of planting per Ha	19062
9	Plant Survival Rate (%)	62.73
10	Estimated Initial Cost per Ha (Rs)	14801
11	Projected Net Income on Maturity of all Plants per Ha (Rs)	21166
12	Current Benefit-Cost Ratio	1.16
13	Projected Benefit Ratio	1.50

Note: Calculation is based on the information obtained from 90 respondents

Surprisingly, the overall plant survival rate is very low at 62.73 percent, which may be increased further. But this analysis assumes that the plant survived till date will reach harvesting stage. Though the annual maintenance cost may decrease further, but it is assumed, here, to be constant only for this analysis. The total initial cost for land preparation, levelling, jungle clearance, seeds supply etc. is estimated to be Rs.14801 per hectare, while the annual recurring cost for farm maintenance is estimated to be Rs.14072 per hectare. At the same time, the estimated net annual income per hectare is Rs.19062. Once all the existing live plants reach the maturity stage, the net annual income could increase to Rs.21166 per hectare.

At current rate of income per hectare and annual maintenance cost, the B-C ratio turned out to be 1.16, i.e. the net income is 16 percent higher than the cost. If all the existing plants reach the harvesting stage, the B-C ratio can be increased to 1.50 which shows that the net income earned from sale of FFB would be 50 percent more than the cost of cultivation. Thus, it can be concluded that cultivation of oil palm could fetch significant and sustainable income for the farmers.

3.3.4 Purchase of FFBs at the Collection Centre: The Company designated some places at the road-side as Collection Centre for the FFBs. There were only few

Collection Centres with buildings. However, Oil Palm farmers keep their harvests on the road-side to be collected by the Company. 58.89 percent of the farmers said that there was no Collection Centre nearby while 41.11 percent said that Collection Centre was available nearby. Regarding the purchase of FFBs in the Collection Centre, 58.89 percent said that the FFBs was collected weekly by the Company, 23.33 percent said that it was collected twice a month; 3.33 percent said that it was collected monthly. 14.44 percent said that it depends on the availability of FFB and on the convenience of the Company. It was shown in Table 14.

Table 14: Frequency of FFB Purchase in the Collection Centre

Purchase of FFBs in the Collection Centre	Frequency	Percent
Weekly	53	58.89
Twice monthly	21	23.33
Monthly	3	3.33
Others	13	14.44

Source: Field Survey, September & October, 2016

3.3.5 Distance from Oil Palm Mill: Regarding the distance of the plantation from the Oil Palm Mill, the maximum distance was at 78 km while the minimum distance was at 0.80 km; the average distance was 26.69 km as shown in table 15. Plantations within the range of 30 km were 54.44 percent; between 30 km to 49 km were 31.11 percent,

whereas there were 14.44 percent located beyond 50 km. In addition to this, as many as 89.89 percent of the plantations in Kolasib district were located away from the main road while plantations were connected with fair weather road during the peak season for harvest i.e. during rainy season. The FFBs had to be transported by manual labor increasing the cost of maintenance.

Table 15: Distances between Oil Palm Plantations and the Processing Mill

Distance from Oil Palm Mill (km)	Frequency	Percent
< 30	49	54.44
30-49	28	31.11
Distance from the main road (Km)		
0	10	11.11
<1 km	56	62.22
1 km - 5km	11	12.22
6km -10km	8	8.89
>10 km	5	5.56

Source: Field Survey, September & October, 2016

3.4 General perception & Problems of the Oil Palm farmers:

Respondents were asked their perception about the dependability of Oil Palm cultivation for meeting the requirement for livelihood using 4-point Likert Scale. Among the respondents, 22.22 percent perceived it as ‘not dependable’; 47.78 percent perceived it as ‘hardly dependable’; 27.78 percent perceived it as ‘dependable’ while 2.22 percent perceived it as ‘fully dependable’. Details could be seen from table 16.

Table 16: Perceptions of the respondents on the dependability for livelihood

Perception of the Respondents	Frequency	Percent
Not Dependable	20	22.22
Dependable to some extent	43	47.78
Dependable	25	27.78
Fully Dependable	2	2.22

Source: Field Survey, September & October, 2016

Table 17 presents the problems faced by the farmers in the cultivation and marketing of the oil palm in the study area. It is observed that transportation remains the main problem of the farmers as more than 85 percent of the farmers were found facing transportation problem. At the same time, majority of the farmers (68.89 percent) also faced problems in technical inputs. As majority of the farmers have

transportation and technical problems, it may be an academic interest to test their statistical significance before making any further conclusion. If more than half (50 percent) of the farmers are facing such problem, we may say that it is the main problem. Consequently, Z-statistic have been calculated under the hypothesis that more than half of them face such problems (i.e. $H_0: P = 0.50$ & $H_1: P > 0.50$). It is observed that Z-statistic is significant in case of transportation and technical inputs. Thus, we may conclude that transportation and technical inputs are the main problems to the farmers.

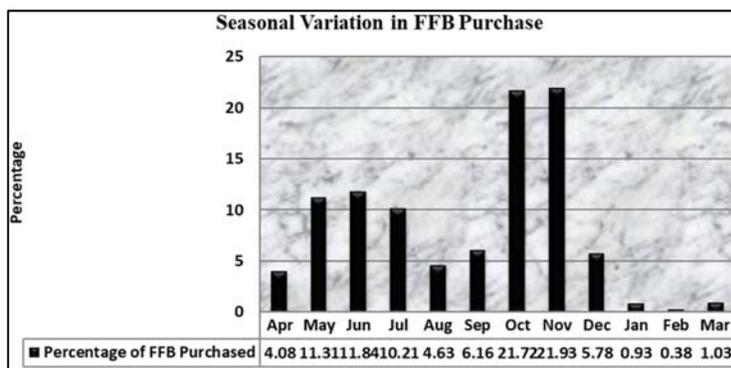
Table 17: General Problems faced by the Respondents

Sl. No.	Problems	Frequency	Percent
1	Transportation Problems		
	Yes	77	85.56**
	No	13	14.44
2	Financial Problems		
	Yes	37	41.11
	No	53	58.89
3	Pests and Animals Problems		
	Yes	34	37.78
	No	56	62.22
4	Technical Support Problems		
	Yes	62	68.89**
	No	28	31.11
5	Marketing Problems		
	Yes	13	14.44
	No	77	85.56
6	Low Rate of FFBs		
	Yes	35	38.89
	Not Mentioned	55	61.11
7	Equipment for cutting of FFBs		
	Yes	15	16.67
	No	75	83.33

Source: Field Survey, September & October, 2016

**Z-statistic is significant.

3.4.1 Seasonal variation: Consideration of seasonality of production is very important in agriculture and allied activities. A record of the four year period from 2012-13 to 2015-16 have been taken to see the seasonal variation of FFB collection by the Mill. Oil Palm FFB collection is during October and November and lowest in January and February. It slowly rises again and reached a medium level during the three months period from May to July. However, during the heavy rainy season of August and September, the collection of FFB is dwindling again. The seasonal variation in the quantity of FFB collection is shown in figure 3.



Source: Godrej Agrovet Ltd. Mizoram

Fig 3: Seasonal variation in FFB Purchase by Godrej Agrovet Pvt. Ltd Oil Palm Mill

4. Conclusion and Recommendations

Based on the Results and Discussion derived from the study on Oil Palm Cultivation in Mizoram, the following recommendations are made for improvement in the cultivation for wider replication in Mizoram.

1. The starting point for the successful cultivation of oil palm in Mizoram is the improvement of farm connectivity for easy transportation of the products. This is necessary keeping in view the hilly terrain of the areas where most of the potential areas could not be reached by motor-able roads. Connectivity development initiatives may be undertaken in two ways:
 - i. Construction of link roads to all cultivated areas as well as potential areas.
 - ii. In fact, connecting the plantation areas at certain point is not sufficient as it may be difficult for the farmers to bring the FFB in the access point (reached by motor-able road) by head-load even within the vicinity of their farm. So, it is necessary to develop in-farm road networks (a network of roads within the farm) in each of the plantation areas to ensure at least the movement of trolleys in the collection of FFB.
2. It is necessary to evolve sustainable land use planning exercise, like compact area approach, one-crop-one-village, crop zoning, etc before proceeding further to expand areas under cultivation. This is necessary keeping in view the problems of transportation, crop maintenance, and marketing which are likely to occur in the subsequent stages of the cultivation.
3. Expansion of plantation areas to each farmers and intensification of the cultivation practices is necessary. To leverage the potential economies of scale in cultivation, harvesting and marketing, the farmers may be encouraged to expand their cultivated areas. To increase the productivity of their existing lands, the farmers may also be encouraged to practice intercropping. This will intensify their current land use and increase their income to a great extent.
4. Use of better technology (fertiliser, mechanised equipments, etc) in the cultivation, harvesting, and marketing is necessary. This will improve plant survival while also enabling better farm maintenance practices, post-harvest and marketing.
5. Current procurement price of FFB, which was in effect since the 1st June, 2014, failed to catch up with the price trends of other agricultural products as well as the overall inflation rate of the country. Thus, it is recommended that continuous price review mechanism be instituted under the provision of Mizoram Oil Palm Act, 2004. This will have dual effects:
 - i. it will ensure earning of remunerative prices by the farmers, and
 - ii. it will boost the morale of the farmers for further development in its cultivation.
6. Majority of the farmers covered in the study areas adopted oil palm cultivation as subsidiary livelihood activities, while substantial number of the household depend on daily labor to earn income to meet their daily family consumption needs
7. It is necessary to conduct, before development of oil palm cultivation, a proper assessment of the attitudes of the society in all the potential areas vis-a-vis analysis of the attachment they have in their age-old practices of shifting cultivation, and other means of livelihood. The

exercise will identify the extent of the adaptability of the people to shift into the cultivation of modern commercial crops. This will enable policy makers in chalking out effective strategies for capacity development for cultivation.

8. It is necessary to conduct research continuously to provide scientific inputs to the farmers for farm management, crop protection, post-harvest practices and marketing.
9. Last but not the least, the study reveals that Oil Palm cultivation is showing development and in anticipation of all the plants reaching production stage and the existing net income and frequency of sale, it is reasonable to say that Oil Palm plantation could fetch substantial and sustainable income for the farmers. The study found impressive scope of oil palm development in Mizoram considering the availability of large potential areas. However, its expansion should be done side by side with the development of the facilitative infrastructures, especially for transportation of the produces.

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