ECONOMICS OF RUBBER PLANTATION IN NAGALAND: A CASE STUDY OF WOKHA AND MOKOKCHUNG DISTRICTS

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CERTIFICATE

The thesis entitled **"Economics of Rubber Plantation In Nagaland: A Case Study of Wokha And Mokokchung Districts"** submitted by Mr. N. Renthungo Patton, research scholar, Department of Economics, Nagaland University: Hqrs; Lumami embodies the results of investigation carried by him under my supervision and that it is an original and authentic work of his.

The thesis is fit for submission for the degree of Doctor of Philosophy in Economics.

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Declaration

I, Mr. N. Renthungo Patton bearing Ph.D. registration No. 684/2015, hereby declare that the subject matter of the thesis **"Economics of Rubber Plantation In Nagaland: A Case Study of Wokha And Mokokchung Districts"** is the record of an authentic work done by me, and that the contents of this thesis did not form basis of the award of any previous degree to me or to anybody else to the best of my knowledge, and that the thesis has not been submitted by me for any research degree in any other university.

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Chapter-I

INTRODUCTION

1. Introduction:

Rubber (*Hevea brasiliensis*) often simply called rubber tree, it is a tree belonging to the family Euphorbiaceae, and is the most economically important member of the genus Hevea. It is a fast growing upright tropical tree crop which is mainly cultivated for its production of latex, a milky (liquid) plant, which serves as a basis for various rubber products. Columbus, (1495) was the first to report about latex, but it was not before French explorer Fusee Aublet, (1775) that the rubber tree was properly described. Almost by the same period Priestly discovered that latex could rub out pencil marks, and this gave the product its name as rubber. MacIntosh, (1823) made waterproof cloths by coating fabric with rubber dissolved in naphtha. The use of waterproof clothing in the American Civil War brought about the first rubber boom, followed by a second one after Goodyear and Hancock, (1839) had discovered the principal of vulcanization, this is the process whereby rubber is heated with Sulphur and retains its physical properties once processed into a useful shape.

The most successful application of latex rubber was achieved in the 1980s when rubber was found to be the basic raw material for pneumatic tires for motor cars. From there on the uses and application of rubber tree and its product have became the raw materials and finished products for many industries. Thus, Rubber products provides

not only valuable income to small holders villagers and large scale production owners, and contributes to national income, but it is also recognized as green produce, such as providing very good wood products with economical price, which is highly appreciated in the world market. Another positive aspect of rubber cultivation is its ecological benefits. Rubber plants enrich soils organic matter by litter recycling and at the same time prevent soil erosion. It has also been recognized that land conversation from forest areas to rubber monoculture has negative environment implications, such as loss of bio¬-diversity, decreased soil quality, rapid soil erosion and carbon sink.

In traditional rubber growing areas, the total rainfall required ranges between 2000-4000 mm, distributed over 140-220 days, without more than one to four dry months (Rao and Vijaykumar (1992). Rubber can successfully be cultivated under these kinds of humid lowland tropical conditions, roughly between 15°N and 10°S (Lemmens et al. 1995). Cultivation of the tree has however, expanded away from the equator to latitudes as far North as 29°N in India, Myanmar and China, and down to 23°S in Brazil. In Thailand, rubber has traditionally been cultivated on the Malay Peninsula from 6-12 N° and in areas with an average rainfall of around 2000 mm per year (Watson, 1989). Cultivation in the East and Northeast of Thailand (up to 18°) has mainly started during the last two decades.

Historically, Rubber was first introduced in Asia in 1876, when seeds were first shipped from the Amazons to the United Kingdom and further to Ceylon and planted there. In the following year, rubber trees were planted in Singapore and Malaya, (Hong 1999). Although, rubber was first an estate crop, local individual farmers soon adopted

the crop and so they were drawn into the commercial economy (Courtenay 1977). In the modern world, the usage of rubber both synthetic and natural is innumerable. It is considered highly sustainable due to its renewable quality. The demand for natural rubber is very high in the market. Asia produces the largest amount of natural rubber in the world. In India Kerala is the largest producer of rubber followed by Tripura. Rubber cultivation is a labour intensive practice and thus generates rural employment. The overall analysis of rubber plantation in the northeast seems quite profitable, both economically and environmentally. Therefore, the Rubber Board under the Ministry of Commerce and Industry‟s, Government of India, has implemented many projects, viz, "Accelerated Development of Rubber Plantation", "Rubber Development", etc, in the North East. Awareness camps and training programme are also being held for farmer from time to time. In Nagaland, Rubber plantation was introduced during 1990‟s and it is now cultivated in almost all the valleys and foothill areas of the state where the climatic conditions are warm.

In India, the rubber-based industry made its first appearance in the Bengal Presidency in 1921. Easy availability of natural rubber as a raw material and a vast market potential attracted foreign as well as Indian capital to this industry, which contributed to the rapid economic growth of the country.

Rubber is well known for its unique properties such as flexibility, plasticity, elasticity, adhesiveness, durability and resistance to electricity. Also rubber is a material that can keep away hold both air and water, and can be made very soft and very tough and hard by special process. Owing to these properties, rubber was found to serve a

number of quite different purposes at one and the same time, and this situation resulted in the fast development of a variety of rubber-based industrialized all over the world.

The most important use of rubber is in transportation. In fact, rubber is indispensable for all forms of modem transportation. The role of rubber is unique in the manufacturing of mechanical goods such as belting, packing, molding goods, hoses etc. which are very essential for running industries. Large quantities of rubber are used in making footwear, proofed fabrics, sheets, flooring mats and mattresses, which are all essential in the comfortable daily living and health of the people. Apart from these, rubber also plays a vital role in communication and transmission in the form of insulation for cables. Its use is also included in homes, farm, sports and games, medical field and above all in defense strategies. Thus the catalogue of use of rubber is endless. In view of the galaxy of uses, rubber has become today one of the world's most important industrial raw materials used for manufacturing a variety of products useful for everyday life. All these consideration emphasis the scope and potentials of rubber-based industries in the economic and social advancement of any country.

Review of Literature

Rubber Plantation is a topic that has been extensively researched and debated amongst academician, NGOs, Government etc. Most of the debate and agreements are based on rubber plantation and its impact on economy, employment, income, soil suitability, climatic condition, environment and its utility.

Martin. R, (1981) on his research study on Development Policies and pattern of Agrarian Dominance in the Malaysian rubber export economy found out that rubber production has undergone a significant and far reaching structural transformation in social as well as economic dimensions. This transformation represented the outcome of policy responses to changing world market conditions for the export of natural rubber, which coincided with a political transaction to independence and parliamentary Government. Although, the trend in world prices for natural rubber fell by half during the 1960s, Malaysian output had doubled. This output effect reflected the productivity gains due to re-planting and new planting with new high yielding material. Whereas improved productivity maintained producer incomes, more or less, despite deteriorating terms of trade, remaining structural constrains had an income redistribution effect of severely regressive proportions. Annual average real rates of growth of Malaysian Gross Domestic product accelerated from the 3-4 per cent level of the 5.5 percent during the 1960s, and reached 7.5 per cent over the first half of the 1970s, meanwhile, a reducing rate of population increase during this period resulted in a credible improvement to average real income per capita.

Stiff. D., Lawrence, (1973) examined the growth of rubber economy of Southern Thialand. Official accounts attribute the attribute first planting of rubber in Siam to Phya Ratsadanupradit (1857-1913), a member of the most powerful Chinese family in the south where he amassed a fortune by controlling the commercial enterprise in the area, thus stirring bitter resentment among the British in Penang and Singapore who could not break his monopolies. Latter on the Southern Thailand established plantation large enough to provide full rather than partial family employment. Consequently, as

Semi-idle subsistence village labour and unemployed land were drawn into rubber plantation and the Southern Thailand was transformed into market oriented cash economy.

French M.J examines the origins of multinational enterprise by studying the decision which established the Goodyear Tire and rubber company as a major international business between 1910 and 1939. With its rubber plantation, purchasing offices, sales branches, and factories overseas, Goodyear was one of the three tire firms among the leading US companies, possessing both market and supply-oriented investments in 1929. The extent of Goodyear‟s overseas activities permits an evaluation of the principal models of enterprise within the context of a single company. Three types of general explanations have been offered for the emergence of multinational enterprises in the twentieth century, Vernon‟s concept of the “product cycle” which stresses the diffusion of production technology through factories established in the foreign countries. The second approach gives play to a wider range of variables than the technology and factor costs approach and consequently gives more emphasis to the specific characteristics of the firm. Thus Foreman Peak, who uses the notion of technical advantage to explain the rise of multinational car firms, nevertheless reveals that US producers had to modify their car designs and use more expensive local steel, and also failed to reproduce their domestic levels of productivity, when they entered into production in Europe. A third approach treats multinational investment as a form of vertical designed to reduce transactions cost. This explanation develops Alfred D. Chander’s account of the growth of large corporations and in its simplest form is merely an extension of Hymer‟s concept of advantage though with the additional strength of

encompassing backward integration. Yet the focus on transactions costs highlights overseas influences. Thus, Chandler treats tariff policies as the decisive external influence on US direct investment.

Dove, (1996) in his studies on the rubber plantation in Borneo tries to examine the relationship between rice eating rubber and export crop development. The result suggest that a comparative analysis of these two interlinked events makes the tribal dream look less fantastic and the international regulation look less rational than they otherwise do. This analysis contributes to current debates about the peasant tendency to differentiate the production of food crops and cash crops, the scholarly failure to link local and global histories, and the anthropological failure to integrate symbolic and political-economic studies. Dove (1998), in his study on Living Rubber, Dead Land, and Persisting Systems in Borneo: Indigenous Representation of Sustainability, found out that there was a distinct difference between the representations of the Kantu‟ and those of global environmentalists with respect to rubber. Whereas the Kantu‟ regard land planted under rubber as dying (within the context of their swidden system), most environmentalists view rubber planting as agroforestry, the undertaking of which is believed to be „reviving‟ for the land. Whereas, the environmentalist see rubber as something so benign as to merit eco-labels for its wood in international markets, the Kantu‟ see rubber as something that fundamentally violates the principles of their system of sustainable tropical forest agriculture, yet is welcomed nonetheless precisely because of this violation. Identifying and analyzing this difference may help to point the way to less essential zed Western representations of indigenous environmental beliefs as well as more nuanced Western conceptions of sustainable environmental relations.

Jianchu. Xu, (2006), in his research study on the Political, Social and Ecological Transformation of a landscape. The Case of Rubber in Xishuangbanna China, found out that driven by economic and ideological policies, rubber plantations have been established in Southern China since the early 1950s. Rubber was seen as a perfect way to modernize the shifting agriculture practices of indigenous minorities and to "legitimize" the landscape according to new Maoist State ideals. However, large scale rubber production was dogged by problems, and most rubber production now emanates from smallholders, challenging the state notion that "bigger is better". In the transition to a free market, smallholders rubber farms, which grow a wider variety of crops, have greater flexibility and are better able to adjust to market changes. These small mixed farms also enhance ecological and cultural diversity.

Colletta N.J. and Sung Ah Wong (1994), in their research study on the Education of Chinese Workers‟ Children on Malaysia‟s Plantation Frontier: Myth and Realities, found that Malaysia‟s economy was primarily based on two raw materials, rubber and tin. The growing reliance on rubber has been dramatically illustrated by the rising exports of rubber. While the ratio of rubber to tin exported was 1:1 in 1969, by 1969 it was 9:1. Since 1965, rubber production has risen from 903,000 tons to more than 1.2 million tons. The export of rubber has increased from a cash return of $1,353 million in 1968 to $1,724 million in 1970, of the 4.8 million acres currently under rubber cultivation in Malaya, approximately 1,575,000 acres are found on large estate. Although, the scientific and economic aspects of rubber production have been studied in great depth from a managerial or profit motive perspective, little attention has been paid to the labour force which contributes so greatly to the prosperity of Malaysia‟s rubber economy in the

modern world. It is the purpose of this article to shed light upon the conditions of the estate labour force with specific reference to the education of the children of estate labors.

Moreina A. et. al (2009), in their study on Potential of „ Rubber Plantations for Environmental Conservation in Amazon Region‟ found out that the potential of planting rubber trees as a source of income and the advantage of their introduction in a sustainable form to reduce the concentration of CO2 in the atmosphere. In this humid tropical Amazon, in upland soil areas, rubber monoculture plantations present the lowest estimated evapotranspiration compared with a natural forest. The Potential carbon sequestration in total dry weight of adult rubber plantations is estimated in 275.1 ton per hectare. The advantage of planting rubber in this region is that, the carbon accumulation in soil cultivated with rubber trees in monoculture and poly culture plantations. The cultivation of rubber trees by small farmers will maintain more extensive forest plots. They concluded that if smallholdings can have at least one perennial crop as a main source of income, communities in the Amazon will reduce the rate of deforestation in comparison with that necessary for short-cycle annual crops.

Gornning T (2008), in his study to investigate the relationship between soil properties and the growth of para rubber trees, and to study the soil properties in Panom Dongrah District, Surin Province, using Pearson‟s Product Moment Correlation Co-Efficient(r) Method, found out that various soil properties in the upland and the lowland areas were at standard levels, such as soil texture, soil drainage, soil moisture and pH; on the contrary, N, P, K and Mg were lower than the standard levels. Further, growth rate of

Para rubber trees in the uplands was slightly higher than that of the lowlands. He also found that Soil properties (except soil texture) do not relate to the growth of Para rubber trees. In his comparisons between soil properties and the growth of Para rubber trees in both areas, there was found no statistical difference at the 0.05 significance level. He concluded that Para rubber trees can be planted on both uplands and lowlands of Panom Dongrak district, where the altitude is between 159-413 meters above mean sea level, with no differences in the rate of growth.

Dey S.R. at. al. (2014), in their study on Economics of Rubber Plantation in Tripura, used personal interview method, collected from 60 farmers, pretested schedule during 2009-10. It was found that the cost of establishment per ha was found to be ` 2,41,011 and ` 2,27,430 of which investment costs constituted 18.92 and 18.64 and maintenance cost 81.08 and 81.36 per cent in small and large plantations respectively. The average per ha maintenance cost incurred by small growers was ` 1,95,408.01 during the first six years, of which variable and fixed cost accounted for 69.67 and 30.33 per cent, respectively. It was ` 1,85,033.62 in large plantation where variable and fixed accounted for 67.97 and 32.03 per cent, respectively. The average per ha maintenance cost incurred during sixth year onwards was ` 80,933 and ` 82,115 in small and large plantation respectively. The yield obtained in the form of sheet rubber was 1423.77 and 1390.45 kgs, and in the form of scrap rubber was 123.91 kg and 134.59 kg respectively and the net returns were ` 1,81,485 and ` 1,73,877 in that same order. The net present values were positive and of higher magnitude indicating soundness of the investment. The internal rate of return was found to be more than opportunity cost of capital (12%) indicating profitability of the business. The returns per rupee investment were capable of generating nearly two rupees

which was highly profitable venture. Their findings revealed that the initial investments can be recovered within eight years.

M. Vongpaphane (2007), in his Research study on The Economic Potential for Small holder Rubber Production in Northern Laos, examines the economics of smallholder rubber production in an established rubber-growing village in Luangnamtha Province and models the likely expansion of smallholder rubber in the Province. He found out that Rubber smallholdings are being established by shifting cultivators in Northern Laos, in response to demand from China and encouraged by government land-use policy. His study was based on informant like interviews, group interviews, direct observation, and a farm-household survey. He also found out that given current market conditions and credit support, investment in smallholder rubber production in the uplands of Northern Laos can be profitable. The results from the DCF analysis for the study village show that the expansion of rubber planting in that village is based on good economic returns. Therefore, rubber can be considered as one of the potential alternatives for poor upland farmers, in line with the government policy of stabilising shifting cultivation and supporting new livelihood options for poverty reduction.

Lallianthanga R.K. et.al, (2014) in their Research study on the Mapping of Potential Areas for Rubber Plantation in Mizoram, India Using GIS Techniques found out that Rubber plantations in India are traditionally found in the hinterlands of the south west coast. This track is, however, reaching a stage of saturation for rubber cultivation and the scope for further expansion of the crop is limited. But however, it was found out that the agro-climatic conditions which represent tropical features in low altitudes, exposure to

monsoon and other moderating influences suitable for rubber plantation was present in Mizoram also. And with the help of GIS analysis, it was found that there is substantial potential area (29.08% of total geographical area), and focus has been given for expansion of rubber plantation and it has also been introduced as one of the trade schemes under the NLUP programme. They also found that there are vast potential for rubber plantation along the western flank and northern part of the state. Cultivable wastelands could be extensively utilized for these plantations and in most parts, an alternative to shifting cultivation. The existing plantations could be improved by restocking or replanting to increase the overall productive output of the land.

Sarkar S (2011) studied the sources of income from rubber plantation for the tribals in Tripura, The results of his studies indicates that rubber plantation is expanding very quickly in Tripura. He also found that various Government agencies are working to rehabilitate the tribal Jhumias through rubber plantation. It was also found that rubber plantation Increases employment and is helpful for reducing poverty. There is large scope for employing more rural tribals in rubber plantation and it will also workagainst deforestation. Thus the paper concludes by suggesting that Government of Tripura should put more efforts for expanding rubber plantation in rural areas which will reduce unemployment.

Jacob (1985) evaluated the performance of co-operative movement in the field of natural rubber marketing. He found that co-operative rubber marketing societies have been confronted with the problems such as overpoliticalisation, less accountability, lack of professionalism, competition from dealers and visual grading. He suggested certain

remedies such as professional orientation and professional representation in the Board of Directors of cooperative. societies, strengthening the Apex Body and membership restrictions.

Raju (1990) analysed the development and problems of the rubber based industries in Kerala. He is of the opinion that steps should be taken to enhance the productivity of the rubber manufacturing industry in Kerala, reorient the tax structure to reduce the tax burden and stabilise the prices of basic inputs to help the local rubber goods industries, to produce goods at competitive prices.

Tansuan (1984) in a comprehensive study on the world rubber marketing structure and price stabilisation, chalked out an econometric model of the world natural and synthetic rubber markets, with a view to explain the peculiarities of NR price. He concluded that oil price is a key factor on the development of SR industry.

Kulkami (1999) studied the challenges and opportunities of Indian Rubber Industry in the wake of liberalisation and globalisation. In his study, he clearly draws the picture of present global rubber scenario together with Indian and South East Asian rubber scenarios. He is of opinion that Rubber Industry In India has maintained a prolific growth rate with the support of easy access to major raw materials, rapidly expanding internal market, adequate government support and technically qualified and experienced man power. He concluded that the rate of growth of production in natural rubber would remain subdued with no prospect of growth in non-traditional areas of rubber

production in lndia. He also stressed that the import of NR will become inevitable if domestic supply falls short of the demand.

Gupta (2000) analysed the implications of GATT Agreement and Dunkel Report on Agriculture, Textile Industry, Pharmaceutical Industry, Trade and Service sectors and Trade Related Investment Measures of the Indian economy. He examined the gains and losses of India from GATT Agreement and suggested that India should strive for the optimisation of benefits From the GATT Agreement. He concluded that the GATT Agreement provides an opportunity to each country to work under a rule-based, multilateral and transparent reading system. Therefore, India will be a part of global market and it cannot keep aloof from other countries of the world.

P.P Courtenay (1965) in his Book on "Plantation Agriculture" studied that plantation agriculture has largely determined many current economic, social and political situations within the equatorial and tropical monsoon zones, where climate permits prolonged harvests and specialized crops that require immediate processing. In his book, chapters 1 and 2 reviewed the development of plantation systems in the 18th and 19th centuries and those massive population movements which led to the creation of multi-racial societies. Again in his book, Chapters 3-6 show that in the 20th century plantation agriculture has matured from a pioneer economic development of unknown tropical regions to a highly organized, scientifically based method of large-scale crop production. A survey of different variants of the system (Chap. 4) covers palm oil, coffee and cane sugar production with particular reference to labour costs. In reviewing the restriction schemes and commodity agreements (Chap. 5), three economic and geographical phases

were distinguished: (i) extensive free-for-all planting of coffee, tea, rubber and sugar in the 19th and early 20th centuries; (ii) a transitional phase of rudimentary control of overproduction which, however, furthered the geographical distribution of planting; and (iii) the international agreements reached either during the great depression (e.g. on rubber and tea), reviewed and revised after World War II (e.g. for sugar), or instituted in post-war years (e.g. for coffee). These schemes have materially strengthened the position of plantations *vis-a-vis* small-holder producers whose low costs enable them to survive slump periods.

Joseph J, et al. (2010) in their study on "Report on the socio-economic impact of Natural Rubber cultivation under the Block Planting Scheme in Tripura" tried to assess the socio-economic impact of the Block Planting Scheme (BPS) from the angle of the beneficiaries, implementing agencies and the policymakers. They used primary data taking 480 households drawn from Block Planting Units with mature (Mature BPUs) and immature (Immature BPUs) area under Natural Rubber (NR) as well as households attached to Group Processing Scheme (GPUs) with mature area under NR during the year 2008. The primary data were supplemented with secondary information gathered from relevant official sources and concerned agencies. They found out that the BPS has been successful in fulfilling the two perceived objectives, viz., the expansion of area under NR cultivation and improvements in the income profile of the ESMGs, judged by the progress under the three completed phases and the fourth phase in progress. During the past 15 years (1992-07) covering the three phases of its operation, the BPS has led to an explicit

shift from the conventional shifting cultivation to settled mode of NR cultivation. In the process of change, the BPS has ensured an equitable distribution and control over land with an assured income to the beneficiary households. Also, there had been a gradual transformation in the social organization of the community favoring the nucleus family concept. They also found that the average size of families of sample households showed a comparatively smaller size for BPU households (4.5) than the GPU households (5.2). The age-wise distribution of sample households indicated a higher share of younger age-groups (less than 24 years) in the BPUs with higher employment and income earning pattern. The compositions of income showed that rubber was the major source of income for GPUs (75%) and mature BPUs (66%). For immature BPUs, employment was the major source of income (77%). The finally found that the annual average value of household savings and assets was Rs. 72546, Rs.41966 and Rs. 183278 respectively for mature BPUs, immature BPUs and GPUs. The difference in annual savings and assets was 72.87 per cent between households with and without rubber income under the BPUs. The BPS has also led to an explicit shift from the conventional shifting cultivation to a settled mode of NR cultivation. In the process of change, the BPS has ensured an equitable distribution and control over land with an assured income to the beneficiary households.

Stiff. D., Lawrence, (1973) examined the growth of rubber economy of Southern Thialand. Official accounts attribute the attribute first planting of rubber in Siam to Phya Ratsadanupradit (1857-1913), a member of the most powerful Chinese family in the south where he amassed a fortune by controlling the commercial enterprise in the area, thus stirring bitter resentment among the British in Penang and Singapore who could not

break his monopolies. Latter on the Southern Thailand established plantation large enough to provide full rather than partial family employment. Consequently, as Semi-idle subsistence village labour and unemployed land were drawn into rubber plantation and the Southern Thailand was transformed into market oriented cash economy.

French M.J examines the origins of multinational enterprise by studying the decision which established the Goodyear Tire and rubber company as a major international business between 1910 and 1939. With its rubber plantation, purchasing offices, sales branches, and factories overseas, Goodyear was one of the three tire firms among the leading US companies, possessing both market and supply-oriented investments in 1929. The extent of Goodyear's overseas activities permits an evaluation of the principal models of enterprise within the context of a single company. Three types of general explanations have been offered for the emergence of multinational enterprises in the twentieth century, Vernon's concept of the "product cycle" which stresses the diffusion of production technology through factories established in the foreign countries. The second approach gives play to a wider range of variables than the technology and factor costs approach and consequently gives more emphasis to the specific characteristics of the firm. Thus Foreman Peak, who uses the notion of technical advantage to explain the rise of multinational car firms, nevertheless reveals that US producers had to modify their car designs and use more expensive local steel, and also failed to reproduce their domestic levels of productivity, when they entered into production in Europe. A third approach treats multinational investment as a form of vertical designed to reduce transactions cost. This explanation develops Alfred D. Chander's account of the growth of large corporations and in its simplest form is merely

an extension of Hymer's concept of advantage though with the additional strength of encompassing backward integration. Yet the focus on transactions costs highlights overseas influences. Thus, Chandler treats tariff policies as the decisive external influence on US direct investment.

Manivong V. (2007), in his research on The "The Economic Potential for small Rubber Production in Northern Laos", found that the Rubber smallholdings are being established by shifting cultivators in Northern Laos, in response to demand from China and encouraged by government land-use policy. This can be seen as part of a general transition from subsistence to commercial agriculture in the uplands – in particular, from shifting cultivation to tree crop production. This study examines the economics of smallholder rubber production in an established rubber-growing village in Luangnamtha Province and models the likely expansion of smallholder rubber in the Province. Data were obtained from key informant interviews, group interviews, direct observation, and a farm-household survey. Latex yields were estimated using the Bio-economic Rubber Agro-forestry Support System (BRASS). A discounted cash flow (DCF) model was developed to estimate the net present value for a representative rubber smallholding. This model was then combined with spatial data in a Geographical Information System (GIS) to predict the likely expansion of rubber based on resource quality and accessibility. The study shows that, given current market conditions and credit support, investment in smallholder rubber production in the uplands of Northern Laos can be profitable. The results from the DCF analysis for the study village show that the expansion of rubber planting in that village is based on good economic returns. The spatial analysis indicates that the potential for rubber in the study village is not an isolated case; there are also

other areas in Luangnamtha Province that appear to be economically suitable for rubber. Therefore, rubber can be considered as one of the potential alternatives for poor upland farmers, in line with the government policy of stabilizing shifting cultivation and supporting new livelihood options for poverty reduction. However, there are risks associated with rubber production and emerging constraints of land and labour, hence government should move cautiously in promoting rubber where farmers are uncertain about reducing their dependence on shifting cultivation. The role for government, as in other countries where smallholder rubber has played a significant role in rural development, is to ensure the provision of good quality planting material, to assist financially during the long investment period when no income is generated, and to invest in roads and marketing infrastructure. In particular, maintaining secure access to the China market will be crucial for the sustainability of smallholder rubber. The Economic Potential for Smallholder Rubber Production in Northern Laos, if carefully managed, the expansion of smallholder rubber in Laos has the potential to contribute to sustainable rural livelihoods.

Dey S.R, Mundinanamani S.M, Basavaraja H, Kulkarni G.N, Banakar B and Hedge R.V (2014), in their research on "Economics of Rubber Plantation in Tripura" used personal interview method by interviewing 60 farmers using pretested schedule during 2009-10. The results on economic analysis of rubber plantations in South Tripura district of Tripura state revealed that, the cost of establishment per ha was found to be ` 2,41,011 and 2,27,430 of which investment costs constituted 18.92 and 18.64 and maintenance cost 81.08 and 81.36 per cent in small and large plantations respectively. The average per ha maintenance cost incurred by small growers was ` 1, 95,408.01

during the first six years, of which variable and fixed cost accounted for 69.67 and 30.33 per cent, respectively. It was ` 1,85,033.62 in large plantation where variable and fixed accounted for 67.97 and 32.03 per cent, respectively. The average per ha maintenance cost incurred during sixth year onwards was ` 80,933 and ` 82,115 in small and large plantation respectively. The yield obtained in the form of sheet rubber was 1423.77 and 1390.45 kg and in the form of scrap rubber was 123.91 kg and 134.59 kg respectively and the net returns were 1,81,485 and ` 1,73,877 in that same order. The net present values were positive and of higher magnitude indicating soundness of the investment. The internal rate of return was found to be more than opportunity cost of capital (12%) indicating profitability of the business. The returns per rupee investment were capable of generating nearly two rupees which can be highly profitable venture. The payback period analysis revealed that the initial investments recovered within eight years. Overall, the proposition of growing rubber crop was highly profitable as revealed by the financial feasibility tests.

Viswanathan (2008), made a comprehensive study on the performance of small rubber farmers and its impact on livelihood systems of North eastern states of India and Thailand. The study uses cross-sectional data collected from 309 rubber smallholders from India's North Eastern states and 106 rubber growers from the Songkhla province in Thailand. The study reveals that the rubber monocrop system is more feasible than integrated system, while the primary market is more efficient. It is further found that rubber farming contributes positively to the gross household income of the rubber growers in the integrated farming systems. Further it has been integrated farming provide more resilience during crises and promises for more sustainable sources of

income. However, the case studies suggests for the need to promote and integrated rubber farm systems in case of small holding.

Min at.al (2017), in the their study found that rubber farming has dominated the rural economy with almost 80% of land is being used for rubber cultivation in XSBN. The findings highlight the need for ethnicity-targeted and location-specific rubber farming policies and agricultural extension services. The study content that rubber farming would contribute to achieving sustainable development by curbing poverty, reducing inequality and managing forest sustainably in this ethnically.

Yogish, S.N. (2017), in his study of rubber plantation in Shimoga district of Karnataka, found that land, labour, capital etc., are most prominent. Rubber predominantly being a rain-fed crops therefore, rubber plantation is mostly effected by weather variation especially on yield , return and supply which further effects market prices. It was found that higher variable cost contributes to higher total costs. Cost-benefit analysis shows less than unity implying that non-viability of investment in rubber. Scarcity of labourers and high price fluctuations are some of the major constraints faced by the famer.

Vongkhamheng (2016), in their paper studied the role of natural rubber in contributing to rural livelihood and its impact on ecology. The study shows that the latex has high commercial value and provided greater scope for earning a decent livelihood and further socioeconomic development. However, rubber faming has it impact on watersheds and disturbs tropical forest ecosystems. The study suggest for adequate and effective management and sustainable planning to control its ecological impact.

Tongkaemkaew, U. (2018), studied the impact of rubber production on the daily time spent on income-earning and non income earning activities of small holders in northeast Thailand. Personal interview was used to collect information 114 households in three villages. The result shows that the maximum time is incurred by the tapping rubber growers in the overall income earning activities that non-rubber grower. Significant effects were found on the time spent on non-income earning activities. However, the effects of the rubber plantation on growers 'daily life were not considered as a barrier for the new growers in the region for rubber plantation.

Binitha, M and Raj, J (2018) in their study on the socio-economic condition such as income, education, wealth, place of residence and employment status of rubber plantation labourers of Kanyakumari District found that owing to variety of reasons the conditions in the rubber plantations remained unsatisfactory for a long time. Socio-economic condition of plantation labourers remained very unsatisfactory with low wages, poor working and living conditions. Though facilities such as drinking water, road, transportation and sanitation facility were available, yet they were not properly maintained. They were found leading a live in poverty which is compelling the younger generation to opt for other better paid jobs.

Joyjit, S., at el (2015) in their paper "Socio-Economic Condition of Rubber Plantation Workers- A Synoptic Study" found that normally the working hours ranges from 8-10 hours every day. One of the most common reasons for choosing rubber plantation is the lake of other employment opportunities. It is further found that existing wage structure is inadequate.

Chouhan, P. and Bhowmik, I. (2018) in their study with dual objectives to examine the trend and nature of wages of the rubber tappers and the employment condition of the workers. Cuddy Della Vale index is used to measure the stability of wages. It was found that natural rubber (NR) contributes substantially to the state GDP of Tripura. However, the real wage of the tappers is found to be less than the other agricultural workers. It is also found that the average employment in higher than other cropping system in the state.

Chouhan,P. at el. (2019), made a study on the Emerging Labour Relations in the Rubber Plantations of Tripur. The study shows that Tripura is the second largest Natural Rubber (NR) growing state in the country. Structured schedule have been used to collect the primary datas and a one-way ANOVA to measure the difference in the mean income of the workers. The study shows that the workers in the rubber sector receive minimal level of income. A revenue sharing mechanism has been used to manage crisis.

Karthiayani, V. and Shivakoti, P. (2008), examines the influence of important socio-economic, institutional/policy level factors in determining the adoption/non-adoption of rubber-integrated farming systems in traditional and non-traditional rubber-growing regions in India. The study shows a contrast in the empirical evidence of the adoption of rubber-integrated farming systems in Kerala and Northeast India, which are mostly explained by region-specific factors dominated by socio-economic, institutional variables, and policy-level constraints, as also revealed by multivariate analysis. The institutional arrangement and policies have been found to be instrumental in the states

of Kerala, however, in Northeast such institutional arrangement are found to be less effective.

Kuswanto (2019), made a study with an aim to study the ratio of income and expenditure as a measure of welfare for rubber farmers. The Farmer Household Income Exchange (NTPRP) approach was used to analyse the welfare of the farmers. The results shows that the average rubber farmer in Jambi Province is less affluent as indicated by NTPRP of 0.97 <1. It was found that consumption expenditure has the largest share compared to expenditure on rubber farming.

Kodoh, J. (2016), found that the average monthly income of the small holding increased by 30 percent. It was also observed that the main factors determining their participation was found to be self motivation, subsidy incentives programme by LIGS, poverty, market prices, and family support. However, the small holder faces problems in the form of unstable price of rubber and theft of latex. It was found that rubber planting project has been successful in emancipating the farmers from poverty.

Sriyalatha, M.A.K. (2018) made a study to examine the determinants of the small rubber productions in Kerala. The study was based on a sample collected through a structured questionnaire. The study shows that majority of the farmers were above the age group of 45. Regression analysis shows that variables such as cost of input, credit, fertilizer subsidiary, size of land, years of experience, working hours, inter-cropping and number of family members age are positive related to output while inversely related to education level. Lack of education is found to be a hindrance to productivity as new techniques of production demands for higher educational level. It is suggested that

promotion, institutional support and provision for the security of the famers is essential to enhance productivity.

Dissanayake, D.M.P et al. (2016), in their study to examine the socio-economic condition and the various challenges faced by the small rubber farmers in Monaragala district. It was found that the average age of the farmers ranges between 41-60 years where majority were male farmers. About 52 percent had primary level education. Average year of experience was 7.5 years. Also majority had small holdings of land. The farmers produce about 160 sheets per month at the average cost per month of Rs. 6,240. Years of experience had significant positive relation with output while land use had negative impact on output. The study also revealed the various challenges faced by the rubber farmers such as reduction in the plant area, lack of skilled labour, low productivity, lack of able human resource and rising cost of production. The study suggested for the need of greater research efforts in areas of increasing productivity.

T.K. Nath et al. (2013), made a study to examine how rubber help small farmers to enhance livelihood in Bangladesh, India and Sri Lanka. The study shows that there are differences in rubber tree stock, growth, management, and livelihood impact. Comparatively the level of plantations in India and Sri Lanka were higher, while it was low in Bangladesh. It was seen that factors such as efficient institutional support, practice of silviculture, proper maintenance, and proper transfer of information on the awareness of the benefits contributed to the growth of rubber plantation in India and Sri Lanka. The correlation analysis shows that there is a positive correlation between household income and the income

from rubber plantation. However, the system of monoculture pose a challenge for the farmers as such rubber agroforestry was suggested as the best alternative to ensure sustainability of environment and livelihood in times of crisis or low productivity.

Singaravelloo, K. and Wee, J. M. (2018) in his study on the economics status of the rubber farmers in the four states of Malaysia found that that majority of the small rubber farmers were poverty stricken and the economics conditions are very poor. Many farmers also depend on alternative means as rubber farming is very dependent on weather conditions. It was suggested that monthly subsidy should be extended to small farmers for support.

Lee, D (2018), in his study found that lower prices discourage the small farmers for increasing production. It was also seen that there are fears of conversion of the large and medium size into other alternative investments. However, inspite of the falling prices rubber farming has been one of the main sources of livelihood for the small farmers in Thailand.

Thongyou, M. (2014), with an aim to examine the changes in the livelihood strategies of Northeast region of Thailand classified livelihood strategies into three periods**.** The farmers adopted various livelihood strategies such as economic diversification to reduce risk, mix cropping by cultivating rice for food security and retaining ownership of agricultural land. The study suggested that, proper support mechanism on sustainable rubber agro-forestry and extension of assistance to the rubber grower's organisation is very essential.

Jin, S. et al. (2018), in the study reveals that composition of the household income has changed over the period between 2014 to 2012 the reason being the fall of the share of rubber cultivation and rise in the share of livestock and non-farm sector. It was found that diversification

of the farming has positive impact on livelihood security. It recommended that rural development program should be focused into enhance livelihood of the rubber farmers.

A. S. Vinitha and L. P. Ramalingam (2017), in their study classified the rubber growing regions in India into two major zones viz. traditional and nontraditional. Kerala and the Kanyakumari district of Tamil Nadu constitute the major part of the traditional region which accounts for about 80 percent of the total geographical area and 93 percent of the production of rubber in the country. Karnataka, Goa, Konkan Region of Maharashtra, hinterlands of coastal Andhra Pradesh and Orissa, the north-eastern states, Andaman and Nicobar Islands constitute the Non-traditional regions. The study shows that majority of rubber sector constitute small holding accounting for 92 per cent of the production and 89 per cent area under plantation in the country.

Ibragimov, A. and Arshad, F.M (2017), made as study to examine the structural factors that led to the reduction in the productive of rubber and suggest measures to increase productivity. It is also found that Malaysia has also grown from a rubber supplier to a manufacturing nation. However, 95 percent of the famers come under small farming. The study reveals that despite the effort from the government the productivity has declined. It was suggested that proper funding on research and development is necessary for the improvement of the yield of the rubber production and productivity.

Bhowmik, I. (2006), in his paper studied the impact of Rubber on the Environment of Tripura and found the following results, the seeds of the rubber causes hindrance for other types of cultivation as it they are hard and do not decompose easily and the immense shade created by the rubber leaves affects the other crops around the rubber plantation. It is also found that 81 percent of the farmers agreed that the rubber

plantation has no negative impact on the ground water as it has remained unchanged. The smell from the rubber processing units causes concern for those the residence around the unit. Hence it was suggested that such units be placed away from the residential areas.

Alexander, T.S. and Haran, B. (2016), examines the status of rubber plantation in Kerala relating to import and export, production and consumption and the effect of decline in price over the small farmers. The study is based on a sample of 120 farmers selected by way of random sampling method. The study shows that, the fall in the rubber price attributes to excess of India's import rate to export. The study also reveals that there has been as increase in the consumption of synthetic rubber in India. The mismatch between tapping cost and rubber price in the market has greatly discourages rubber farmers. Hence it was suggested for the review of the national policy so as to ensure decent livelihood to the small rubber farmers.

Nair, T. S. (2016), made a study with an aim to assess the health issues of the rubber farmers in rural Kerala for 154 rubber plantation workers in Pathanamthitta District in Kerala. The study reveals that 70.1 percent of the famers were found to be exposed to chemical. The following are the most common disease suffered by the farmers, Musculoskeletal (66.2 percent), respiratory (31.2 percent), dermatological (26.6 percent) and ophthalmological disorders (22.7 percent). It was also found that there was a lack of awareness programmes for the farmers. It was suggested for the need of proper training on health and safety measures for the farmers.

Cramb, V. M. (2008), made the study on the bio-economics of smallholder rubber in Northern Laos. In the study Bio-economic Rubber Agroforestry Support System (BRASS) was used to examine the Latex yields. On the other hand, for calculation of the net present value (NPS), a financial model was developed. Further the model was incorporated with location data in a Geographical Information System (GIS) for the purpose of the spread of rubber plantation depending on its quality and accessibility.

Giroh, Y.D. and Adebayo, E (2009), studied to examine the rubber tapping efficiency of Rubber Research Institute of Nigeria, Benin City, Edo State. Date were analysed using stochastic frointer analysis. It was found that the technical efficiency of the rubber tappers was less than one which shows that they were not operating at its optimum efficiency. It was suggested that education and institutional trainings can improve the efficiency of the tappers and enhance the productivity of rubber framing.

In Nagaland rubber plantation was introduced in 1990s, and the area of plantation has been growing over the years. Though it is in the nascent stage, yet, no scholars or rubber board in Nagaland, or Government Agencies has put an effort to study the production, pricing and marketing of rubber products. Thus, this research aims to fill the Lagunae in the literature of rubber plantation.

Statement of the Problem

The geographic isolation of the Northeast region from the rest of India has resulted in a corresponding isolation from markets for the region's products. Rubber cultivation is a valuable agro-based industry which can create employment and income in the region. According to the latest report by the Government of Nagaland, under the Department of Land Resource, the total geographical area of Nagaland in terms of hectare is 16,57, 900, out of which the potential area for rubber plantation is 116546 hectare accounting for 27.87 percent of the total geographical area. Rubber plantation is a new cash crop invading the market in the region but the focus on rubber plantation in Nagaland is at its nascent stage. Thus, the development of rubber plantation in the state is important as it will address some of the economic problems faced by the state of Nagaland as such the study of rubber plantation is pertinent.

Area and period of study

Nagaland which got its statehood in 1963, lies approximately between 25° 6′ and 27° 4′ latitude and between the Longitudes 93° 15′ E, occupying the total area of 16,579 Sq. Kms. It is located in the extreme North-Eastern part of India. Nagaland is bounded by Arunachal Pradesh in the north, Manipur in the south, Myanmar in the east and Assam in

the west and runs parallel to the left bank of the Great Brahmaputra River. The state is inhabited by 16 major tribes, each with its own distinct language, custom and traditions. The climatic conditions ranges from sub-tropical to temperate. The rainfall varies in the state between 200cm to 250cm in a year. According to the latest report by the Government of Nagaland, under the Department of Land Resource, 27.87% of the total geographical area is suitable for rubber plantation. Now taking all the common climatic and soil conditions of the state, Mokokchung and Wokha districts was chosen for the study. The data for the study was collected during 2016-17 from these areas.

Objectives of the Study

1. To study the Farm size and productivity of rubber plantation in the state.
2. To study the employment generation through rubber plantation in the state.
3. To examine the cost and revenue aspects of rubber plantation in the state.
4. To study whether rubber farming is viable in the state.

Hypothesis

1. There is a positive relationship between the size of the farm and rubber production in the state.
2. Higher income groups tend to have larger size of holdings.

Scope of the study

The detail analysis on the issues relating to production, farm size and productivity, cost, income and employment generation from rubber plantation will provide an effective guideline for the policy planners and the rubber farmers in the long run.

Methodology:

In order to analyze and examine the objectives, the study was carried out using the following methods.

A). Primary and Secondary Data: The study was based on data collected from both primary and secondary sources. The secondary data was be collected from the various sources of books and periodicals, published and unpublished records/dissertations/thesis; journals; district gazetteers; research articles, seminar reports, newspapers, study reports of expert committees, departmental publications, plan documents, websites etc. The primary data was collected through Field Survey, questionnaire and interview methods.

B. Sample Design. The primary data was collected through Field Survey using simple random sampling method during 2016-17. Two districts, viz, Mokokchung and Wokha, were chosen for the study. From the two districts, sixty rubber farmers (30 rubber farmer from each district) were taken as a sample.

C. Data Analysis.

The collected data was analyzed using mean, standard deviation, correlation, regression, etc. For Benefit –Cost analysis, the following formulas were used.

(i) Net Present Value (NPV): The NPV of cash flows have been computed as:

$$NPV = \sum_{t=1}^{n} \left(\frac{(B_t - C_t)}{(1+r)^t} \right)$$

Where, B_t= benefit from rubber plantations in each year,

C_t = Cost of rubber plantations in each year,

r = discount rate, t = 1,2, 3…. n, the entire life of the plantation across the study region (comprising seven years of immaturity period, followed by 25 years of rubber production cycle)

n = number of years.

(ii) Benefit-Cost Ratio: It was estimated by using the formula:

$$\text{B: C ratio} = \frac{\sum_{t=1}^{n} \left(\frac{(B_t)}{(1+r)^t} \right)}{\sum_{t=1}^{n} \left(\frac{(C_t)}{(1+r)^t} \right)!}$$

Chapter - 2

Farm size and Productivity

This chapter will highlight the survival rate of rubber trees and also discusses the different farm size holding and the volume of natural rubber production in the state under the study area. The first section examines the overall survival rate followed by hectare-wise and income-wise survival rate for the state of Nagaland followed by Wokha district and Mokokchung district. The second section talks about the overall farm size and productivity of natural rubber in terms of hectare-wise and income- wise in the state followed by Wokha district and Mokokchung district.

2.1: Farm Size and Survival Rate of Rubber Tree.

The farm size is categorized into four types i.e. a. marginal farmers (0-1hectare) b. Small farmers (1-2 hectare) c. Medium farmers (2-4 hectare) and d. Large farmers (4-Above hectares). However it was found that there is no marginal farmer under rubber cultivation in the study area. The survival rate of the rubber trees in both hectare wise and income wise is explained in detail with the help of a diagram.

2.1.1: Survival Rate (Hectare Wise): Nagaland.

The detailed structures of the sample farm of the rubber farmers according to farm size groups with relation to the survival rate of rubber trees under the study area are discussed below. The survival rate of rubber trees in hectare wise of Nagaland is shown in Table No.1, which shows that the total area under rubber cultivation is 144.5 hectares with an average size of holding as 2.40 hectares. A total of 58380 rubber trees were planted, however only 55220 rubber trees survived. Thus the survival rate of rubber trees for the state came out to be 94.58 per cent.

2.1.1.a: Under small farm size, a total area of 40 hectares is under rubber cultivation with an average size of holding as 1.33 hectare. In this area, a total of 9370 rubber trees were

planted out of which 9160 rubber trees survived. Thus the survival rate for the small farm size is 96.09 percent.

2.1.1.b: The medium farm size shows that a total area of 55.5 hectares with an average size of holding as 2.52 hectares. In this area of farming a total of 22940 rubbers trees were planted out of which 21610 rubbers trees survived bringing the survival rate at 94.20 percent.

2.1.1.c: Under large farm size, the total area under rubber cultivation is 49 hectares with an average size of holding as 6.12 hectares. In this area of farming, a total of 20060 rubbers trees were planted, out of which 18830 rubbers trees survived. Thus the survival rate for the large farm size came out to be 93.86 per cent.

2.1.1.d: On comparison among different farm size for the state, it was found that the small farm size has the highest survival rate than the rest, which is even higher than the state survival rate.

2.1.1.e: The percentage wise distribution of cultivated land in hectare wise under rubber plantation for the entire farm size was also calculated. It was found that the medium farm size has the highest percentage of land under rubber cultivation with 38.40 per cent followed by large farm size with 33.91 percent and the least was found in the small farm size with 27.68 per cent.

2.1.1.f: The overall correlation between farm size and survival rate for the state shows a negative relationship with r= - 0.14079. However, since the value of correlation(r) is less than the probable error (P.Er=0.8535), there is no evidence of correlation. Moreover, correlations for the entire farm size category were also examined and it was found that there is no existence of correlation between farm size and survival rate within the group for the state.

Table No.1: Survival Rate: Nagaland.

Size of Holding	Total Area	No. of House	Average Size of holding	Total Trees	Total Trees	Survival Rate (%)

	(in Ha)	Hold	Per H/H	Planted	Survived	
Small	40	30	1.33	15380	14780	96.09
Medium	55.5	22	2.52	22940	21610	94.20
Large	49	8	6.12	20060	18830	93.86
Total	**144.5**	**60**	**2.40**	**58380**	**55220**	**94.58**

Source: Field Survey 2016-17.

2.2: Survival Rate (Hectare-Wise): Wokha.

The survival rate of rubber trees in hectare wise of Wokha District is shown in Table No.2. It shows that the total area under rubber cultivation is 90 hectares with an average size of holding as 3 hectares. A total of 37630 rubber trees were planted, out of which 35240 rubber trees survived. Thus the survival rate of rubber trees for the district came out to be 93.51 per cent.

2.2.a: Under small farm size, a total area of 15 hectares is under rubber plantation with an average size of holding as 1.5 hectare. In this area, a total of 6010 rubber trees were planted where 5620 rubber trees survived. Thus the survival rate for the small farm size in the district is 93.51 percent.

2.2.b: Under medium farm size, a total area of 36.5 hectares is under rubber plantation with an average size of holding as 2.60 hectare. In this area, a total of 15460 rubber trees were planted where 14490 rubber trees survived. Thus the survival rate for the medium farm size in the district is 93.72 percent.

2.2.c: The large farm size shows that a total area of 38.5 hectares is under rubber farming with an average size of holding as 6.41 hectares. In this area of farming a total of 16160 rubbers trees were planted where 15130 rubbers trees survived bringing the survival rate for the large farm size in the district at 93.62 percent.

2.2.d: When comparison was made among the different farm size for the district, it was found that the medium farm size has the highest survival rate than the rest, which is even higher than the survival rate of the district.

2.2.e: The percentage wise distribution of cultivated land in hectare wise under rubber plantation for the entire farm size was also calculated. It was found that the large farm size has the highest percentage of land under rubber cultivation with 42.77 per cent followed by medium farm size with 40.55 per cent and the least was found in the small farm with 16.66 per cent.

2.2.f: The overall correlation between farm size and survival rate for the district was calculated, which shows a positive relationship of r=0.24. However, since the correlation(r) is not greater than the probable error (P.Er= 0.179) by 6 times, we can say that the correlation is not significant and therefore the farm size and survival rate are not related in the district. Moreover, correlations for the entire farm size of the district were also examined. However it was found that there is no existence of correlation between farm size and survival rate within the group in the district.

Table No.2: Survival Rate: Wokha.

Size of Holding	Total Area (in Ha)	No. of House Hold	Average size of holding Per H/H	Total Trees Planted	Total Trees Survived	Survival Rate (%)
Small	15	10	1.5	6010	5620	93.51
Medium	36.5	14	2.60	15460	14490	93.72
Large	38.5	6	6.41	16160	15130	93.62
Total	**90**	**30**	**3**	**37630**	**35240**	**93.64**

Source: Field Survey 2016-17.

2.3: Survival Rate (in Hectare -wise): Mokokchung.

The survival rate of rubber trees in hectare wise of Mokokchung District is explained in Table No.3. It clearly shows that the total area under rubber cultivation is 54.5 hectares with an average size of holding as 1.81 hectares. A total of 20750 rubber trees were planted, where 19980 rubber trees survived. Thus the survival rate of rubber trees for the district came out to be 96.28 percent.

2.3.a: The small farm size shows that a total area of 25 hectares is under rubber farming with an average size of holding as 1.25 hectares. In this area of farming a total of 9370 rubbers trees were planted, where 9160 rubbers trees survived. Thus the survival rate for the small farm size in the district came out to be 97.75 percent.

2.3.b: Under medium farm size, a total area of 19 hectares is under rubber plantation with an average size of holding as 2.375 hectare. In this area, a total of 7480 rubber trees were planted out of which 7120 rubber trees survived. Thus the survival rate in the district for the medium farm size is 95.18 percent.

2.3.c: Under large farm size, a total area of 10.5 hectares is under rubber plantation with an average size of holding as 5.25 hectare. In this area, a total of 3900 rubber trees were planted out of which 3700 rubber trees survived. Thus the survival rate in the district for the large farm size is 94.87 percent.

2.3.d: On comparison among different farm size for the district, it was found that the small farm size has the highest survival rate than the rest, which is even higher than the survival rate of the district.

2.3.e: The percentage wise distribution of cultivated land in hectare wise under rubber plantation for the entire size of holdings for the district was also calculated and it was found that the small farm size has the highest percentage of land under rubber cultivation with 45.87 per cent followed by medium farm size with 34.86 per cent and the least is by large size of farming with 19.26 per cent.

2.3.f: The overall correlation between farm size and survival rate for the district shows a negative relationship of r= -0.04466. However, since the value of correlation (r) is less than the probable error (P.Er=0.6813), there is no evidence of correlation. Moreover, correlations

for the entire farm size category were also examined and it was found that there is no existence of correlation between farm size and survival rate within the group for the district.

Table No.3: Survival Rate: Mokokchung.

Size of Holding	Total Area (in Ha)	No. of House Hold	Average size of holding Per H/H	Total Trees Planted	Total Trees Survived	Survival Rate (%)
Small	25	20	1.25	9370	9160	97.75
Medium	19	8	2.375	7480	7120	95.18
Large	10.5	2	5.25	3900	3700	94.87
Total	**54.5**	**30**	**1.81**	**20750**	**19980**	**96.28**

Source: Field Survey 2016-17.

2.4: Farm Size and Survival Rate: Income-Wise.

The detailed structure of the farm size for the rubber farmers according to income group with relation to the survival rate of rubber trees under the study area are discussed below.

2.4.1: Survival Rate (Income-Wise): Nagaland.

The survival rate of rubber trees by income wise distribution of Nagaland is clearly explained in Table No.4. It clearly shows that the monthly income of the rubber farmers for the state is Rs.7,81,300/- with an average income of Rs.13021.66 per rubber farmers in the state. The total area under rubber cultivation in the state is 144.5 hectares with an average size of holding as 2.40 hectares per house hold. A total of 58,590 rubber trees were planted where 55,070 rubbers trees survived. Thus the survival rate of rubber trees came out to be 93.99 per cent.

2.4.1.a: Under the income group of Rs.5,000-10,000, it shows that the monthly income of the rubber farmers is Rs.2,25,500 with an average of Rs.2,272.72 per rubber farmer. The total area under rubber plantation in this group is 64.5 hectares. It also shows the total area under rubber plantation is 64.5 hectares with an average size of 1.95 hectares per house hold. In this income group, a total of 26330 rubber trees were planted where 24850 rubbers

trees survived. Thus the survival rate of rubber tree for this income group came out to be 94.3 per cent.

2.4.1.b: Under the income group of Rs.10,000-15,000, it shows that the monthly income of the rubber farmers is Rs.75,000/- with an average of Rs.10,714 per rubber farmer. It also shows the total area under rubber plantation is 13.5 hectares with an average size of 1.92 hectares per house hold. In this income group, a total of 5430 rubber trees were planted, where 4930 rubbers trees survived giving the survival rate for the this income group at 90.79 percent.

2.4.1.c: Under the income group of Rs.15.000-20.000, it shows that the monthly income of the rubber farmers is Rs.1,09,800/- with an average of Rs.15,685.71/- per rubber farmer. It also shows that the total area under rubber cultivation in this group is 17.5 hectares with an average size of holding as 2.5 hectares per rubber farmer. A total of 7200 rubber trees were planted where only 6870 rubbers trees survived. Thus the survival rate of rubber trees for this income group came out to be 95.41 per cent.

2.4.1.d: Under the income group of Rs.20,000-25,000, it shows that the monthly income of the rubber farmers is Rs.1,49,000/- with an average of Rs.21,285.71 per rubber farmers. The total area under rubber plantation for this income group is 13.5 hectares with an average size of holding as 1.92 hectares per rubber farmer. A total of 5130 rubber trees were planted, where 4910 rubbers trees survived. Thus, the survival rate of rubber trees for this income group came out to be 95.71 per cent.

2.4.1.e: Under income group of Rs.25,000-30,000, it clearly shows that that the monthly income of the rubber farmers is Rs.77,000/- with an average income of Rs.25,666. The total area under rubber plantation is 12 hectares with an average size of holding as 4 hectares. A total of 4800 rubber trees were planted, where 4510 rubbers trees survived. Thus the survival rate of rubber trees came out to be 93.95 per cent.

2.4.1.f: Under income group of Rs.30,000-Above, it clearly shows that that the monthly income of the rubber farmers is Rs. 1,45,000 with an average of Rs.48,333 which is the highest among different income groups and even higher than the state average income. The total area under rubber plantation is 23.5 hectares with an average size of holding as 7.83

hectares. A total of 9700 rubber trees were planted where 9000 rubbers trees survived. Thus the survival rate of rubber trees came out to be 93.99 per cent.

2.4.1.g: On comparison among different income group of the rubber farmers for the state, it was found that the income group ranging from Rs.20,000-25,000 has the highest survival rate than the rest, which is even higher than the survival rate of the state.

2.4.1.h: The percentage wise distribution of cultivated land in income wise under rubber plantation for the entire income group was also calculated and found that the small income group of Rs.5,000-10,000 has the highest percentage of land under rubber cultivation with 44.63 per cent, and the least was found to be from the income group of Rs. 25,000-30,000 with 8.30 per cent.

2.4.1.i: The overall correlation between monthly income of the rubber farmers and survival rate of the state shows a negative relationship with r= -0.0576595. However, since the value of correlation(r) is less than the probable error (P.Er=2.0202), there is no evidence of correlation. Moreover, correlations for the entire income group of the rubber farmers were also examined, and found that there is no correlation between income group and survival rate of rubber trees within the group in the state.

Table No.4: Survival Rate (Income-Wise): Nagaland:

Category (Rs.)	Monthly Income	Average Monthly Income	Total Hectare	No. of House Hold	Average Size of holding Per H/H	Total Trees Planted	Total Trees Survived	Survival Rate (%)
5000-10000	225500	6833.33	64.5	33	1.95	26330	24850	94.37
10000-15000	75000	10714.85	13.5	7	1.92	5430	4930	90.79
15000-20000	109800	15400	17.5	7	2.5	7200	6870	95.41
20000-25000	149000	21285	13.5	7	1.92	5130	4910	95.71
25000-30000	77000	25666	12	3	4	4800	4510	93.95

30000-Above	145000	. 48333	23.5	3	7.83	9700	9000	92.78
Total	781300	**12988.33**	**144.5**	**60**	**2.40**	**58590**	**55070**	**93.99**

Source: Field Survey 2016-17.

2.5: Survival Rate (Income-Wise): Wokha.

The survival rate of rubber trees by income wise distribution in Wokha district is explained in the following Table No.5, which shows that the monthly income of the rubber farmers is Rs.4,05,000/- with an average income of Rs.13,500. The total area under rubber cultivation is 90 hectares with an average size of holding as 3 hectares. A total of 37630 rubber trees were planted, however only 35240 rubbers trees survived. Thus the survival rate of rubber trees for the district comes out to be93.64 per cent.

2.5.a: Under the category of Rs.5,000-10,000, it shows that that the monthly income of the rubber farmers is Rs.1,12,000/- with an average income of Rs.6588.23. The total area under rubber cultivation in this group is 37 hectares with an average size of holding as 2.17 hectares. A total of 15320 rubber trees were planted, however only14430 rubbers trees survived giving the survival rate for this group at 94.19 percent.

2.5.b: Under the category of Rupees 10,000-15,000income groups, it shows that the monthly income of the rubber farmers is Rs.41,000/- with an average income of Rs.10,250. The total area under rubber cultivation is 10 hectares with an average size of holding as 2.5 hectares. A total of 4220 rubber trees were planted, however only 3900 rubbers trees survived giving the survival rate for this income group at 92.41 percent.

2.5.c: The income group ranging from Rs.15,000-20,000 clearly shows that the monthly income of the rubber farmers is Rs.48,000/- with an average income Rs.16,000. The total area under rubber plantation is 11.5 hectares with an average size of holding as 3.83 hectares. In this income group, a total of 4840 rubber trees were planted, however only 4600 rubber trees survived giving the survival rate for the this income group at 95.04 percent.

2.5.d: The income group ranging from Rs.20,000-25,000 clearly shows that the monthly income of the rubber farmers is Rs.42,000/- with an average income of Rs.21,000. The total

area under rubber cultivation in this income group is 4 hectares with an average size of holding as 2 hectares. A total of 1650 rubber trees were planted, however only 1550 rubber trees survived. Thus the survival rate for this group comes out to be 93.93 per cent.

2.5.e: Under income category of Rs.25,000-30,000, it clearly shows that the monthly income of the rubber farmers is Rs.52,000/- with an average income of Rs.26,000. The total area under rubber cultivation in this income group is 10 hectares with an average size of holding as 5 hectares. A total of 4000 rubber trees were planted, however only 3760 rubber trees survived giving the survival rate for the this group at 94 per cent.

2.5.f: Under income category of Rs.30,000-Above, it clearly shows that the monthly income of the rubber farmers is Rs.1,10,000/- with an average income of Rs.55,000. The total area under rubber cultivation in this income group is 17.5 hectares with an average size of holding as 8.75 hectares. In this income group, a total of 7600 rubber trees were planted, where 7,000 rubber trees survived giving the survival rate for the this income group at 92.1 percent.

2.5.g: On comparison among different income group for the district, it can be seen that the income group of Rs.15,000-20,000 has the highest survival rate than the rest, which is even higher than the district survival rate.

2.5.h: The percentage wise distribution of cultivated land in income wise under rubber plantation for the entire income group was also calculated. It was found that the small income group of Rs.5,000-10,000 has the highest percentage of land under rubber cultivation with 41.11 per cent, and the least was found to be from the income group of Rs.20,000-25,000 with 4.44 per cent.

2.5.i: The overall correlation between monthly income of the rubber farmers and survival rate shows a negative relationship with r= -0.15224. However, since the value of correlation(r) is less than the probable error (P.Er=1.2030), there is no evidence of correlation. Moreover, correlations for the entire income group were also examined and found that there is no existence of correlation between average income and survival rate within the group.

Table No.5: Survival Rate (Income-Wise): Wokha.

Category (Rs.)	Monthly Income	Average Monthly Income per H/H	Total Hectare	No. of House hold	Average Size of holding Per H/H	Total Trees Planted	Total Trees Survived	Survival Rate (%)
5000-10000	112000	6588.23	37	17	2.17	15320	14430	94.19
10000-15000	41000	11250	10	4	2.5	4220	3900	92.41
15000-20000	48000	15333	11.5	3	3.83	4840	4600	95.04
20000-25000	42000	21000	4	2	2	1650	1550	93.93
25000-30000	52000	26000	10	2	5	4000	3760	94.00
30000-Above	110000	55000	17.5	2	8.75	7600	7000	92.1
Total	**405000**	**13466**	**90**	**30**	**3**	**37630**	**35240**	**93.64**

Source: Field Survey 2016-17.

2.6: Survival Rate (Income-Wise): Mokokchung. The survival rate of rubber trees by income wise distribution in Mokokchung district is explained in the following table No.6, which shows that the monthly income of the rubber farmers is Rs.3,76,300/- with an average income of income of Rs.12,543. The total area under rubber cultivation in the study area for the district is 54.5 hectares with an average size of holding as 1.81 hectares. In this area of cultivation, a total of 20960 rubber trees were planted, however only19830 rubbers trees survived giving the survival rate for the district at 94.60 percent.

2.6.a: Under the income groups of Rs.5,000-10,000, it shows that the monthly income of the rubber farmers is Rs.1,13,500/- with an average income of Rs.7,093.75. The total area under rubber cultivation in this group is 27.5 hectares with an average size of holding as 1.71 hectares. In this income group, a total of 11010 rubber trees were planted, however only 10420 rubber trees survived giving the survival rate for this group at 94.64 percent.

2.6.b: Under the income groups of Rs.10,000-15,000, it shows that the monthly income of the rubber farmers is Rs.34,000/- with an average income of Rs.11,333. The total area under rubber cultivation is 3.5 hectares with an average size of holding as 1.16 hectares. In this

income group, a total of 1210 rubber trees were planted, however only 1030 rubber trees survived giving the survival rate for the this group at 85.12 per cent.

2.6.c: Under the income group of Rs.15,000-20,000, it clearly shows that the monthly income of the rubber farmers is Rs.61,800/- with an average income of Rs.15,450. The total area under rubber plantation is 6 hectares with an average size of holding as 1.5 hectares. In this income group, a total of 2360 rubber trees were planted, however only 2270 rubber trees survived giving the survival rate for the this group at 96.18 percent.

2.6.e: Under the income group of Rs.20,000-25,000, it clearly shows that the monthly income of the rubber farmers is Rs.1,07,000/- with an average income of Rs.21,400. The total area under rubber plantation is 9.5 hectares with an average size of holding as 1.9 hectares. In this income group, a total of 3480 rubber trees were planted, however only 3360 rubbers trees survived giving the survival rate for this group at 96.55 per cent.

2.6.f: Under the income group of Rs. 25000-30000, it clearly shows that the monthly income of the rubber farmers is Rs.25,000/- with an average income of Rs.25,000. The total area under rubber cultivation in this group is 2 hectares with an average size of holding as 2 hectares. In this income group, a total of 800 rubber trees were planted, however only 750 rubbers trees survived giving the survival rate for the this group at 93.75 per cent.

2.6.g: Under the income group of Rs.30,000-Above, it shows that the average monthly income of the rubber farmers is Rs.35,000/- with an average income of Rs.35,000. The total area under rubber cultivation in this group is 6 hectares with an average size of holding as 6 hectares. In this income group, a total of 2,100 rubber trees were planted, however only 2,000 rubbers trees survived giving the survival rate for the this group at 95.23 per cent.

2.6.h: On comparison among different income group for the district, it was found that the income group of Rs. 20,000-25,000 has the highest survival rate than the rest, which is even higher than the survival rate of the district.

2.6.i: The percentage wise distribution of cultivated land in income wise under rubber plantation for the entire income group was also calculated. It was found that the small income group of Rs.5,000-10,000 has the highest percentage of land under rubber

cultivation with 50.45 per cent, and the least was found to be from the income group of Rs. 20,000-25,000 with 3.66 per cent.

2.6.j: The overall correlation between monthly income of the rubber farmers and survival rate shows a positive relationship with r= 0.168968. However, since the value of correlation(r) is less than the probable error (P.Er=1.196), there is no evidence of correlation. Moreover, correlations for the entire income category were also examined and found that there is no existence of correlation between average income and survival rate within the group.

Table No.6: Survival Rate (Income-Wise): Mokokchung.

Category (Rs.)	Monthly Income	Average Monthly Income	Total Hectare	No. Of House Hold	Average Size of holding Per H/H	Total Trees Planted	Total Trees Survived	Survival Rate (%)
5000-10000	1,13,500	7093	27.5	16	1.71	11010	10420	94.64
10000-15000	34,000	11000	3.5	3	1.16	1210	1030	85.12
15000-20000	61,800	15450	6	4	1.5	2360	2270	96.18
20000-25000	1,07,000	21400	9.5	5	1.9	3480	3360	96.55
25000-30000	25,000	25000	2	1	2	800	750	93.75
30000- Above	35,000	35000	6	1	6	2100	2000	95.23
Total	**3,76,300**	**12510**	**54.5**	**30**	**1.81**	**20960**	**19830**	**94.60**

Source: Field Survey 2016-17.

2.7: Farm Size and Productivity:

The farm size is categorized into four types, Marginal farmers (0-1hectare), Small farmers (1-2 hectare), Medium farmers (2-4 hectare) and large farmers (4-Above hectares). However it was found that there is no marginal farmer under rubber cultivation in the study area. The productivity of rubber sheet in both hectare wise and income wise is explained in detail below. The rubber tree starts yielding at the age of eight year onwards till it attain the age of 31 years. Thus the yielding period of a rubber tree is 24 years. The total production of latex which is converted into smoked rubber sheet and valued in terms of Kg is explained with the help of suitable diagrams. The detailed structures of the rubber farmers according to different farm size with relation to productivity under the study area are discussed below.

Rubber plantations under the study area were not done at the same time as some were planted as an extension after one to three years. Hence all the rubber trees are not tapped in the same year. Therefore, the tables below were categorized into three batches viz. 8-10 Years, 11-31 Years and 32-34 Years. In the first batch majority of the rubber trees

are tapped, The second batch starts tapping after three years from 11-31 Years for a period of 21 years where all the rubber trees in the study area are tapped, and the last batch which were planted as an extension are tapped for a period of 3 Years viz. 32-34 Years.

The rubber trees are tapped for eight months in a year starting from the month of April to November, but some rubber farmers tape from the month of May to December. The total number of days in a year for eight months comes to approximately 240 days. However, the rubber trees are tapped every alternate days, therefore the total number of tapping days in a year comes to 120 days. The total amount of latex collected in a day per rubber tree is 250 ml, as such it will take four days to get one litter of latex which is converted into smoked rubber sheet ready for sell in the market. Again for one Kg. of smoked rubber sheet, it requires four litters of latex. Therefore, it will take 16 days to get one Kg. of smoked rubber sheet where a single rubber tree will produce 7.5 Kgs of rubber sheet per annum.

2.7.1: Farm Size and Productivity: Nagaland.

The total area under rubber cultivation in the study area for the state is 144.5 hectares. As shown in Table No.7, the total production for the state during the whole period of tapping (8-34 years) was 993960 Kgs. of rubber sheet with an average productivity or yield per hectare of 68786.16 Kgs. The total production of natural rubber in the state for the whole tapping period (8-34 Years) for Small farm size is 2660400 Kgs. with an average of 66510 Kgs. per hectare, Medium farm size is 3889800 Kgs with an average of 70086.48 Kgs per hectare and Large size is 3389400 Kgs with an average of 69171.42 Kgs per hectare. On comparison among different farm size in the state for the period 8-34 years, it was found that the medium farm size has the highest yield per hectare than the rest, which is even higher than the yield per hectare in the state. It was also found that the medium farm size has the highest percentage of land under rubber cultivation for the state is and the least was found to be from the small farm size. The overall correlation between size of farming and production of rubber sheet for the State shows a positive relationship with r=0.99. Since the value of r is more than six times the probable error (P.Er=0.0017), the co-efficient of correlation between farm size and productivity is significant which shows that as the size of farm increases, the productivity of rubber also increases. The co-efficient of determinants

on r^2 value shows that 98% of the variation in Production is explained by the farm size X, the regression values of farm size (Y) on Production (X) gave us.

Y= a+bx, Y= -5261.71 + 70915X

The result shows that the regression co-efficient byx is 70915. This explains that a unit change in Farm Size will lead a change in Production by 70915. The p-value of 'byx' is 3.61E-57 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%. *Thus, the hypothesis which states that higher the size of the farm higher is the production has been proved.*

2.7.1.a: *8-10 Years of Tapping:*

The production/yield of rubber sheet in terms of Kg. for the state is well explained in the following table no. 7 below. The total area under rubber cultivation in the study area for the state is 144.5 hectares. In this area of cultivation, a total of 832725 Kgs. of rubber sheet is produced for this period of three years, and the productivity or yield per hectare is 5762 Kgs. for the period. The overall correlation between farm size and production of rubber sheet for the state shows a positive relationship with r=0.99. Since the value of r is more than six times the probable error (P.Er=0.0017), the co-efficient of correlation between farm size and productivity is significant which shows that as the farm size increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 98% of the variation in Production is explained by the farm size X, the regression values of Production (Y) on farm size (X) gave us.

Y= a+bx, Y= -186.515 + 5830.841X

The result shows that the regression co-efficient byx is 5830.841. This explains that a unit change in Farm Size will lead a change in Production by 5830.841. The p-value of 'byx' is 3.286E-50 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

Under small farm size for the state, the total area under rubber plantation in the study area is 40 hectares. The total production under this area for this period of three years is 230625 Kgs. which is converted to smoked rubber sheet and ready for delivery, and the yield per hectare is 5765.63 Kgs for the period. The correlation between farm size and

production of rubber sheet for the State under small farm size shows a positive relationship with r=0.86. Since the value of r is more than six times the probable error (P.Er=0.0320), the co-efficient of correlation between farm size and productivity is significant which shows that as the size of farm increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 74% of the variation in Production is explained by the farm size X, the regression values of Production (Y) on farm size (X) gave us.

Y= a+bx, Y= -4254.74 + 8961.159X

The result shows that the regression co-efficient byx is 8961.159. This explains that a unit change in Farm Size will lead a change in Production by 8961.159. The p-value of 'byx' is 1.63E-09 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

Under Medium farm size for the state, the total area under rubber plantation in the study area is 55.5 hectares. The total production under this area for this period of three years is 323100 Kgs. which is converted into smoked rubber sheet and ready for delivery, and the yield per hectare is 5821.62 Kgs. for the period. The correlation between size of farming per hectare and production of rubber sheet for the State shows a positive relationship with r=0.82. Since the value of r is more than six times the probable error (P.Er=0.0474), the co-efficient of correlation between farm size and productivity is significant which shows that as the size of farm increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 67% of the variation in Production is explained by the farm size X, the regression values of Production(Y) on farm size(X) gave us.

Y= a+bx, Y= 1423.089 + 5235.191X

The result shows that the regression co-efficient byx is 5235.191. This explains that a unit change in Farm Size will lead a change in Production by 5235.191. The p-value of 'byx' is 441E-06 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

Under Large farm size for the state, the total area under rubber plantation in the study area is 49 hectares. The total production under this area for this period of three years is 2,79,000 Kgs. which is converted to smoked rubber sheet and ready for delivery, and the yield per hectare for the same period is 5693.88 Kgs. The correlation between size of

farming per hectare and production of rubber sheet for the State shows a positive relationship with r=0.99. Since the value of r is more than six times the probable error (P.Er=0.0047), the co-efficient of correlation between farm size and productivity is significant which shows that as the size of farm increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 98% of the variation in Production is explained by the farm size X, the regression values of Production (Y) on farm size (X) gave us.

Y= a+bx, Y= -2172.41 + 6037.931X

The result shows that the regression co-efficient byx is 6037.931. This explains that a unit change in Farm Size will lead a change in Production by 6037.931. The p-value of 'byx' is 2.98E-06 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

On comparison among different farm size in the state for the period 8-10 years, it was found that the medium farm size has the highest yield per hectare than the rest, which is even higher than the yield per hectare in the state. The percentage wise distribution of cultivated land in hectare wise under rubber plantation for the entire farm size for the period 8-10 Years was also calculated and found that the medium farm size has the highest percentage of land under rubber cultivation with 38.40 per cent, and the least was found to be from the small farm size with 27.68 per cent.

2.7.1.b: 11-31 years:

At this stage, all the standing rubber tree starts tapping and a total of 8697150 Kgs. of rubber sheet is produced for this period of 21 years, and the productivity or yield per hectare for the same period is 60187 Kgs. The overall correlation between farm size and production of rubber sheet for the State shows a positive relationship with r=0.99. Since the value of r is more than six times the probable error (P.Er=0.0017), the co-efficient of correlation between farm size and productivity is significant which shows that as the farm size increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 98% of the variation in Production is explained by the farm size X, the regression values of Production(Y) on farm size(X) gave us.

Y= a+bx, Y= -186.515+ 5830.841X

The result shows that the regression co-efficient byx is 5830.841. This explains that a unit change in Farm Size will lead a change in Production by 5830.841. The p-value of 'byx' is 3.28E-50 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%

Under Small farm size for the state, the total area under rubber plantation in the study area is 40 hectares. The total production under this area for this period of 21 years is 2327850 Kgs. which is converted to smoked rubber sheet and ready for delivery, and the yield per hectare for the same period is 58196 Kgs. The correlation between farm size and production of rubber sheet for the State shows a positive relationship with r=0.86. Since the value of r is more than six times the probable error (P.Er=0.0320), the co-efficient of correlation between farm size and productivity is significant which shows that as the size of farm increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 74% of the variation in Production is explained by the farm size X, the regression values of Production (Y) on farm size (X) gave us.

Y= a+bx, Y= -11442.9+ 66628.39X

The result shows that the regression co-efficient byx is 66628.39. This explains that a unit change in Farm Size will lead a change in Production by 66628.39. The p-value of 'byx' is 1.87E-09 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

Under Medium farm size for the state, the total area under rubber plantation in the study area is 55.5 hectares. The total production under this area for this period of 21 years is 3403575 Kgs. which is converted to smoked rubber sheet and ready for delivery, and the yield per hectare for the same period is 61325 Kgs. The correlation between farm size and production of rubber sheet for the State shows a positive relationship with r=0.89. Since the value of r is more than six times the probable error (P.Er=0.0287), the co-efficient of correlation between farm size and productivity is significant which shows that as the farm size increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 80% of the variation in Production is explained by the farm size X, the regression values of Production(Y) on farm size(X) gave us.

Y= a+bx, Y= 18007.17+ 54111.78X

The result shows that the regression co-efficient byx is 54111.78. This explains that a unit change in Farm Size will lead a change in Production by 54111.78. The p-value of 'byx' is 3.22E-08 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

Under Large farm size for the state, the total area under rubber plantation in the study area is 49 hectares. The total production under this area for this period of 21 years is 2965725 Kgs. which is converted to smoked rubber sheet and ready for delivery, and the yield per hectare for the same period is 60525 Kgs. The overall correlation between farm size and production of rubber sheet for the State shows a positive relationship with r=0.99. Since the value of r is more than six times the probable error (P.Er=0.0047), the co-efficient of correlation between farm size and productivity is significant which shows that as the size of farm increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 98% of the variation in Production is explained by the farm size X the regression values of Production (Y) on farm size (X) gave us.

Y= a+bx, Y= -2172.41 + 6037.931X

The result shows that the regression co-efficient byx is 6037.931. This explains that a unit change in Farm Size will lead a change in Production by 6037.931. The p-value of 'byx' is 2.98E-06 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

On comparison among different farm size for the state for the period 11-31 years, it was found that the medium farm size has the highest yield per hectare than the rest, which is even higher than the yield per hectare of the state. The percentage wise distribution of cultivated land in hectare wise under rubber plantation for the entire farm size for the period 11-31 years, was also calculated and found that the medium farm size has the highest percentage of land under rubber cultivation with 38.40 per cent, and the least was found to be from the small farm size with 27.68 per cent.

2.7.1.c: From 32-34 Years.

At this stage, all the rubber tree will stop tapping except for the only rubber trees which was planted as an extension are tapped for three more years i.e 32-34 years, and a total of 409725 Kgs. of rubber sheet is produced for the period with an average productivity or yield per hectare of 2835 Kgs. The overall correlation between farm size and production

of rubber sheet for the State shows a positive relationship with r=0.96. Since the value of r is more than six times the probable error (P.Er=0.0061), the co-efficient of correlation between farm size and productivity is significant which shows that as the farm size increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 93% of the variation in Production is explained by the farm size X, the regression values of Production (Y) on farm size (X) gave us.

Y= a+bx, Y= -4603.99+ 62051.31X

The result shows that the regression co-efficient byx is 62051.31. This explains that a unit change in Farm Size will lead a change in Production by 62051.31. The p-value of 'byx' is 3.61E-57 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%

Under Small farm size for the state, the total production under this area for this period of 3 years is 101925 Kgs. which is converted to smoked rubber sheet and ready for delivery, and the yield per hectare for the same period is 2548 Kgs. The correlation co-efficient is .15 which is not significant. Therefore, we reject the hypothesis stating that higher the farm size higher is the production in case of small farm size in the State.

Under Medium farm size for the state, the total production under this area for this period of 3 years is163125 Kgs. which is converted to smoked rubber sheet and ready for delivery, and the yield per hectare for the same period is 2939 Kgs. The correlation between farm size and production of rubber sheet for the State under medium farm size shows a positive relationship with r=0.56. Since the value of r is more than six times the probable error (P.Er=0.0992), the co-efficient of correlation between farm size and productivity is significant which shows that as the size of farm increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 31% of the variation in Production is explained by the farm size X, the regression values of Production (Y) on farm size (X) gave us.

Y= a+bx, Y= 1149.363 + 2495.064X

The result shows that the regression co-efficient byx is 2495.064. This explains that a unit change in farm size will lead a change in Production by 2495.064. The p-value of 'byx' is 0.008183 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

Under Large farm size for the state, the total production under this area for this period of 3 years is144675 Kgs. which is converted to smoked rubber sheet and ready for delivery, and the yield per hectare for the same period is 2952 Kgs. The correlation between farm size and production of rubber sheet for the State under large size of holding shows a positive relationship with r=0.95. Since the value of r is more than six times the probable error (P.Er=0.0023), the co-efficient of correlation between farm size and productivity is significant which shows that as the farm size increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 90 percent of the variation in Production is explained by the farm size X, the regression values of Production (Y) on farm size (X) gave us.

$$Y= a+bx, \qquad Y= -411.207+ 3028.966X.$$

The result shows that the regression co-efficient byx is 3028.966. This explains that a unit change in Farm Size will lead a change in Production by 3028.966. The p-value of 'byx' is 0.000204 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

On comparison among different farm size for the state for the period 32-34 years, it was found that the large farm size has the highest yield per hectare than the rest, which is even higher than the yield per hectare of the state. The percentage wise distribution of cultivated land in hectare wise under rubber plantation for the entire farm for the period 32-34 years, was also calculated and found that the medium farm size has the highest percentage of land under rubber cultivation with 38.40 per cent, and the least was found to be from the small farm size with 27.68 per cent.

2.7.2: Farm Size and Productivity: Wokha.

The total area under rubber cultivation in the study area for the district is 90 hectares. As clearly shown in Table No.8, the total production for the district during the whole period of tapping (8-34 years) is 6343200 Kgs. of rubber sheet with an average productivity or yield per hectare of 70480 Kgs. The total production of natural rubber in the district for the whole tapping period (8-34 Years) for Small farm size is 1011600 Kgs with an average of 67440 Kgs per hectare, Medium farm size is 2608200 Kgs with an average of 71457.53 Kgs per hectare and Large size is 2723400 Kgs with an average of 70737.66 Kgs per

hectare. On comparison among different farm size in the district for the period 8-34 years, it was found that the medium farm size has the highest yield per hectare than the rest, which is even higher than the yield per hectare in the district. It was also found that the large farm size has the highest percentage of land under rubber cultivation for the district is and the least was found to be from the small farm size.

The overall correlation between farm size and production of rubber sheet for the district shows a positive relationship with r=0.99. Since the value of r is more than six times the probable error (P.Er=0.002), the co-efficient of correlation between farm size and productivity is significant which shows that as the farm size increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 98% of the variation in Production is explained by the farm size X, the regression values of farm size (Y) on Production (X) gave us.

$$Y= a+bx, \qquad Y= -3348.06 + 71596.02X$$

The result shows that the regression co-efficient byx is 71596.02. This explains that a unit change in Farm Size will lead a change in Production by 71596.02. The p-value of 'byx' is 7.36E-31 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%. *Thus, the hypothesis which states that higher the size of the farm higher is the production has been proved.*

2.7.2.a: ***8-10 Years of Tapping:***

The production of rubber sheet in terms of Kg. for the district is well explained in the following table no. 8. The total area under rubber cultivation in the study area for the district is 90 hectares. In this area of cultivation for the period of 3 Years i.e 8-10 Years, a total of 528975 Kgs. of rubber sheet is produced, and the productivity or yield per hectare is 5877.50 Kgs. for the period. The overall correlation between farm size and production of rubber sheet for the district shows a positive relationship with r=0.99. Since the value of r is more than six times the probable error (P.Er=0.0024), the co-efficient of correlation between farm size and productivity is significant which shows that as the farm size increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 98% of the variation in Production is explained by the farm size X, the regression values of Production (Y) on farm size (X) gave us.

Y= a+bx, Y= 310.7791 + 5762.427X

The result shows that the regression co-efficient byx is 5762.427. This explains that a unit change in Farm Size will lead a change in Production by 5762.427. The p-value of 'byx' is 9.94E-25 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

Under small farm size of holding for the district, the total area under rubber cultivation in this study area is 15 hectares. In this area of cultivation, a total of 93375 Kgs is produced and the productivity or yield per hectare is 6225 Kgs for the period. Since the correlation co-efficient is not significant, we reject the hypothesis stating that higher the farm size higher is the Production in case of small farm size in the district.

Under medium farm size for the district, the total area under rubber cultivation in this study area is 36.5 hectares. In this area of cultivation, a total of 217350 Kgs of rubber sheet is produced for the period of three years and the productivity or yield per hectare is 5954.79 Kgs for the period. The correlation between farm size and production of rubber sheet for the district under medium farm size shows a positive relationship with r=0.74. Since the value of r is more than six times the probable error (P.Er=0.0856), the co-efficient of correlation between farm size and productivity is significant which shows that as the farm

size increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 53% of the variation in Production is explained by the farm size X, the regression values of Production (Y) on farm size (X) gave us.

Y= a+bx, Y= 5275 + 3912.5X

The result shows that the regression co-efficient byx is 3912.5. This explains that a unit change in Farm Size will lead a change in Production by 3912.5. The p-value of 'byx' is 0.00468 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

Under large farm size for the district, the total area under rubber cultivation in this study area is 6 hectares. In this area of cultivation, a total of 218250 Kgs of rubber sheet is produced for the period and the productivity or yield per hectare for the period is 5668.83 Kgs. The correlation between farm size and production of rubber sheet for the district shows a positive relationship with r=0.99. Since the value of r is more than six times the probable error (P.Er=0.9955), the co-efficient of correlation between farm size and productivity is significant which shows that as the farm increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 98% of the variation in Production is explained by the farm size X, the regression values of Production (Y) on farm size (X) gave us.

Y= a+bx, Y= -2866.07+ 6089.286X

The result shows that the regression co-efficient byx is 6089.286. This explains that a unit change in Farm Size will lead a change in Production by 6089.286. The p-value of 'byx' is 0.000709 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

On comparison among different farm size in the district for the period 8-10 years, it was found that the medium farm size has the highest yield per hectare than the rest, which is even higher than the yield per hectare of the state. The percentage wise distribution of cultivated land in hectare wise under rubber plantation for the entire farm size in the district for the period 8-10 years, was also calculated and found that the large farm size has the highest percentage of land under rubber cultivation with 42.77 per cent, and the least was found with the small farm size with 16.6 per cent.

2.7.2.b: ***11-31 Years of Tapping:***

At this stage, all the standing rubber tree are tapped and a total of 55,50,300 Kgs of rubber sheet is produced for the period of 21 years, and the productivity or yield per hectare for the same period is 61670 Kgs. The overall correlation between farm size and production of rubber sheet for the district shows a positive relationship with r=0.99. Since the value of r is more than six times the probable error (P.Er=0.0012), the co-efficient of correlation between farm size and productivity is significant which shows that as the farm increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 99% of the variation in Production is explained by the farm size X, the regression values of Production (Y) on farm size (X) gave us.

Y= a+bx, Y= -3092.08 + 62656.8X

The result shows that the regression co-efficient byx is 62656.8. This explains that a unit change in Farm Size will lead a change in Production by -62656.8. The p-value of 'byx' is 8.19E-30 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

Under small farm size for the district, a total of 5620 rubber trees are tapped and a total of 885150 Kgs. of rubber sheet is produced, and the productivity or yield per hectare is 59010 kgs for the period. Since the correlation co-efficient is not significant, we reject the hypothesis stating that higher the farm size, higher is the Production in case of small farm size in the district.

Under medium farm size for the district, a total of 14490 rubber trees are tapped and a total of 2282175 Kgs of rubber sheet is produced for the period and the productivity or yield per hectare is 62525 Kgs for the same period. The correlation between farm size and production of rubber sheet for the district under medium farm size shows a positive relationship with r=0.87. Since the value of r is more than six times the probable error (P.Er=0.0432), the co-efficient of correlation between farm size and productivity is significant which shows that as the farm size increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 76% of the variation in Production is explained by the farm size X, the regression values of Production (Y) on farm size (X) gave us.

Y= a+bx, Y= 53666.7+ 41970.8X

The result shows that the regression co-efficient byx is 41970.8. This explains that a unit change in Farm Size will lead a change in Production by 41970.8. The p-value of 'byx' is 8.5E-05 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

Under large farm size for the district, a total of 15130 rubber trees are tapped and a total of 2382975 Kgs of rubber sheet is produced and the productivity or yield per hectare is 61895.45 Kgs for the period. The correlation between farm size and production of rubber sheet for the district under large farm size shows a positive relationship with r=0.99. Since the value of r is more than six times the probable error (P.Er=0.0027), the co-efficient of correlation between farm size and productivity is significant which shows that as the farm size increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 99% of the variation in Production is explained by the farm size X, the regression values of Production (Y) on farm size (X) gave us.

Y= a+bx, Y= -5268.75+ 629875X

The result shows that the regression co-efficient byx is 629875. This explains that a unit change in Farm Size will lead a change in Production by 629875. The p-value of 'byx' is 0.000212 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

On comparison among different farm size in the district for the period 11-31 years, it can be seen that the medium farm size has the highest yield per hectare than the rest, which is even higher than the yield per hectare of the district. The percentage wise distribution of cultivated land in hectare wise under rubber plantation for the entire farm size in the district for the period 11-31 years, was also calculated and found that the large farm size has the highest percentage of land under rubber cultivation with 42.77 per cent, and the least was found to be from the small farm size with 16.6 per cent.

2.7.2.c: ***From 32-34 Years.***

At this stage, only rubber trees which were planted as an extension are tapped for another period of three years and a total of 11730 rubber trees are tapped which produces 263925 Kgs of rubber sheet with an average productivity of 2932.50 Kgs per hectare for the period. The overall correlation between farm size and production of rubber sheet for the district shows a positive relationship with r=0.98. Since the value of r is more than six times

the probable error (P.Er=0.0049), the co-efficient of correlation between farm size and productivity is significant which shows that as the farm size increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 96% of the variation in Production is explained by the farm size X, the regression values of Production (Y) on farm size (X) gave us.

Y= a+bx, Y= -752.505+ 3188.544X

The result shows that the regression co-efficient byx is 3188.544. This explains that a unit change in Farm Size will lead a change in Production by 3188.544. The p-value of 'byx' is 1.24E-20 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

Under small farm size for the district, a total 1470 rubber trees are tapped and a total of 33075 Kgs of rubber sheet is produced, and the productivity or yield per hectare for the period is 2205 kgs. Since the correlation co-efficient is not significant, we reject the hypothesis stating that higher the farm size, higher is the Production in case of small farm size in the district.

Under medium farm size for the district, a total of 4830 rubber trees are tapped and a total of 108675 Kgs of rubber sheet is produced for the period and the productivity or yield per hectare for the period is 2977.40 Kgs. Since the correlation co-efficient is not significant, we reject the hypothesis stating that higher the farm size higher is the Production in case of Medium farm size in the district.

Under large farm size for the district, a total of 5430 rubber trees are tapped and a total of 122175 Kgs of rubber sheet is produced and the productivity or yield per hectare is 3173.38 Kgs for the period. The correlation between farm size and production of rubber sheet for the district shows a positive relationship with r=0.98. Since the value of r is more than six times the probable error (P.Er=0.0110), the co-efficient of correlation between farm size and productivity is significant which shows that as the size of farm increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 96% of the variation in Production is explained by the farm size X , the regression values of Production (Y) on farm size (X) gave us.

Y= a+bx, Y= 2113.393+ 2908.929X

The result shows that the regression co-efficient byx is 2908.929. This explains that a unit change in Farm Size will lead a change in Production by 2908.929. The p-value of 'byx' is 0.002231 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

On comparison among different farm size in the district for the period 32-34 Years, it was found that the large farm size has the highest yield per hectare than the rest which is even higher than the district average. The percentage wise distribution of cultivated land in hectare wise under rubber plantation for the entire farm size in the district for the period 32-34 Years, was also calculated and found that the large farm size has the highest percentage of land under rubber cultivation with 42.77 per cent, and the least was found to be from the small farm size with 16.6 per cent.

2.7.3: Farm Size and Productivity: Mokokchung.

The total area under rubber cultivation in the study area for Mokokchung district is 54.5 hectares. As shown in Table No.9, the total production for the district during the whole period of tapping (8-34 years) was 3596400 Kgs of rubber sheet with an average productivity or yield per hectare of 65989 Kgs. The total production of natural rubber in the district for the whole tapping period (8-34 Years) for small farm size is 1648800 Kgs with an average of 65952 Kgs per hectare, medium farm size is 1281600 Kgs with an average of 67452.63 Kgs per hectare, large size is 666000 Kgs with an average of 63428.57 Kgs per hectare. On comparison among different farm size in the district for the period 8-34 years, it was found that the medium farm size has the highest yield per hectare than the rest, which is even higher than the yield per hectare in the district. It was also found that the small farm size has the highest percentage of land under rubber cultivation for the district and the least was found to be from the large farm size

The overall correlation between farm size and production of rubber sheet for the district shows a positive relationship with r=0.98. Since the value of r is more than six times the probable error (P.Er=0.0036), the co-efficient of correlation between farm size and productivity is significant which shows that as the farm size increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 97% of the variation in Production is explained by the farm size X, the regression values of farm size (Y) on Production (X) gave us.

$$Y = a+bx, \qquad Y = 4361.55 + 63588.1X$$

The result shows that the regression co-efficient byx is 63588.1. This explains that a unit change in Farm Size will lead a change in Production by 63588.1. The p-value of 'byx' is 2.4E-24 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%. *Thus, the hypothesis which states that higher the size of the farm higher is the production has been proved.*

2.7.3.a: ***8-10 Years of tapping.***

The production/yield of rubber sheet in terms of Kgs for a period of three years in the district is well explained in the following table no. 9 below. The total area under rubber cultivation in the study area for the state is 54.5 hectares. In this area of cultivation, a total of 13500 rubber trees are being tapped, and a total of 303750 Kgs of rubber sheet is produced, and the productivity or yield per hectare is 5573.39 Kgs for the period. The overall correlation between farm size and production of rubber sheet for the district shows a positive relationship with r=0.98. Since the value of r is more than six times the probable error (P.Er=0.0049), the co-efficient of correlation between farm size and productivity is significant which shows that as the farm size increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 96% of the variation in Production is explained by the farm size X, the regression values of Production (Y) on farm size (X) gave us.

$$Y = a+bx, \qquad Y = -555.407 + 5894.52X$$

The result shows that the regression co-efficient byx is 5894.52. This explains that a unit change in Farm Size will lead a change in Production by 5894.52. The p-value of 'byx' is 9.66E-22 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

Under small farm size for the district, the total area under rubber cultivation in this study area is 25 hectares. In this area of cultivation, a total of 6100 rubber trees are being tapped and a total of 137250 Kgs of rubber sheet is produced, and the productivity or yield per hectare is 5490 Kgs for the period. The correlation between size of farming and production of rubber sheet for the district shows a positive relationship with r=0.90. Since the value of r is more than six times the probable error (P.Er=0.0286), the co-efficient of correlation

between farm size and productivity is significant which shows that as the farm size increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 81% of the variation in Production is explained by the farm size X , the regression values of Production(Y) on farm size(X) gave us.

Y= a+bx, Y= -3750+ 8500X

The result shows that the regression co-efficient byx is 8500. This explains that a unit change in Farm Size will lead a change in Production by 8500. The p-value of 'byx' is 1.36E-07 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

Under medium farm size for the district, the total area under rubber cultivation in this study area is 19 hectares. In this area of cultivation, a total of 4700 rubber trees are being tapped and a total of 105750 Kgs of rubber sheet is produced, and the productivity or yield per hectare is 5565.79 Kgs for the period.

Under large farm size for the district, the total area under rubber cultivation in this study area is 10.5 hectares. In this area of cultivation, a total of 2700 rubber trees are being tapped and a total of 60750 Kgs of rubber sheet is produced, and the productivity or yield per hectare is 5785.71 Kgs for the period.

Since the farm size for both medium and large is too small for calculating correlation and regression, both medium Size and Large Size is combined for the purpose of calculating correlation and regression. The correlation between farm size and production of rubber sheet for the district shows a positive relationship with r=0.99. Since the value of r is more than six times the probable error (P.Er=0.0021), the co-efficient of correlation between farm size and productivity is significant which shows that as the farm size increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 99% of the variation in Production is explained by the farm size X, the regression values of Production(Y) on farm size(X) gave us.

Y= a+bx, Y= -169.355+ 5806.452X

The result shows that the regression co-efficient byx is 5806.452. This explains that a unit change in Farm Size will lead a change in Production by 5806.452. The p-value of 'byx' is 61.04E-08 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

On comparison among different farm size in the district for the period 8-10 Years, it was found that the large farm size has the highest yield per hectare than the rest, which is even higher than the yield per hectare of the district. The percentage wise distribution of cultivated land in hectare wise under rubber plantation for the entire farm size in the district for the period 8-10 Years, was also calculated and found that the small farm size has the highest percentage of land under rubber cultivation with 45.87 per cent, and the least was found within the large farm size with 19.26 per cent.

2.7.3.b: ***11-31 Years of Tapping:***

Under this period all the standing rubber trees are tapped and the total area under rubber cultivation in the study area for the district is 54.5 hectares where a total of 19980 rubber trees are tapped and a total of 3146850 Kgs. of rubber sheet is produced with an average productivity per hectare of 57740.37 Kgs. for the period. The overall correlation between farm size and production of rubber sheet for the district shows a positive relationship with r=0.98. Since the value of r is more than six times the probable error (P.Er=0.0036), the co-efficient of correlation between farm size and productivity is significant which shows that as the farm size increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 97% of the variation in Production is explained by the farm size X, the regression values of Production (Y) on farm size (X) gave us.

Y= a+bx, Y= 4155.571+ 55536.7X

The result shows that the regression co-efficient byx is 55536.7. This explains that a unit change in Farm Size will lead a change in Production by 55536.7. The p-value of 'byx' is 2.14E-24 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

Under small farm size for the district, the total area under rubber cultivation in this study area is 25 hectares. In this area of cultivation, a total of 9160 rubber trees are tapped and a total of 1442700 Kg. of rubber sheet is produced, and the productivity or yield per hectare

is 57708 Kgs for the period. The correlation between farm size and production of rubber sheet for the district under small farm size shows a positive relationship with r=0.91. Since the value of r is more than six times the probable error (P.Er=0.0224), the co-efficient of correlation between farm size and productivity is significant which shows that as the farm size increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 84% of the variation in Production is explained by the farm size X, the regression values of Production(Y) on farm size(X) gave us.

Y= a+bx, Y= -12075 + 67375X

The result shows that the regression co-efficient byx is 67375. This explains that a unit change in Farm Size will lead a change in Production by 67375. The p-value of 'byx' is 2.79E-08 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

Under medium farm size for the district, the total area under rubber cultivation in this study area is 19 hectares. In this area of cultivation, a total of 7120 rubber trees are tapped and a total of 1121400 Kgs of rubber sheet is produced, and the productivity or yield per hectare is 59021.05 Kgs for the period.

Under large farm size for the district, the total area under rubber cultivation in this study area is 10.5 hectares. In this area of cultivation, a total of 3700 rubber trees are tapped and a total of 582750 Kgs of rubber sheet is produced, and the productivity or yield per hectare is 55500 Kgs for the period.

Since the Farm Size for both medium and large is too small for calculating correlation and regression, both Medium Farm Size and Large Farm Size is combined for the purpose calculating correlation and regression. The correlation between farm size and production of rubber sheet for the district shows a positive relationship with r=0.98. Since the value of r is more than six times the probable error (P.Er=0.0063), the co-efficient of correlation between farm size and productivity is significant which shows that as the farm size increases, the productivity of rubber also increases..The co-efficient of determinants on r^2 value shows that 97% of the variation in Production is explained by the farm size X, the regression values of Production (Y) on farm size (X) gave us.

Y= a+bx, Y= 14705.65 + 52381.45X

The result shows that the regression co-efficient byx is 52381.45. This explains that a unit change in Farm Size will lead a change in Production by 52381.45. The p-value of 'byx' is 7.42E-07 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

On comparison among different farm size in the district for the period 11-31 Years, it was found that the medium farm size has the highest yield per hectare than the rest, which is even higher than the yield per hectare of the district. The percentage wise distribution of cultivated land in hectare wise under rubber plantation for the entire farm size in the district for the period 11-31 Years, was also calculated and found that the small farm size has the highest percentage of land under rubber cultivation with 45.87 per cent, and the least was found to be within the large farm size with 19.26 per cent.

2.7.3.c: *32-34 Years of Tapping:*

At this stage, only rubber trees which were planted as an extension after three years are tapped and the total area under rubber cultivation for the district is 54.5 hectares. In this area of cultivation, a total of 6480 rubber trees are tapped and a total of 145800 Kgs of rubber sheet is produced, and the productivity or yield per hectare is 2675 Kgs for the period. The overall correlation between farm size and production of rubber sheet for the district shows a positive relationship with r=0.86. Since the value of r is more than six times the probable error (P.Er=0.0320), the co-efficient of correlation between farm size and productivity is significant which shows that as the farm size increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 74% of the variation in Production is explained by the farm size X, the regression values of Production(Y) on farm size(X) gave us.

Y= a+bx, Y= 1149.06 + 2039.294X

The result shows that the regression co-efficient byx is 2039.294. This explains that a unit change in Farm Size will lead a change in Production by2039.294. The p-value of 'byx' is 1.77E-09 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

Under small farm size for the district, the total area under rubber cultivation in this study area is 25 hectares. In this area of cultivation, a total of 3060 rubber trees are tapped and a total of 68850 Kgs of rubber sheet is produced, and the productivity or yield per

hectare is 2754 Kgs for the period. Since the correlation co-efficient is not significant, we reject the hypothesis stating that higher the farm size higher is the production of rubber sheet in case of small farm size in the district.

Under medium farm size for the district, the total area under rubber cultivation is 19 hectares and a total of 2420 rubber trees are tapped where a total of 54450 Kg. of rubber sheet is produced, and the productivity or yield per hectare is 2866 Kg. for the period.

Under large farm size for the district, the total area under rubber cultivation is 10.5 hectares. In this area of cultivation, a total of 1000 rubber trees are tapped and a total of 22500 Kg of rubber sheet is produced with the productivity or yield per hectare for the period is 2143 kgs.

Since the Farm Size for both medium and large is too small for calculating correlation and regression, both Medium Farm Size and Large Farm Size is combined for the purpose calculating correlation and regression. The correlation between farm size and production of rubber sheet for both medium and Large farm Size for the district shows a positive relationship with r=0.90. Since the value of r is more than six times the probable error (P.Er=0.0405), the co-efficient of correlation between farm size and productivity is significant which shows that as the farm size increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 0.81 percent of the variation in Production is explained by the farm size X, the regression values of Production (Y) on farm size (X) gave us.

$$Y = a + bx, \qquad Y = 2270.161 + 1676.613X$$

The result shows that the regression co-efficient byx is 1676.613. This explains that a unit change in Farm Size will lead a change in Production by 1676.613. The p-value of 'byx' is 0.000912 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

On comparison among different farm size for the district for the period 32-34 Years, it was found that the medium farm size has the highest yield per hectare than the rest, which is even higher than the yield per hectare of the district. The percentage wise distribution of cultivated land in hectare wise under rubber plantation for the entire farm size for the period 32-34 Years was also calculated and found that the small farm size has

the highest percentage of land under rubber cultivation with 45.87 per cent, and the least was found to be within the large farm size with 19.26 per cent.

Table No.7: Farm size and productivity: Nagaland.

			8-10 Years			11-31 Years			32-34 Years				
Size of Holding	Total hectare	Total trees	Total trees tapping	Total production	Average Production	Total trees tapping	Total production	Average Production	Total trees tapping	Total production	Average Production	Total production(in kgs) From 8-34 Years	Average production/productivity per hectare (8-34 years)
Small	40	14780	10250	230625	5765.63	14780	2327850	58196	4530	101925	2548	2660400	**66510**
Medium	55.5	21610	14360	323100	5821.62	21610	3403575	61325	7250	163125	2939	3889800	**70086.48**
Large	49	18830	12400	279000	5693.88	18830	2965725	60525	6430	144675	2952	3389400	**69171.42**
Total	**144.5**	**55220**	**37010**	**832725**	**5762.80**	**55220**	**8697150**	**60187**	**18210**	**409725**	**2835**	**9939600**	**68786.16**

Source: Field Survey 2016-2017.

Table No.8: Farm Size and Productivity: Wokha.

	8-10 Years	**11-31 Years**	**32-34 Years**		

Size of Holding	Total hectare	Total trees	Total trees tapping	Total Production	Average Production	Total trees tapping	Total Production	Average Production	Total trees tapping	Total Production	Average Production	Total production(in kgs) From 8-34 Years	Average production(in kgs) From 8-34 Years
Small	15	5620	4150	93375	6225	5620	885150	59010	1470	33075	2205	1011600	67440
Medium	36.5	14490	9660	217350	5954.79	14490	2282175	62525.34	4830	108675	2977	2608200	71457.53
Large	38.5	15130	9700	218250	5668.83	15130	2382975	61895.45	5430	122175	3173	2723400	70737.66
Total	**90**	**35240**	**23510**	**528975**	**5877.50**	**35240**	**5550300**	**61670**	**11730**	**263925**	**2932**	**6343200**	70480

Source: Field Survey 2016-2017.

Table No.9: Farm Size and Productivity: Mokokchung.

Hectare Wise	8-10 Years	11-31 Years	32-34 Years		

Size of Holding	Total hectare	Total trees	Total trees tapping	Total Production	Average Production	Total trees tapping	Total Production	Average Production	Total trees tapping	Total Production	Average Production	Total production(in kgs) From 8-34 Years	Average production(in kgs) From 8-34 Years
Small	25	9160	6100	137250	5490	9160	1442700	57708	3060	68850	2754	1648800	65952
Medium	19	7120	4700	105750	5565.79	7120	1121400	59021.05	2420	54450	2866	1281600	67452.63
Large	10.5	3700	2700	60750	5785.71	3700	582750	55500	1000	22500	2143	666000	63428.57
Total	**54.5**	**19980**	**13500**	**303750**	**5573.39**	**19980**	**3146850**	**57740.37**	**6480**	**145800**	**2675**	**3596400**	65988.99

Source: Field Survey 2016-2017.

2.8: Farm size and productivity (Income Wise):

The detailed structures of the sample farm of the rubber farmers according to income groups with relation to productivity under the study area are discussed below.

2.8.1: Farm Size and Productivity (Income-Wise): Nagaland.

The total area under rubber cultivation in the study area for the state is 144.5 hectares and the total monthly income for the rubber farmers in the state is Rs.781300 with average monthly income of Rs. 13021.67 per household. The total production of rubber sheet under the study area for the state from 8-34 Years is 9939600 Kgs. with an average productivity of 68786.16 Kgs. per annum for the period. The overall correlation between farm size and income of rubber farmers shows a positive relationship with r=0.87. Since the value of r is more than six times the probable error (P.Er=0.0209), the co-efficient of correlation between farm size and income is significant which shows that as income increases, the farm size also increases. The co-efficient of determinants on r^2 value shows that 76% of the variation in farm size is explained by the income X, the regression values of size of holding (Y) on income (X) gave us.

Y= a+bx, Y= -16.78647+ 0.000313X

The result shows that the regression co-efficient byx is 0.000313. This explains that a unit change in income will lead a change in farm size by 0.000313. The p-value of 'byx' is 0.022107 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%. *Thus, the hypothesis which states that higher income tends to have higher farm size has been proved*.

On comparison among different income group in the state for the period 8-34 years, it was found that the income group of Rs.15,000-20,000 has the highest yield per hectare than the rest, which is even higher than the yield per hectare in the district. It was also found that the highest percentage of land under rubber cultivation for the state is within the income group of Rs.5,000-10,000 and the least was found to be from the income group of Rs. 25000- 30,000.

2.8.1.a: *8-10 Years of tapping:*

The production of rubber sheet in terms of Kg. for a period of three years in the state is well explained in the following Table No.10, the total area under rubber cultivation in the study area for the state is 144.5 hectares. In this area of cultivation, a total of 832725 Kgs. of rubber sheet is produced from a total of 37010 rubber trees with an average productivity or yield per hectare of 5762.80 Kgs. for the period.

Under the category of Rs.5,000-10,000 income group, the total area under rubber cultivation is 64.5 hectares. In this area of cultivation, a total of 382725 Kgs. of rubber sheet is produced from a total of 17010 rubber trees, with an average productivity/yield per hectare of 5933.72 Kgs. for the period.

Under the category of Rs.10,000-15,000 income group, the total area under rubber cultivation in the study area is 13.5 hectares. In this area of cultivation, a total of 75375 Kgs. of rubber sheet is produced from a total of 3350 rubber trees, with an average productivity/yield per hectare is 5583.33 Kgs. for the period.

Under the category of Rs.15,000-20,000 income group, the total area under rubber cultivation in the study area is 17.5 hectares. In this area of cultivation, a total of 100125 Kgs. of rubber sheet is produced from 4450 rubber trees, with an average productivity/yield per hectare is 5721.42 Kgs. for the period.

Under the category of Rs.20,000-25,000 income group, the total area under rubber cultivation in the study area is 13.5 hectares. In this area of cultivation, a total of 74,250 Kgs. of rubber sheet is produced from 3300 rubber trees, with an average productivity/yield per hectare of 5,500 kgs. for the period.

Under the category Rs.25,000-30,000 income group, the total area under rubber cultivation in the study area for this group is 12 hectares. In this area of cultivation, a total of 60750 Kgs. of rubber sheet is produced from 2700 rubber trees, and the average productivity/yield per hectare is 5062.50 Kgs. for the period.

Under the category 30,000-Above income group, the total area under rubber cultivation in the study area is 23.5 hectares. In this area of cultivation, a total of 139500 Kgs. of rubber sheet is produced from 6200 rubber trees, and the average productivity/yield per hectare is 5936.17 Kgs. for the period.

On comparison among different income group in the state for the period 8-10 Years, it was found that the income group of Rs.30,000-Above has the highest yield per hectare than the rest, which is even higher than the yield per hectare of the state.\

The percentage wise distribution of cultivated land under rubber plantation in the state under different Income group for the period 8-10 Years, was also calculated and found that the highest percentage of land under rubber cultivation for the State is within the income group of Rs.5,000-10,000 with 44.63 per cent, and the least was found within the income group of Rs.25,000-30,000 with 8.30 per cent.

2.8.1.b: ***11-31 Years of Tapping:***

Under this period all the standing rubber trees are tapped. The production/yield of rubber sheet in terms of Kg. for the state is well explained in the following Table No.10. The total area under rubber cultivation in the study area for the state is 144.5 hectares. In this area of cultivation, a total of 8697150 Kgs. of rubber sheet is produced annually from a total of 55220 rubber trees with an average productivity or yield per hectare of 60187.89 Kgs. for the period.

Under the category of Rs.5,000-10,000 income group, the total area under rubber cultivation for is 64.5 hectares. In this area of cultivation, a total of 39,13,875 Kgs. of rubber sheet is produced from a total of 24,850 rubber trees with an average productivity/yield per hectare of 60680.23 Kgs. for the period.

Under the category of Rs.10,000-15,000 income group, the total area under rubber cultivation in the study area is 13.5 hectares. In this area of cultivation, a total of 800100 Kgs. of rubber sheet is produced from a total of 5,080 rubber trees with an average productivity/yield per hectare of 59266.67 Kgs. for the period.

Under the category of Rs.15,000-20,000 income group, the total area under rubber cultivation in the study area is 17.5 hectares. In this area of cultivation, a total of 10,82,025 Kg of rubber sheet is produced from 6,870 rubber trees, and the average productivity/yield per hectare of 61,830 Kgs. per annum.

Under the category of Rs.20,000-25,000 income group, the total area under rubber cultivation in the study area is 13.5 hectares. In this area of cultivation, a total of 7,73,325 Kgs. of rubber sheet is produced from 4,910 rubber trees with an average productivity/yield per hectare of 57283.33 Kg. for the period.

Under the category of Rs.25,000-30,000 income group, the total area under rubber cultivation in the study area is 12 hectares. In this area of cultivation, a total of 7,10,325 Kgs. of rubber sheet is produced from 4,510 rubber trees with an average productivity/yield per hectare of 59193.75 Kgs. for the period.

Under the category of Rs.30,000-Above income group, the total area under rubber cultivation in the study area is 23.5 hectares. In this area of cultivation, a total of 1417500 Kgs. of rubber sheet is produced from 9000 rubber trees with an average productivity/yield per hectare of 60319.15 Kgs. for the period.

On comparison among different income group in the state for the period 11-31Years, it was found that the income group of Rs.15,000-20,000 has the highest yield per hectare per annum than the rest, which is even higher than the yield per hectare of the state.

The percentage wise distribution of cultivated land under rubber plantation for the State under different Income group for the period 11-31Years, was also calculated and found that the highest percentage of land under rubber cultivation for the State is within the income group of Rs.5,000-10,000 with 44.63 per cent, and the least was found within the income group of Rs.25,000-30,000 with 8.30 per cent.

2.8.1.c: ***32-34 Years of Tapping:***

At this stage, only rubber trees which were planted as an extension are tapped and the annual production/yield of smoked rubber sheet in terms of Kg. for a period of three years in the district is well explained in the following Table No.10. The total area under rubber cultivation in the study area for the state is 144.5 hectares. In this area of cultivation, a total of 4,09,725 Kgs. of rubber sheet is produced from a total of 18,210 rubber trees with an average productivity or yield per hectare of 6829 Kgs. for the period.

Under the category of Rs.5,000-10,000 income group, the total area under rubber cultivation is 64.5 hectares. In this area of cultivation, a total of 1,76,400 Kgs. of rubber sheet is produced from a total of 7,840 rubber trees with an average productivity/yield per hectare of 2735 Kgs. for the period.

Under the category of Rs.10,000-15,000 income groups, the total area under rubber cultivation in the study area is 13.5 hectares. In this area of cultivation, a total of 38,925 Kgs. of rubber sheet is produced from a total of 1,730 rubber trees with an average productivity/yield per hectare of 2883 Kgs. for the period.

Under the category of Rs.15,000-20,000 income group, the total area under rubber cultivation in the study area is 17.5 hectares. In this area of cultivation, a total of 54,450 Kgs. of rubber sheet is produced from 2420 rubber trees with an average productivity/yield per hectare of 3,111 Kgs. for the period.

Under the category of Rs.20,000-25,000 income group, the total area under rubber cultivation in the study area is 13.5 hectares. In this area of cultivation, a total of 36,225 Kgs. of rubber sheet is produced from 1610 rubber trees with an average productivity/yield per hectare of 2683 kgs. for the period.

Under the category of Rs.25,000-30,000 income group, the total area under rubber cultivation in the study area is 12 hectares. In this area of cultivation, a total of 40,725 Kgs. of rubber sheet is produced from 1810 rubber trees with an average productivity/yield per hectare of 3394 Kgs. for the period.

Under the category of Rs.30,000-Above income group, the total area under rubber cultivation in the study area is 23.5 hectares. In this area of cultivation, a total of 63,000 Kgs. of rubber sheet is produced from 2800 rubber trees with an average productivity/yield per hectare of 2,681 Kgs. for the period.

On comparison among different income group in the State for the period 32-34 Years, it was found that the income group of Rs.3394 has the highest yield per hectare than the rest, which is even higher than the yield per hectare of the state.

The percentage wise distribution of cultivated land under rubber plantation for the State under different Income group for the period 32-34 Years, was also calculated and found that the highest percentage of land under rubber cultivation for the State is within the income group of Rs.5,000-10,000 with 44.63 per cent, and the least was found within the income group of Rs.25,000-30,000 with 8.30 per cent.

The total production of rubber sheet under the study area for the State from 8-34Years is 99,39,600 Kgs. with an average productivity of 36,8,133.33 kgs. per annum for the period.

2.8.2: Farm size and productivity (Income-Wise): Wokha.

The total area under rubber cultivation in the study area for the district is 90 hectares and the total monthly income for the rubber farmers in the district is Rs.405000 with average monthly income of Rs.13,500 per household. The total production of rubber sheet under the study area for the district from 8-34 Years is 6343200 Kgs. with an average productivity of 70480 Kgs. per annum for the period. The overall correlation between income and size of holding for the district shows a positive relationship with r=0.99. Since the value of r is more than six times the probable error (P.Er=0.002), the co-efficient of correlation between farm size and income is significant which shows that as the income of the farmer increases, the farm size also increases. The co-efficient of determinants on r^2 value shows that 98% of the variation in farm size is explained by the income X, the regression values of size of holding (Y) on income (X) gave us.

Y= a+bx, Y= -4.267 + .00029X

The result shows that the regression co-efficient byx is .00029. This explains that a unit change in income will lead a change in farm size by .00029. The p-value of 'byx' is .03872 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%. *Thus, the hypothesis which states that higher the income, higher is the size of holding has been proved.*

On comparison among different income group in the district for the period 8-34 years, it was found that the income group of Rs.15,000-20,000 and income group of Rs.30,000-Above has the highest yield per hectare than the rest, which is even higher than the yield per hectare in the district. It was also found that the highest percentage of land under rubber cultivation for the state is within the income group of Rs.5,000-10,000 and the least was found to be from the income group of Rs.20,000- 25,000.

2.8.2.a: ***8-10 Years of tapping.***

The production/yield of rubber sheet in terms of Kgs. for the district is well explained in the following Table No.11. The total area under rubber cultivation in the study area for the district is 90 hectares. In this area of cultivation, a total of 528975 Kgs. of rubber sheet is produced form 23510 rubber trees with an average productivity or yield per hectare of 5877 5 Kgs. for the period.

Under the category of Rs.5,000-10,000 income group, the total area under rubber cultivation in the study area is 37 hectares. In this area of cultivation, a total of 2,28,600 Kgs. of rubber sheet is produced from 10,160 rubber trees with an average productivity or yield per hectare of 6178.37 Kgs. for the period.

Under the category of Rs.10,000-15,000 income group, the total area under rubber cultivation in the study area is 10 hectares. In this area of cultivation, a total of 57,375 Kgs. of rubber sheet is produced annually from 2,550 rubber trees with an average productivity or yield per hectare of 5737.5 Kgs. for the period.

Under the category of Rs.15,000-20,000 income group, the total area under rubber cultivation in the study area is 11.5 hectares. In this area of cultivation, a total of 65,250 Kgs. of rubber sheet is produced from 2,900 rubber trees with an average productivity or yield per hectare of 5673.91 Kgs. for the period.

Under the category of Rs.20,000-25,000 income group, the total area under rubber cultivation in the study area is 4 hectares. In this area of cultivation, a total of 22,500 Kgs. of rubber sheet is produced from 1,000 rubber trees with an average productivity or yield per hectare of 5625 Kgs. for the period.

Under the category of Rs. 25000-30,000 income group, the total area under rubber cultivation in the study area is 10 hectares. In this area of cultivation, a total of 49,500 Kgs. of rubber sheets is produced from 2,200 rubber trees with an average productivity or yield per hectare of 4950 Kgs. for the period.

Under the category of Rs.30,000-Above income group, the total area under rubber cultivation in the study area is 17.5 hectares. In this area of cultivation, a total of 1,05,750 Kgs. of rubber sheet is produced from 4,700 rubber trees with an average productivity or yield per hectare is 6042.85 Kgs. for the period.

On comparison among different income group in the district for the period 8-10 Years, it was found that the income group of Rs.5,000-10,000 has the highest yield per hectare than the rest, which is even higher than the yield per hectare of the district.

The percentage wise distribution of cultivated land under rubber plantation for the State under different Income group for the period 8-10 Years, was also calculated and found that the highest percentage of land under rubber cultivation for the State is within the income group of Rs.5,000-10,000 with 41.11 per cent, and the least was found within the income group of Rs.30,000-Above with 2.22 per cent

2.8.2.b: ***11-31 Years of Tapping.***

The production/yield of rubber sheet in terms of Kg. for the district is well explained in the following Table No.11 below. The total area under rubber cultivation in the study area for the district is 90 hectares. In this area of cultivation, a total of 55,50,300 Kgs. of rubber sheet is produced form 35,240 rubber trees, with an average productivity or yield per hectare of 61670 kgs. for the period.

Under the category of Rs.5,000-10,000 income group, the total area under rubber cultivation in the study area for this group is 37 hectares. In this area of cultivation, a total of 22,72,725 Kgs. of rubber sheet is produced from 14,430 rubber trees with an average productivity or yield per hectare of 61425 Kgs. for the period.

Under the category of Rs.10.000-15.000 income group, the total area under rubber cultivation in the study area is 10 hectares. In this area of cultivation, a total of 6,14,250 Kgs. of rubber sheet is produced from 3,900 rubber trees with an average productivity or yield per of 61425 Kgs. for the period.

Under the category of Rs.15,000-20,000 income group, the total area under rubber cultivation in the study area group is 11.5 hectares. In this area of cultivation, a total of 7,24,500 Kgs. of rubber sheet is produced from 4,600 rubber trees with an average productivity or yield per hectare of 63000 Kgs. for the period.

Under the category of Rs.20,000-25,000 income group, the total area under rubber cultivation in the study area is 4 hectares. In this area of cultivation, a total of 2,44,125 Kg of rubber sheet is produced from 1,550 rubber trees with an average productivity or yield per hectare of 61031.25 Kgs. for the period.

Under the category of Rs.25,000-30,000 income group, the total area under rubber cultivation in the study area is 10 hectares. In this area of cultivation, a total of 5,92,200 Kg of rubber sheet is produced from 3760 rubber trees with an average productivity or yield per hectare is 59220 Kgs. for the period.

Under the category of Rs.30,000-Above income group, the total area under rubber cultivation in the study area is 17.5 hectares. In this area of cultivation, a total of 1,102,500 Kgs. of rubber sheet is produced from 7,000 rubber trees with an average productivity or yield per hectare is 2,300 Kgs. for the period.

On comparison among different income group in the district for the period11-31 Years, it was found that the income group of Rs.15,000-20,000 and 30,000-Above has the highest yield per hectare than the rest of the different income group for the district.

The percentage wise distribution of cultivated land under rubber plantation for the district under different Income group for the period11-31 Years, was also calculated and found that the highest percentage of land under rubber cultivation for the district is within the income group of Rs.5,000-10,000 with 41.11 per cent, and the least was found within the income group of Rs.30,000-Above with 2.22 per cent.

2.8.2.c: ***32-34 Years of Tapping.***

At this stage, only rubber trees which were planted as an extension are tapped and the annual production/yield of rubber sheet in terms of Kg. for the district is well explained in the following Table No.11. The total area under rubber cultivation in the study area for the district is 90 hectares. In this area of cultivation, a total of 2,63,925 Kgs. of rubber sheet is produced form 11,730 rubber trees with an average productivity or yield per hectare is 2932.5 Kgs. for the period.

Under the category of Rs.5,000-10,000 income group, the total area under rubber cultivation in the study is 37 hectares. In this area of cultivation, a total of 96,075 Kgs. of rubber sheet is produced from 4270 rubber trees with an average productivity or yield per hectare is 2596.62 Kgs. for the period.

Under the category of Rs.10,000-15,000 income group, the total area under rubber cultivation in the study area is 10 hectares. In this area of cultivation, a total of 30,375 Kgs. of rubber sheet is produced from 1350 rubber trees with an average productivity or yield per hectare is 3037.5 Kgs. for the period.

Under the category of Rs.15,000-20,000 income group, the total area under rubber cultivation in the study area is 11.5 hectares. In this area of cultivation, a total of 38,250 Kgs. of rubber sheet is produced from 1,700 rubber trees with an average productivity or yield per hectare of 3326.08 Kgs. for the period.

Under the category of Rs.20,000-25,000 income group, the total area under rubber cultivation in the study area is 4 hectares. In this area of cultivation, a total of 12,375 Kgs. of rubber sheet is produced from 550 rubber trees with an average productivity or yield per hectare of 3093.75 Kgs. for the period.

Under the category Rs.25,000-30,000 income group, the total area under rubber cultivation in the study area is 10 hectares. In this area of cultivation, a total of 35,100 Kgs. of rubber sheet is produced from 1560 rubber trees with an average productivity or yield per hectare is 3510 Kgs. for the period.

Under the category of Rs.30,000-Above income group, the total area under rubber cultivation in the study area for this group is 17.5 hectares. In this area of cultivation, a total of 51,750 Kgs. of rubber sheet is produced from 2,300 rubber trees with an average productivity or yield per hectare is 2957.14 Kgs. for the period.

The percentage wise distribution of cultivated land under rubber plantation for the district under different Income group for the period 32-34 Years, was also calculated and found that the highest percentage of land under rubber cultivation for the district was within the income group of Rs.5,000-10,000 with 41.11 per cent, and the least was found within the income group of Rs.30,000-Above with 2.22 percent.

2.8.3: Farm Size and Productivity (Income-Wise): Mokokchung:

The total area under rubber cultivation in the study area for the district is 54.5 hectares and the total monthly income for the rubber farmers in the district is Rs.3,76,300

with average monthly income of Rs.12,543.33 per household. The total production of rubber sheet under the study area for the district from 8-34 Years is 3596400 Kgs. with an average productivity of 65988.99 Kgs. per annum for the period. The overall correlation between farm size and income of rubber farmers shows a positive relationship with r=0.82. Since the value of r is more than six times the probable error (P.Er=0.0209), the co-efficient of correlation between farm size and income is significant which shows that as income increases, the farm size(size of holding) also increases. The co-efficient of determinants on r^2 value shows that 67% of the variation in farm size is explained by the income X, the regression values of size of holding (Y) on income (X) gave us.

Y= a+bx, Y= -3.11347+ 0.00015X

The result shows that the regression co-efficient byx is 0.00015. This explains that a unit change in income will lead a change in farm size by 0.00015. The p-value of 'byx' is 0.043, which is less than 0.05. Therefore, the regression co-efficient is significant at 5%. *Thus, the hypothesis which states that higher the income, higher is the size of holding has been proved.*

On comparison among different income group in the district for the period 8-34 years, it was found that the income group of Rs.5,000-10,000 has the highest yield per hectare than the rest, which is even higher than the yield per hectare in the district. It was also found that the highest percentage of land under rubber cultivation for the district is within the income group of Rs.5,000-10,000 and the least was found to be from the income group of Rs.25,000- 30,000.

2.8.3.a: ***8-10 Years of Tapping.***

The production/yield of rubber sheet in terms income-wise for the district is well explained in the following table no.12. The total area under rubber cultivation in the study area for the district is 54.5hectares. In this area of cultivation, a total of 3,03,750 Kgs. of rubber sheet is produced from 13,500 rubber trees, and the productivity or yield per hectare of 5573 Kgs. for the period.

Under the category of Rs.5,000-10,000 income group, the total area under rubber cultivation in the study area for this group is 27.5 hectares. In this area of cultivation, a total

of 1,54,125 Kg of rubber sheet is produced from 6,850 rubber trees, and the productivity or yield per hectare of 5605 Kgs. for the period.

Under the category of Rs.10,000-15,000 income group, the total area under rubber cultivation in the study area is 3.5 hectares. In this area of cultivation, a total of 18000 Kgs. of rubber sheet is produced from 800 rubber trees with an average productivity or yield per hectare of 1180 Kgs. for the period.

Under the category of Rs.15,000-20,000 income group, the total area under rubber cultivation in the study area is 6 hectares. In this area of cultivation, a total of 34,875 Kgs. of rubber sheet is produced from 1,550 rubber trees with an average productivity or yield per hectare of 5813 Kgs. for the period.

Under the category of Rs.20,000-25,000 income group, the total area under rubber cultivation in the study area is 9.5 hectares. In this area of cultivation, a total of 51750 Kg of rubber sheets is produced from 2300 rubber trees with an average productivity or yield per hectare of 5447 kgs. for the period.

Under the category of Rs. 25000-30,000 income group, the total area under rubber cultivation in the study area is 2 hectares. In this area of cultivation, a total of 11,250 Kgs. of rubber sheet is produced from 500 rubber trees with an average productivity or yield per hectare of 5625 Kgs. for the period.

Under the category of Rs.30,000-Above income group, the total area under rubber cultivation in the study area is 6 hectares. In this area of cultivation, a total of 33,750 Kg of rubber sheets is produced annually from 1500 rubber trees, and the average productivity or yield per hectare of 5625 Kgs. for the period.

On comparison among different income group in the district for the period 8-10 Years, it was found that the income group of Rs.15,000-20,000 has the highest yield per hectare than the rest, which is even higher than the yield per hectare of the district.

The percentage wise distribution of cultivated land under rubber plantation in the district 8-10 Years, under different Income group for the period 8-10 Years, was also calculated and found that the highest percentage of land under rubber cultivation for the

district was within the income group of Rs.5,000-10,000 with 50.45 per cent, and the least was found within the income group of Rs.25,000-30,000 with 3.66per cent.

2.8.3.b: ***11-31 Years of Tapping:***

The production/yield of rubber sheet in terms of Kg. for the district is well explained in the following Table No.12. The total area under rubber cultivation in the study area for the district is 54.5 hectares. In this area of cultivation, a total of 31,46,850 Kgs. of rubber sheet is produced from 19980 rubber trees, and the productivity or yield per hectare is 57740 kgs. for the period.

Under the category of Rs.5,000-10,000 income group, the total area under rubber cultivation in the study area is 27.5 hectares. In this area of cultivation, a total of 16,41,150 Kgs. of rubber sheet is produced from 10,420 rubber trees with an average productivity or yield per hectare of 59678 Kgs. for the period.

Under the category of Rs.10,000-15,000 income group, the total area under rubber cultivation in the study area is 3.5 hectares. In this area of cultivation, a total of 1,85,850 Kg of rubber sheet is produced from 1180 rubber trees with an average productivity or yield per hectare of 53100 for the period.

Under the category of Rs.15,000-20,000 income group, the total area under rubber cultivation in the study area is 6 hectares. In this area of cultivation, a total of 3,57,525 Kg of rubber sheet is produced from 2270 rubber trees with an average productivity or yield per hectare of 59588 Kgs. for the period.

Under the category of Rs.20,000-25,000 income group, the total area under rubber cultivation in the study area is 9.5 hectares. In this area of cultivation, a total of 5 29,200 Kgs. of rubber sheet is produced from 3,360 rubber trees with an average productivity or yield per hectare of 55705 Kgs. for the period.

Under the category of Rs.25,000-30,000 income group, the total area under rubber cultivation in the study area is 2 hectares. In this area of cultivation, a total of 1,18,125 Kgs. of rubber sheet is produced from 750 rubber trees with an average productivity or yield per hectare of 59063 Kgs.for the period.

Under the category of Rs.30,000-Above income group, the total area under rubber cultivation in the study area is 6 hectares. In this area of cultivation, a total of 3,15,000 Kgs. of rubber sheet is produced from 2,000 rubber trees with an average productivity or yield per hectare of 52500 Kgs. for the period.

On comparison among different income group in the district for the period 11-31 Years, it was found that the income group of Rs.5,000-10,000 has the highest yield per hectare than the rest, which is even higher than the yield per hectare of the district.

The percentage wise distribution of cultivated land under rubber plantation for the district under different Income groups district for the period 11-31 Years, was also calculated and found that the highest percentage of land under rubber cultivation for the district was within the income group of Rs.5,000-10,000 with 50.45 per cent, and the least was found within the income group of Rs.25000-30,000 with 3.66 per cent.

2.8.3.c: ***32-34 Years of Tapping:***

At this stage, only rubber trees which were planted as an extension are tapped and the annual production/yield of rubber sheet in terms of income-wise for the district is well explained in the following Table No.12. The total area under rubber cultivation in the study area for the district is 54.5hectares. In this area of cultivation, a total of 1,45,800 Kgs. of rubber sheet is produced from 6,480 rubber with an average productivity or yield per hectare of 2675.23 Kgs. for the period.

Under the category of Rs.5,000-10,000 income group, the total area under rubber cultivation in the study area is 27.5 hectares. In this area of cultivation, a total of 80,325 Kgs. of rubber sheet is produced from 3570 rubber trees with an average productivity or yield per hectare of 2920.91 Kgs. for the period.

Under the category of Rs.10,000-15,000 income group, the total area under rubber cultivation in the study area is 3.5 hectares. In this area of cultivation, a total of 8,550 Kgs. of rubber sheet is produced from 380 rubber trees with an average productivity or yield per hectare of 2442.86 Kgs. for the period.

Under the category of Rs.15,000-20,000 income group, the total area under rubber cultivation in the study area is 6 hectares. In this area of cultivation, a total of 16,200 Kgs. of rubber sheet is produced from 720 rubber trees with an average productivity or yield per hectare of 2700 Kgs. for the period.

Under the category of Rs.20,000-25,000 income group, the total area under rubber cultivation in the study area is 9.5 hectares. In this area of cultivation, a total of 23,850 Kgs. of rubber sheet is produced from 1060 rubber trees with an average productivity or yield per hectare of 2510.53 Kgs. for the period.

Under the category of Rs.25,000-30,000 income group, the total area under rubber cultivation in the study area is 2 hectares. In this area of cultivation, a total of 5,625 Kg of rubber sheet is produced from 250 rubber trees with an average productivity or yield per hectare of 2812.50 Kgs. for the period.

Under the category of Rs.30,000-Above income group, the total area under rubber cultivation in the study area is 6 hectares. In this area of cultivation, a total of 11,250 Kgs. of rubber sheet is produced from 500 rubber trees with an average productivity or yield per hectare of 1875 Kgs. for the period.

On comparison among different income group in the district for the period 32-34 Years, it was found that the income group of Rs.5,000-10,000 has the highest yield per hectare than the rest,

The percentage wise distribution of cultivated land under rubber plantation for the district under different Income group for the period 32-34 Years, was also calculated and found that the highest percentage of land under rubber cultivation for the district was within the income group of Rs.5,000-10,000 with 50.45 per cent, and the least was found within the income group of Rs.25,000-30,000 with 3.66 per cent.

The total production of rubber sheet in the district for the period from 8-34 Years is 35,96,400 Kgs. with an average productivity of 1,33,200 Kgs. per annum for the period.

Table No.10: Farm Size and Productivity (Income-Wise): Nagaland.

					8-10 Years			11-31 Years			32-34 Yrs				
Category (Rs.)	Total monthly income	Average monthly income	Total hectare	Total trees	Total trees tapping	Total Production	Average Production	Total trees tapping	Total Production	Average Production	Total trees tapping	Total Production	Average Production	Total production(in kgs) for 8-34 Years	Average production(in kgs) for 8-34 Years
5000-10000	225500	6833.333	64.5	24850	17010	382725	5933	24850	3913875	60680	7840	176400	2735	**4473000**	**69348.84**
10000-15000	75000	10714.29	13.5	5080	3350	75375	5583	5080	800100	59266	1730	38925	2883	**914400**	**67733.33**
15000-20000	109800	15685.71	17.5	6870	4450	100125	5721	6870	1082025	61830	2420	54450	3111	**1236600**	**70662.86**
20000-25000	149000	21285.71	13.5	4910	3300	74250	5500	4910	773325	57283	1610	36225	2683	**883800**	**65466.67**
25000-30000	77000	25666.67	12	4510	2700	60750	5062	4510	710325	59193	1810	40725	3394	**811800**	**67650**
30000-Above	145000	48333.33	23.5	9000	6200	139500	5936	9000	1417500	60319	2800	63000	2681	**1620000**	**68936.17**
Total	781300	13021.67	**144.5**	**55220**	**37010**	**832725**	**5762**	**55220**	**8697150**	**60187**	**18210**	**409725**	**2835**	**9939600**	**68786.16**

Source: Field Survey 2016-2017.

Table No.11: Farm size and productivity (Income-Wise): Wokha.

					8-10 Years			11-31 Years			32-34 Yrs				
Category (Rs.)	Total monthly income	Average monthly income	Total hectare	Total trees	Total trees tapping	Total Production	Average Production	Total trees tapping	Total Production	Average Production	Total trees tapping	Total Production	Average Production	Total production(in kgs) for the period of 8-34 Years.	Average production(in kgs) for period of 8-34 Years
5000-10000	112000	6588.23	37	14430	10160	228600	6178	14430	2272725	61425	4270	96075	2596	**2597400**	**70200**
10000-15000	41000	10250	10	3900	2550	57375	5737	3900	614250	61425	1350	30375	3037	**702000**	**70200**
15000-20000	48000	16000	11.5	4600	2900	65250	5673	4600	724500	63000	1700	38250	3326	**828000**	**72000**
20000-25000	42000	21000	4	1550	1000	22500	5625	1550	244125	61031	550	12375	3093	**279000**	**69750**
25000-30000	52000	26000	10	3760	2200	49500	4950	3760	592200	59220	1560	35100	3510	**676800**	**67680**
30000-Above	110000	55000	17.5	7000	4700	105750	6042	7000	1102500	63000	2300	51750	2957	**1260000**	**72000**
Total	405000	13500	**90**	**35240**	**23510**	**528975**	**5877**	**35240**	**5550300**	**61670**	**11730**	**263925**	**2932**	**6343200**	**70480**

Source: Field Survey 2016-17.

Table No.12: Farm size and productivity (Income-Wise): Mokokchung.

	8-10 Years	11-31 Years	32-34 Years	period 8-34 Years	Total production (in

Category (Rs.)	Total monthly income	Average monthly income	Total hectare	Total trees	Total trees tapping	Total Production	Average Production	Total trees tapping	Total Production	Average Production	Total trees tapping	Total Production	Average Production		
5000-10000	113500	7093.75	27.5	10420	6850	154125	5605	10420	1641150	59678	3570	80325	2920	**1875600**	**68203.64**
10000-15000	34000	11333.33	3.5	1180	800	18000	5143	1180	185850	53100	380	8550	2442	**212400**	**60685.71**
15000-20000	61800	15450	6	2270	1550	34875	5813	2270	357525	59588	720	16200	2700	**408600**	**68100.00**
20000-25000	107000	21400	9.5	3360	2300	51750	5447	3360	529200	55705	1060	23850	2510	**604800**	**63663.16**
25000-30000	25000	25000	2	750	500	11250	5625	750	118125	59063	250	5625	2812	**135000**	**67500.00**
30000-Above	35000	35000	6	2000	1500	33750	5625	2000	315000	52500	500	11250	1875	**360000**	**60000.00**
Total	376300	12543.33	**54.5**	**19980**	**13500**	**303750**	**5573**	**19980**	**3146850**	**57740**	**6480**	**145800**	**2675**	**3596400**	**65988.99**

Source: Field Survey 2016-2017.

Chapter – 3

Rubber Plantation and Employment.

This chapter discusses about the impact of rubber plantation on employment in the state under the study area. The first section examines the employment generation through rubber plantation for the state interms of hectare, followed by Wokha District and Mokokchung District. The second section examines the employment generation through rubber plantation for the state in terms income group, followed by Wokha district and Mokokchung district.

3.1: Total Employment (Hectare Wise): Nagaland.

The total employment generated from rubber plantation for the state from 1-34 Years is 4,30,401 man days where male labour accounts for 4,17,755 (97%) man days and female labour accounts for 12646 (3%) man days. It was also found that from 1-34 Years, the average employment per hectare for the state was 2978.55 man days for the period, where the average employment per hectare for male and female labour was 2891.038 man days, and 87.51 man days respectively.

As shown in the Table No.13, the average employment per hectare for the 1st Year is 102.62 man days, where the average employment per hectare for male and female labour is 75.61 man days and 27.02 man days respectively. The average employment per hectare for 2-3 Years is 122.49 man days, where the average employment per hectare for male and female labours is 86.41 man days and the 36.08 man days respectively. The average employment per hectare for 4-7 Years is 80.53 man days, where the average employment per hectare for male and female labour is 56.11 man days and 24.42 man days respectively. The average employment per hectare for cleaning the field during the tapping period (8-31 Yrs) is 158.12 man days, where male labour accounts for 100 percent. The average employment per hectare for tappers during the tapping period (8-31 Yrs) is 2341 man days, where male labour accounts for 100 percent. The average employment per hectare for cleaning the field during the tapping period (32-34 Yrs) is 9.32 man days, where male labour accounts for 100 percent. The average

employment per hectare for tappers during the tapping period (32-34 Yrs) is 163.59 man days, where male labour accounts for 100 percent.

The overall correlation between farm size and employment for the state shows a positive relationship with r=0.96. Since the value of r is more than six times the probable error (P.Er=0.0069), the co-efficient of correlation between farm size and employment is significant which shows that as the farm size increases, the employment also increases. The co-efficient of determinants on r^2 value shows that 92% of the variation in employment is explained by the farm size X, the regression values of Employment (Y) on farm size (X) gave us.

Y= a+bx, Y= 966.4361+ 2577.265X

The result shows that the regression co-efficient byx is 2577.265. This explains that a unit change in farm size will lead a change in employment by 2577.265. The p-value of 'byx' is 6.49E-35 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

3.1.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 14,829 man days labour were employed, out of which 10,925 (74%) man days were male labours and 3,904 (26%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 4,848 man days labour were employed, out of which 3367 (69%) man days were male labours and 1481 (31%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 1,877 man days labour were employed, out of which male labour accounts for 1672 (89%) man days and 205 (11%) man days labour were female. In the 3rd stage for plantation work, a total of 1,344 man days labour were employed, out of which 1166 (87%) man days were male labours and 178 (13%) man days were female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 6760 man days labours were employed, where male labour accounts for 4720 (70%) man days and female labour accounts for 2040 (30%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 17,700 man days labour were employed, out of which 12486 (71%) man days were male labours and 5214 (29%) man days of female labours were employed. From 4th to 7 years, a total

of 11,636 man days labour were employed, where male labour accounts for 8108 (70%) man days, and female labour accounts for 3528 (30%) man days.

3.1.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31 years. It is also to be noted that during this tapping period, no female labour are employed, as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the field is cleaned only one time in a year, for which a total of 22,848 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 8-31 Years is 3,38,400 man days labour, where male labour accounts for 100 percent. Therefore the total employment generated for this tapping period is 3,61,248 man days labour, where male labour accounts for 100 percent. From 32-34 Years, the field is cleaned only one time in a year, for which a total of 1,348 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 32-34 Years is 23,640 man days labour, where male labour accounts for 100 percent. Therefore the total employment generated for this tapping period of three years is 24,988 man days labour, where male labour accounts for 100 percent.

Table No.13. Total Employment (Hectare Wise): Nagaland. Total Hectare=144.5.

Year	Items	Total Employment	Male	Female	Average Per Hec.	Average Per Hectare Male	Average Per Hec. Female	% Male	% Female
1	Jungle cutting mulching and burning	4848	3367	1481	33.55	23.3	10.25	69	31
	Digging	1877	1672	205	12.99	11.57	1.42	89	11
	Planting	1344	1166	178	9.3	8.07	1.23	87	13
	Clearing 2 times	6760	4720	2040	46.78	32.66	14.12	70	30

	Total	**14829**	**10925**	**3904**	**102.62**	**75.61**	**27.02**	**74**	**26**
2-3	Clearing 3 times	17700	12486	5214	122.49	86.41	36.08	71	29
4-7	Clearing of the field 2 times	11636	8108	3528	80.53	56.11	24.42	70	30
8-31	Clearing of the field 1 time	22848	22848	0	158.12	158.12	0	100	0
8-31	Tappers	338400	338400	0	2341.87	2341.87	0	100	0
32-34	Cleaning of the field 1 time	1348	1348	0	9.32	9.32	0	100	0
32-34	Tappers	23640	23640	0	163.59	163.59	0	100	0
	G.Total	**430401**	**417755**	**12646**	**2978.55**	**2891.03**	**87.51**	**97**	**3**

Source: Field Survey 2016-2017.

3.2: Small Farm Size: Nagaland.

The total employment generated from rubber plantation for the small farm size from 1-34 Years is 144884 man days labour, where male labour accounts for 141585 (98%) mandays and female labour accounts for 3299 (2%) mandays. It was also found that from 1-34 Years, the average employment per hectare for the small farm size was 3622.1 man days for the period, where the average employment per hectare for male and female labour was 3539.62 man days, and 82.47 man days respectively.

As shown in the Table No.14, the average employment per hectare for the 1st Year is 92.13 man days, where the average employment per hectare for male and female labour is 68.15 man days and 23.98 man days respectively. The average employment per hectare for 2-3 Years is 124.75 man days, where the average employment per hectare for male and female labour is 88.55 man days, and 36.20 man days respectively. The average employment per hectare for 4-7 Years is 77.10 man days, where the average employment per hectare for male and female labour is 54.80 man days and 77.10 man days respectively. The average employment per hectare for cleaning the field during the tapping period (8-31 Yrs) is 168.60 man days, where male labour accounts for 100 percent. The average employment per hectare for tappers during the tapping period (8-31 Yrs) is 2880 man days, where male labour accounts for 100 percent. The average employment per hectare during the tapping period (8-31 Yrs) is 3048.60 man days, where male labour accounts for 100 percent. The average employment per hectare for cleaning the field during the tapping period (32-34 Yrs) is 9.52 man days, where male labour accounts for 100 percent, and the average employment per hectare for tappers during the tapping period (32-34 Yrs) is 270 man days, where male labour accounts for 100 percent. The average employment per hectare from 1-34 Years is 3622.1 man days, where the average employment per hectare for male and female labour is 3539.62 man days and 82.47 man days respectively.

The correlation between farm size and employment for small farm size in the state shows a positive relationship with r=0.56. Since the value of r is more than six times the probable error (P.Er=0.0849), the co-efficient of correlation between farm size and employment

is significant which shows that as the farm size increases, the employment also increases. The co-efficient of determinants on r^2 value shows that 31% of the variation in employment is explained by the farm size X the regression values of Employment (Y) on farm size (X) gave us.

Y= a+bx, Y= 68.03438+ 3571.074X

The result shows that the regression co-efficient byx is 3571.074. This explains that a unit change in farm size will lead a change in employment by 3571.074. The p-value of 'byx' is 0.001176 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

3.2.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 3685 man days labour were employed, out of which 2726 (74%) man days were male labours and 959 (26%) man-days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 1168 man-days labours were employed, out of which 821 (70%) man days were male labours and 347 (30%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 456 man days labours were employed, out of which male labour accounts for 393 (86%) man days and 63 (14%) man days were female labour. In the 3rd stage for plantation work, a total of 371 man days labours were employed, out of which 310 (84%) mandays were male labours, and 61 (16%) man days were female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 1690 man days labour were employed, where male labour accounts for 1202 (71%) man days and female labour accounts for 488 (29%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 4990 man days labour were employed, out of which 3542 (71%) man days were male labours and 1448 (29%) man days were female labours. From 4th to 7 years, a total of 3084 man days labour were employed, where 2192 (71%) man days male labour and 892 (29%) man days of female labours were employed.

3.2.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31 years. It is also to be noted that during this tapping period, no female labours are employed as it is inconvinent and

not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the field is cleaned only one time in a year for which a total of 6744 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 8-31 Years is 115200 man days labour, where male labour accounts for 100 per cent. Therefore the total employment generated for this tapping period is 121944 man days labour, where male labour accounts for 100 percent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 1348 man days labour were employed, where male labour accounts for 100 percent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 381 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 32-34 Years is 10800 man days labour, where male labour accounts for 100 per cent. Therefore the total employment generated for this tapping period of three years is 11181 man days labour, where male labour accounts for 100 percent.

Table No.14: Small Farm Size: Nagaland. **Total Hectare =40.**

Year	Items	Total Employment	Male	Female	Average Per Hec Hectare.	Average Per Hectare Male	Average Per Hec Hectare. Female	% Male	% Female
1	Jungle cutting mulching and burning	1168	821	347	29.2	20.53	8.68	70	30
	Digging	456	393	63	11.4	9.83	1.58	86	14
	Planting	371	310	61	9.28	7.75	1.53	84	16
	Clearing 2 times	1690	1202	488	42.25	30.05	12.2	71	29
	Total	**3685**	**2726**	**959**	**92.13**	**68.15**	**23.98**	**74**	**26**
2-3	Clearing 3 times	4990	3542	1448	124.75	88.55	36.2	71	29
4-7	Clearing of the field 2 times	3084	2192	892	77.1	54.8	22.3	71	29

8-31	Clearing of the field 1 time	6744	6744	0	168.6	168.6	0	100	0
8-31	Tappers	115200	115200	0	2880	2880	0	100	0
32-34	Cleaning of the field 1 time	381	381	0	9.53	9.53	0	100	0
32-34	Tappers	10800	10800	0	270	270	0	100	0%
	G.Total	**144884**	**141585**	**3299**	**3622.1**	**3539.62**	**82.47**	**98**	**2**

Source: Field Survey 2016-17.

3.3: Medium Farm Size: Nagaland.

3.3.1: *Total employment upto the bearing period (1-7 Years).*

The total employment generated from rubber plantation for the medium farm Size from 1-34 Years is 149027 man days labour where male labour accounts for 143784 (96%) mandays and female labour accounts for 5243 (4%) mandays. It was also found that from 1-34 Years, the average employment per hectare for the small farm size was 2685.17 man days for the period, where the average employment per hectare for male and female labour was 2590.7 man days, and 94.46man days respectively.

As shown in Table No.15, the average employment per hectare for the 1st year is 98.86 man days, where the average employment per hectare for male and female labour is 72.94 and 25.93 respectively. The average employment per hectare for 2-3 Years is 123.06, where the average employment per hectare for male and female labour is 82.56 and 40.50 respectively.The average employment per hectare for 4-7 years is 84.76 where the average employment per hectare for male and female labour is 56.72 and 28.04 respeetively. The average employment per hectare for cleaning the field during the tapping period (8-31 Yrs) is 153.08 man days where male labour accounts for cent percent. The average employment per

hectare for tappers during the tapping period (8-31 Yrs) is 2069.19 where male labours accounts for 100 percent. The average employment per hectare for cleaning the field during the tapping period (32-34 Yrs) is 9.18 man days where male labour accounts for 100 percent and the average employment per hectare for tappers during the tapping period (32-34Yrs) is 147.02 man days, where male labour accounts for 100 percent.

The correlation between farm size and employment for medium farm size in the State shows a positive relationship with r=0.68. Since the value of r is more than six times the probable error (P.Er=0.0776), the co-efficient of correlation between farm size and employment is significant which shows that as the farm size increases, employment also increases. The co-efficient of determinants on r^2 value shows that 46% of the variation in employment is explained by the farm size X, the regression values of Employment (Y) on farm size (X) gave us.

Y= a+bx, Y= 1862.274+ 1946.973X

The result shows that the regression co-efficient byx is 1946.973. This explains that a unit change in farm size will lead a change in employment by 1946.973. The p-value of 'byx' is 0.000583 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

In the 1st year, a total of 5487 man days labour were employed, out of which 4048 (74%) man days were male labours and 1439 (26%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 1900 man days labour were employed, out of which 1411 (74%) man days were male labours and 489 (26%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 743 man days labour were employed, out of which male labour accounts for 666 (90%) mandays were male labours and 77 (10%) man days were female. In the 3rd stage for plantation work, a total of 534 man days labour were employed, out of which 457 (86%) mandays were male labours and 77 (14%) man days were female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 2310 man days labour were employed, where male labour accounts for 1514 (66%) man days and female labour accounts for 796 (34%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 6830 man days labours were employed, out of which, 4582 (67%) man days were male labours

and 2248 (33%) man days of female labours were employed. From 4th to 7 years, a total of 4704 man days labour were employed, where 3148 (67%) man days'male labours and 1556 (33%) man days of female labours were employed.

3.3.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31 years. It is also to be noted that during this tapping period, no female labours are employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the field is cleaned only one time in a year for which a total of 8496 man days labour were employed, where male labour accounts for 100 per cent. The total labours employed for tapping purpose for the period 8-31 Years is 114840 mandays, where male labour accounts for 100 percent. Therefore the total employment generated for this tapping period is 123336 man days labour, where male labour accounts for 100 per cent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 510 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 32-34 years is 8160 man days labour, where male labour accounts for 100 percent. Therefore the total employment generated for this tapping period of three years is 8670 man days labour, where male labour accounts for 100 per cent. The total employment generated from rubber plantation for the medium farm size in the state from 1-34 Years is 149027 man days labour, where male labour accounts for 143784 (96%) man days and female labour accounts for 5243 (4%) mandays.

Table No.15: Medium Farm Size: Nagaland. **Hectare=55.5.**

Year	Items	Total Employment	Male	Female	Average Per Hectare	Average Per Hec Male	Average Per Hectare Female	% Male	% Female
1	Jungle cutting mulching and burning	1900	1411	489	34.23	25.42	8.81	74	26
	Digging	743	666	77	13.39	12	1.39	90	10
	Planting	534	457	77	9.62	8.23	1.39	86	14
	Clearing 2 times	2310	1514	796	41.62	27.28	14.34	66	34
	Total	5487	4048	1439	98.86	72.94	25.93	74	26
2-3	Clearing 3 times	6830	4582	2248	123.06	82.56	40.5	67	33
4-7	Clearing of the field 2 times	4704	3148	1556	84.76	56.72	28.04	67	33
8-31	Clearing of the field 1 time	8496	8496	0	153.08	153.08	0	100	0
8-31	Tappers	114840	114840	0	2069.19	2069.19	0	100	0
32-34	Cleaning of the field 1 time	510	510	0	9.18919	9.19	0	100	0
32-34	Tappers	8160	8160	0	147.03	147.03	0	100	0
	G.Total	**149027**	**143784**	**5243**	**2685.17**	**2590.7**	**94.46**	**96**	**4**

Source: Field Survey 2016-17.

3.4: Large Farm Size: Nagaland.

The total employment generated from rubber plantation for the large farm size from 1-34 Years is 136490 man days labour where male labour accounts for 1323686 (97%) mandays and female labour accounts 4104 (3%) mandays. It was also found that from 1-34 Years, the average employment per hectare large farm size was 2785.51 man days for the period, where

the average employment per hectare for male and female labour was 2701.75 man days, and 83.76 man days respectively.

As shown in TableNo.16, the average employment per hectare for the 1st Year is 115.45 man days, where the average employment per hectare for male and female labours is 84.71 and 30.73 respectively. The average employment per hectare for 2-3 Years is 120.00 man days, where the average employment per hectare for male and female labours is 89.02 and 30.98 respectively.The average employment per hectare for 4-7 Years is 80.53 man days, where the average employment per hectare for male and female labour is 56.49 and 22.04 respectively. The average employment per hectare for cleaning the field during the tapping period (8-31 Yrs) is 15527 man days, where male labour accounts for 100 percent. The average employment per hectare for tappers during the tapping period (8-31 Yrs) is 2211.43 man days, where male labour accounts for 100 percent. The average employment per hectare during the tapping period (8-31 Yrs) is 2366.69 man days, where male labour accounts for 100 percent. The average employment per hectare for cleaning the field during the tapping period (32-34 Yrs) is 9.32 man days, where male labour accounts for 100 percent. and the average employment per hectare for tappers during the tapping period (32-34 Yrs) is 95.51 man days, where male labours accounts for100 percent.

The correlation between farm size and employment for large farm size in the state shows a positive relationship with r=0.93. Since the value of r is more than six times the probable error (P.Er=0.0166), the co-efficient of correlation between farm size and employment is significant which shows that as the farm size increases, the employment also increases. The co-efficient of determinants on r^2 value shows that 93% of the variation in employment is explained by the farm size X. the regression values of Employment (Y) on farm size (X) gave us.

Y= a+bx, Y= 841.0203 + 2648.201X.

The result shows that the regression co-efficient byx is 2648.201. This explains that a unit change in Farm Size will lead a change in employment by 2648.201. The p-value of 'byx' is 6.94E-05 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

3.4.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 5657 man days labour were employed, out of which 4151 (73%) mandays were male labours and 1506 (27%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 1780 man days labour were employed, out of which 1135 (64%) mandays were male labours and 645 (36%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 678 man days labour were employed, out of which male labours accounts for 613 (90%) mandays and 65 (10%) man days were female. In the 3rd stage for plantation work, a total of 439 man days labours were employed, out of which 399 (91%) mandays were male labours and 40 (9%) man days were female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, For which 2760 man days labours were employed, where male labours accounts for 2004 (73%) man days and female labours accounts for 756 (27%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 5880 man days labour were employed, out of which 4362 (74%) man days were male labours and 1518 (26%) man days of female labours were employed. From 4th to 7 years, a total of 3848 man days labour were employed, where 2768 (72%) man days male labour and 1080 (28%) man days of female labour were employed.

3.4.2: *Total employment during the tapping period (8-34 Years).*

The rubber trees start tapping from the 8th Years onwards upto 31 years. It is also to be noted that during this tapping period, no female labours are employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the field is cleaned only one time in a year for which a total of 7608 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 8-31 Years is 108360 man days labour, where male labour accounts for 100 per cent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 457 man days labour were employed, where male labour accounts for 100 per cent. The total labours employed for tapping purpose for the period 32-34 Years is 4680 man days labour, where male labour accounts for 100 per cent. Therefore the total employment generated for

this tapping period of three years is 5137 man days labour, where male labour accounts for 100 percent.

Table No.16. Large Farm Size: Nagaland. Hectare=49.

Year	Items	Total Employment	Male	Female	Average Per Hectare	Average Per Hectare Male	Average Per Hectare Female	% Male	% Female
1	Jungle cutting mulching and burning	1780	1135	645	36.33	23.16	13.16	64	36
	Digging	678	613	65	13.84	12.51	1.33	90	10
	Planting	439	399	40	8.96	8.14	0.82	91	9
	Clearing 2 times	2760	2004	756	56.33	40.9	15.43	73	27
	Total	**5657**	**4151**	**1506**	**115.45**	**84.71**	**30.73**	**73**	**27**
2-3	Clearing 3 times	5880	4362	1518	120	89.02	30.98	74	26
4-7	Clearing of the field 2 times	3848	2768	1080	78.53	56.49	22.04	72	28
8-31	Clearing of the field 1 time	7608	7608	0	155.27	155.27	0	100	0
8-31	Tappers	108360	108360	0	2211.43	2211.43	0	100	0
32-34	Cleaning of the field 1 time	457	457	0	9.33	9.33	0	100	0
32-34	Tappers	4680	4680	0	95.51	95.51	0	100	0
	G.Total	**136490**	**132386**	**4104**	**2785.51**	**2701.75**	**83.76**	**97**	**3**

Source: Field Survey 2016-17.

3.5: Total Employment (Income Wise): Nagaland.

This section highlights about the employment generated through rubber plantation for the state in terms of income wise.

3.5.1: *Income Group of Rs.5,000-10,000.*

3.5.1.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 6459 man days labour were employed, out of which 4806 (74%) mandays were male labour and 1648 (26%) man days were female labour. In the 1st stage of jungle cutting, mulching and burning, a total of 2160 man days labour were employed, out of which 1525 (71%) man days were male labour and 635 (29%) man days were female labour. In the 2nd stage of digging of hole for rubber plantation, a total of 835 man days labour were employed, out of which male labour accounts for 737 (88%) man days and 98 (12%) man days were female. In the 3rd stage for plantation work, a total of 619 man days labour were employed, out of which 528 (85%) man days were male labour and 91 (15%) man days were female labour. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 2840 man days labour were employed, where male labour accounts for 2016 (71%) man days and female labour accounts for 824 (29%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 8440 man days labour were employed, out of which 5984 (71%) man days were male labour and 2456 (29%) man days of female labour were employed. From 4th to 7 years, a total of 5245 man days labour were employed, where 3600 (69%) man days male labour and 1645 (31%) man days of female labour were employed.

3.5.1.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31 years, it is also to be noted that during this tapping period, no female labour are employed as it is inconvinent and not practical for female labour for the job under the study area. From 8-31 Years (24 Yrs), the field is cleaned only one time in a year for which a total of 10416 man days labour were employed, where male labour accounts for 100 per cent. The total labour employed for tapping

purpose for the period 8-31 Years is 165480 man days labour were employed, where male labour accounts for 100 per cent. Therefore the total employment for this tapping period is 175896 man days labour, where male labours accounts for 100 per cent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 601 man days labour were employed where male labour accounts for 100 per cent. The total labour employed for tapping purpose for the period 32-34 Years is 12000 man days labour, where male labour accounts for 100 per cent. Therefore the total employment for this tapping period of three years is 12601 man days labour, where male labour accounts for 100 per cent. The total employment generated from rubber plantation for the income group of Rs.5,000-10,000 in the state from 1-34 Years is 208636 man days labour, where male labour accounts for 202887 (97%) mandays and female labour accounts for 5749 (3%) mandays.

3.5.1.3: *Average employment.*

As shown in the Table No.17, the average employment per house hold for the 1st Year is 195.58 mandays, where the average employment per house hold for male and female labour is 145.64 and 49.94 man days respectively. The average employment per hectare for 2-3 Years is 255.76 man days, where the average employment per house hold for male and female labour is 181.33 and 74.42 man days.The average employment per house hold for 4-7 Years is 158.94 man days, where the average employment per house hold for male and female labour is 109.09 and 49.85 respectively. The average employment per house hold for cleaning the field during the tapping period (8-31 Yrs) is 315.64 man days, where male labour accounts for 100 percent. The average employment per house hold for tappers during the tapping period (8-31 Yrs) is 5014.55 man days where male labour accounts for 100 percent.The average employment per house hold during the tapping period (8-31 Yrs) is 5330.18 man days, where male labours accounts for 100 percent. The average employment per house hold for cleaning the field during the tapping period (32-34 Yrs) is 18.21 man days, where male labour accounts for 100 percent, and the average employment per house hold for tappers during the tapping period (32-34 Yrs) are 363.63 man days, where male labour accounts for 100 percent. The average employment per house hold from 1-34 Years is 6322.30 man days, where the average employment per house hold for male and female labour accounts for 6148.09 and 174.21 respectively.

Table No.17. Total Employment: Nagaland. Rs.5,000-10,000. H/H=33.

Year	Items	Total Employment	Male	Female	Average Per H/H	Average Per H/H Male	Average Per H/H Female	% Male	% Female
1	Jungle cutting mulching and burning	2160	1525	635	65.45	46.21	19.24	71	29
	Digging	835	737	98	25.3	22.33	2.97	88	12
	Planting	619	528	91	18.76	16	2.76	85	15
	Clearing 2 times	2840	2016	824	86.06	61.09	24.97	71	29
	total	6454	4806	1648	195.58	145.64	49.94	74	26
2-3	Clearing 3 times	8440	5984	2456	255.76	181.33	74.42	71	29
4-7	Clearing of the field 2 times	5245	3600	1645	158.94	109.09	49.85	69	31
8-31	Clearing of the field 1 time	10416	10416	0	315.64	315.64	0	100	0
8-31	Tappers	165480	165480	0	5014.55	5014.55	0	100	0
32-34	Cleaning of the field 1 time	601	601	0	18.21	18.21	0	100	0
32-34	Tappers	12000	12000	0	363.63	363.63	0	100	0
	G.Total	**208636**	**202887**	**5749**	**6322.3**	**6148.09**	**174.21**	**97**	**3**

Source: Field Survey 2016-17.

3.5.2*: Income Group of Rs.10,000-15,000.*

3.5.2.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 1263 man days labour were employed, out of which 897 (71%) mandays were male labour and 366 (29%) man days were female labour. In the 1st stage of jungle cutting, mulching and burning, a total of 460 man days labour were employed, out of which 326 (71%) mandays were male labour and 134 (29%) man days were female labour. In the 2nd stage of digging of hole for rubber plantation, a total of 181 man days labour were employed, out of which male labour accounts for 163 (90%) mandays and 1810 (10%) man days were female. In the 3rd stage for plantation work, a total of 122 man days labour were employed, out of which 106 (87%) man days were male labour and 16 (13%) man days were female labour. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 500 man days labour were employed, where male labour accounts for 302 (60%) man days and female labour accounts for 198 (40%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 1500 man days labour were employed, out of which 1026 (68%) man days were male labour and 474 (32%) man days of female labour. From 4th to 7 years, a total of 1404 man days labour were employed, where 980 (70%) man days'male labour and 424 (30%) man days of female labour were employed.

3.5.2.2*: Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwardsupto 31 years. It is also to be noted that during this tapping period, no female labour are employed as it is inconvinent and not practical for female labour for the job under the study area. From 8-31 Years (24 Yrs), the field is cleaned only one time in a year for which a total of 2040 man days labour were employed where male labour accounts for 100 per cent. The total labours employed for tapping purpose for the period 8-31 Years is 31680 man days labour were employed where male labour accounts for 100 percent. Therefore the total employment for this tapping period is 33720 man days labour, where male labour accounts for 100 percent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 125 man days labour were employed, where male labour accounts for 100 percent. The total labour employed for tapping purpose for the period

32-34 Years is 2520 man days labour, where male labour accounts for 100 per cent. Therefore the total employment for this tapping period of three years is 2645 man days labou,r where male labour accounts for 100 percent. The total employment generated from rubber plantation for the income group of Rs.10,000-15,000 in the state from 1-34 Years is 40532 man days labour, where male labour accounts for 39268 (97%) mandays and female labour accounts for 1264 (3%) mandays.

3.5.2.3: *Average employment.*

As shown in the Table No.18, the average employment per house hold for the 1st Year is 180.43 man days, where the average employment per house hold for male and female labour is 128.14 and 52.29 respectively. The average employment per house hold for 2-3 Years is 214.29 man days, where the average employment per house hold for male and female labour is 146.57 and 67.71 respectively. The average employment per house hold for 4-7 Years is 200.57 man days, where the average employment per house hold for male and female labour is 140.00 and 60.57 respectively. The average employment per house hold for cleaning the field during the tapping period (8-31 Yrs) is 291.43 man days, where male labour accounts for 100 percent. The average employment per house hold for tappers during the tapping period (8-31 Yrs) is 4525.71 man days, where male labour accounts for 100 percent.The average employment per house hold during the tapping period (8-31 Yrs) is 4817.14 man days, where male labour accounts for 100 percent. The average employment per house hold for cleaning the field during the tapping period (32-34 Yrs) is 17.85 man days, where male labour accounts for 100 percent, and the average employment per house hold for tappers during the tapping period (32-34 Yrs) are 360 man days, where male labour accounts for 100 percent. The average employment per house hold from 1-34 Years is 5790.28 man days, where the average employment per house hold for male and female labour accounts for 5609.71 and 180.57 respectively.

Table No.18. Income Group of Rs.10,000-15,000. H/H=7.

Year	Items	Total Employment	Male	Female	Average Per H/H	Average Per H/H	Average Per H/H	% Male	% Female

						Male	Female		
1	Jungle cutting mulching and burning.	460	326	134	65.71	46.57	19.14	71	29
	Digging	181	163	18	25.86	23.29	2.57	90	10
	Planting	122	106	16	17.43	15.14	2.29	87	13
	Clearing 2 times	500	302	198	71.43	43.14	28.29	60	40
	Total	1263	897	366	180.43	128.14	52.29	71	29
02-3	Clearing 3 times per year.	1500	1026	474	214.29	146.57	67.71	68	32
4-7	Clearing of the field 2 times	1404	980	424	200.57	140	60.57	70	30
8-31	Clearing of the field 1 time per yrs	2040	2040	0	291.43	291.43	0	100	0
8-31	Tappers	31680	31680	0	4525.71	4525.71	0	100	0
32-34	Cleaning of the field 1 time.	125	125	0	17.86	17.86	0	100	0
32-34	Tappers	2520	2520	0	360	360	0	100	0
	G.Total	**40532**	**39268**	**1264**	**5790.28**	**5609.71**	**180.57**	**97**	**3**

Source: Field Survey 2016-17.

3.5.3: *Income Group of Rs.15000-20000.*

3.5.3.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 1877 man days labour were employed, out of which 1290 (69%) man days were male labours and 587 (31%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 620 man days labour were employed, out of which 390 (63%) man days were male labours and 230 (37%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 233 man days labours were employed, out of which male labours accounts for 208 (89%) mandays were male labours and 25 (11%) man days were female labours. In the 3rd stage for plantation work, a total of 164 man days labour were employed, out of which 144 (88%) man days were male labours and 20 (12%) man days were female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 860 man days labour were employed, where male labour accounts for 548 (64%) man days and female labour accounts for 312 (36%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 2580 man days labours were employed, out of which 1794 (70%) man days were male labours and 786 (30%) man days of female labours were employed. From 4th to 7 years, a total of 1183 man days labour were employed, where 788 (67%) man days'male labours and 395 (33%) man days of female labours were employed.

3.5.3.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31 years. It is also to be noted that during this tapping period, no female labour are employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the field is cleaned only one time in a year for which a total of 2760 man days labour were employed, where male labour accounts for 100 per cent. The total labours employed for tapping purpose for the period 8-31 Years is 39600 mandays labour, were employed, where male labour accounts for 100 per cent. Therefore the total employment generated for this tapping period is 42360 man days labour, where male labour accounts for 100 per cent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 180 man days labour were employed, where male labour accounts for 100 per cent. The total labours

employed for tapping purpose for the period 32-34 Years is 2880 man days labour, where male labour accounts for 100 per cent. Therefore the total employment for this tapping period of three years is 3060 man days labour, where male labour accounts for 100 per cent. The total employment generated from rubber plantation for the income group of Rs.15000-20000 in the State from 1-34 Years is 51060 man days labour, where male labour accounts for 49292 (97%) man days and female labour accounts for 1768 (3%) mandays.

3.5.3.3: *Average employment.*

As shown in Table No.19, the average employment per house hold for the 1st Year is 268.14 man days, where the average employment per house hold for male and female labour is 184.29 and 83.86 respectively. The average employment per house hold for 2-3 Years is 368.57 man days, where the average employment per house hold for male and female labour is 256.29 and 112.29 respectively. The average employment per house hold for 4-7 Years is 169.00 man days, where the average employment per house hold for male and female labour is 112.57 man days and 56.43 respectively. The average employment per house hold for cleaning the field during the tapping period (8-31 Yrs) is 394.29 man days, where male and female labour accounts for 100 percent. The average employment per house hold for tappers during the tapping period (8-31 Yrs) is 5657.14 man days, where male labour accounts for 100 percent. The average employment per house hold for cleaning the field during the tapping period (32-34 Yrs) is 25.71 man days, where male labour accounts for 100 percent, and the average employment per house hold for tappers during the tapping period (32-34 Yrs) is 411.43 man days, where male labour accounts for 100 per cent. The average employment per house hold from 1-34 Years is 7294.28 man days, where the average employment per house hold for male and female labour is 7041.71 man days and 252.57 man days respectively.

Table No.19. Income Group of Rs. 15,000-20,000. H/H=7.

Year	Items	Total Employment	Male	Female	Average Per H/H	Average Per H/H Male	Average Per H/H Female	% Male	% Female
1	Jungle cutting mulching and burning	620	390	230	88.57	55.71	32.86	63	37
	Digging	233	208	25	33.29	29.71	3.57	89	11
	Planting	164	144	20	23.43	20.57	2.86	88	12
	Clearing 2 times	860	548	312	122.86	78.29	44.57	64	36
	Total	**1877**	**1290**	**587**	**268.14**	**184.29**	**83.86**	**69**	**31**
2-3	Clearing 3 times	2580	1794	786	368.57	256.29	112.29	70	30
4-7 year	Clearing of the field 2 times	1183	788	395	169	112.57	56.43	67	33
8-31	Clearing of the field 1 time	2760	2760	0	394.29	394.29	0	100	0
8-31	Tappers	39600	39600	0	5657.14	5657.14	0	100	0
32-34	Cleaning of the field 1 time	180	180	0	25.71	25.71	0	100	0
32-34	Tappers	2880	2880	0	411.43	411.43	0	100	0
	G.Total	**51060**	**49292**	**1768**	**7294.29**	**7041.71**	**252.57**	**97**	**3**

Source: Field Survey 2016-17.

3.5.4: *Income Group of Rs.20,000-25,000.*

3.5.4.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 1185 man days labour were employed, out of which 890 (75%) man days were male labours and 295 (25 %) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 378 man days labour were employed, out of which 291 (77%) mandays were male labours and 87 (23%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 144 man days labour were employed, out of which male labour accounts for 125 (87%) mandays and 19 (13%) man days were female labours. In the 3rd stage for plantation work, a total of 123 man days labour were employed, out of which 102 (83%) man days were male labours and 21 (17%) man days were female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 540 man days labour were employed, where male labour accounts for 372 (69%) man days and female labour accounts for 168 (31%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 1620 man days labour were employed, out of which 1116 (69%) man days were male labours and 504 (31%) man days of female labour were employed. From 4th to 7 years, a total of 732 man days labour were employed, where 540 (74%) man days male labour and 192 (26%) man days of female labours were employed.

3.5.4.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31 years. It is also to be noted that during this tapping period, no female labour are employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the field is cleaned only one time in a year for which a total of 2088 man days labour were employed, where male labour accounts for 100 percent. The total labour employed for tapping purpose for the period 8-31 Years is 30240 man days labour were employed, where male labour accounts for 100 percent. Therefore the total employment for this tapping period is 32328 man days labour, where male labour accounts for 100 per cent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 121 man days labour were employed, where male labour accounts for 100 percent. The total labour employed for tapping purpose for the

period 32-34 Years is 2640 man days, where male labour accounts for 100 percent. Therefore the total employment for this tapping period of three years is 2761 man days labour, where male labour accounts for 100 percent. The total employment generated from rubber plantation for the income group of Rs.20,000-25,000 in the state from 1-34 Years is 38626 man days labour, where male labour accounts for 37635 (97%) mandays and female labour accounts 991 (3%) mandays.

3.5.4.3: *Average employment.*

As shown in Table No.20, the average employment per house hold for the 1st Year is 169.29 man days, where the average employment per house hold for male and female labours is 127.14 and 42.14 respectively. The average employment per house hold for 2-3 Years is 231.43 man days, where the average employment per house hold for male and female labours is 159.43 and 72.00 respectively. The average employment per house hold for 4-7 Years is 104.57 man days, where the average employment per house hold for male and female labour is 77.14 and 27.43 respectively. The average employment per house hold for cleaning the field during the tapping period (8-31 Yrs) is 298.29 man days, where male labours accounts for 100 percent. The average employment per house hold for tappers during the tapping period (8-31 Yrs) is 4320.00 man days, where male labour accounts for 100 percent. The average employment per house hold during the tapping period (8-31 Yrs) is 4618.29 man days, where male labour accounts for 100 percent. The average employment per house hold for cleaning the field during the tapping period (32-34 Yrs) is 17.28 man days, where male labour accounts for100 percent, and the average employment per house hold for tappers during the tapping period (32-34 Yrs) is 377.14 man days, where male labour accounts for 100 percent. The average employment per house hold from 1-34 Years is 5518 man days, where the average employment per household for male labour accounts for 5376.42 man days, and the average employment per house hold for female labour accounts for 141.57 man days.

Table No.20. Income Group Rs.20,000-25,000. **H/H= 7**

Year	Items	Total	Male	Female	Average	Average Per H/H	Average	%	%

		Employment			Per H/H	Male	Per H/H Female	Male	Female
1	Jungle cutting mulching and burning	378	291	87	54	41.57	12.43	77	23
	Digging	144	125	19	20.57	17.86	2.71	87	13
	Planting	123	102	21	17.57	14.57	3	83	17
	Clearing 2 times	540	372	168	77.14	53.14	24	69	31
	Total	**1185**	**890**	**295**	**169.29**	**127.14**	**42.14**	**75**	**25**
2-3	Clearing 3 times	1620	1116	504	231.43	159.43	72	69	31
4-7	Clearing of the field 2 times	732	540	192	104.57	77.14	27.43	74	26
8-31	Clearing of the field 1 time	2088	2088	0	298.29	298.29	0	100	0
8-31	Tappiers	30240	30240	0	4320	4320	0	100	0
32-34	Cleaning of the field 1 time	121	121	0	17.29	17.29	0	100	0
32-34	Tappers	2640	2640	0	377.14	377.14	0	100	0
	G.Total	**38626**	**37635**	**991**	**5518**	**5376.42**	**141.57**	**97**	**3**

Source: Field Survey 2016-17.

3.5.5: *Income Group of Rs.25,000-30,000.*

3.5.5.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 1200 man days labour were employed, out of which 894 (75%) man days where male labour, and 306 (25%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 390 man days labour were employed, out of which 255 (65%) man days were male labours, and 135 (35%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 164 man days labour were employed, out of which male labour accounts for 147 (90%) man days, and 17 (10%) man days were female labour. In the 3rd stage for plantation work, a total of 106 man days labour were employed, out of which 94 (89%) man days were male labours, and 12 (11%) man days were female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 540 man days labour were employed, where male labour accounts for 398 (74%) man days, and female labour accounts for 142 (26%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 1520 man days labour were employed, out of which 1114 (73%) man days were male labours and 406 (27%) man days were female labours. From 4th to 7 years, a total of 952 man days labour were employed, where 620 (65%) man days male labours and 332 (35%) man days of female labours were employed.

3.5.5.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31 years. It is also to be noted that during this tapping period, no female labours are employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the field is cleaned only one time in a year for which a total of 1824 man days labour were employed, where male labour accounts for 100 per cent. The total labours employed for tapping purpose for the period 8-31 Years is 21000 man days labour, where male labour accounts for 100 per cent. Therefore the total employment for this tapping period is 22824 man days labour, where male labour accounts for 100 per cent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 120 man days labour were employed, where male labour accounts for 100 per cent. The total labours employed for tapping purpose for the period 32-34 Years is 1440 man days labour, where male labour accounts for 100 percent.

Therefore the total employment generated for this tapping period of three years is 1560 man days labour, where male labour accounts for 100 per cent. The total employment generated from rubber plantation for the income group of Rs.25,000-30,000 in the state from 1-34 Years is 28056 man days labour, where male labour accounts for 27012 (96%) mandays and female labour accounts 1044 (4%) mandays.

3.5.5.3: *Average employment.*

As shown in Table No.21, the average employment per house hold for the 1st Year is 400.00 man days, where the average employment per house hold for male and female labour is 298.00 and 102.00 respectively. The average employment per house hold for 2-3 Years is 506.67 man days, where the average employment per house hold for male and female labour is 371.33 and 135.33 respectively. The average employment per house hold for 4-7 Years is 317.33 man days, where the average employment per house hold for male and female labour is 206.67 and 110.67 respectively. The average employment per house hold for cleaning the field during the tapping period (8-31 Yrs) is 608.00 man days, where male labour accounts for 100 percent. The average employment per house hold for tappers during the tapping period (8-31 Yrs) is 7000 man days, where male labour accounts for 100 percent. The average employment per house hold during the tapping period (8-31 Yrs) is 7608.00 man days, where male labour accounts for 100 percent. The average employment per house hold for cleaning the field during the tapping period (32-34 Yrs) is 40 man days, where male labour accounts for 100 percent. The average employment per house hold for tappers during the tapping period (32-34 Yrs) is 480 man days, where male labour accounts for 100 percent. The average employment per house hold from 1-34 Years is 9352 man days, where the average employment per house holds for male labour accounts for 9004 man days, and the average employment per house hold for female labours accounts for 348 man days.

Table No.21. Income Group Rs.25000-30000. H/H= 3

Year	Items	Total Employment	Male	Female	Average Per H/H	Average Per H/H Male	Average Per H/H Female	% Male	% Female
1	Jungle cutting mulching and burning	390	255	135	130	85	45	65	35
	Digging	164	147	17	54.67	49	5.67	90	10
	Planting	106	94	12	35.33	31.33	4	89	11
	Clearing 2 times	540	398	142	180	132.67	47.33	74	26
	Total	**1200**	**894**	**306**	**400**	**298**	**102**	**75**	25
2-3	Clearing 3 times	1520	1114	406	506.67	371.33	135.33	73	27
4-7	Clearing of the field 2 times	952	620	332	317.33	206.67	110.67	65	35
8-31	Clearing of the field 1 time	1824	1824	0	608	608	0	100	0
8-31	Tappers	21000	21000	0	7000	7000	0	100	0
32-34	Cleaning of the field 1 time.	120	120	0	40	40	0	100	0
32-34	Tappers	1440	1440	0	480	480	0	100	0
	G.Total	**28056**	**27012**	**1044**	**9352**	**9004**	**348**	**96**	4

Source: Field Survey 2016-17.

3.5.6: *Income Group of Rs.30,000-Above.*

3.5.6.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 2850 man days labour were employed, out of which 2148 (75%) man days were male labours and 702 (25%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 840 man days labour were employed, out of which 580 (69%) man days were male labour and 260 (31%) man days were female labour. In the 2nd stage of digging of hole for rubber plantation, a total of 320 man days labour were employed, out of which male labour accounts for 292 (91%) man days and 28 (9%) man days were female labour. In the 3rd stage for plantation work, a total of 210 man days labour were employed, out of which 192 (91%) man days were male labour and 18 (9%) man days were female labour. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 1480 man days labour were employed, where male labour accounts for 1084 (73%) man days, and female labour accounts for 396 (27%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 2040 man days labour were employed, out of which 1452 (71%) man days were male labours and 588 (29%) man days of female labours were employed. From 4th to 7 years, a total of 2120 man days labour were employed, where 1580 (75%) man days male labours and 540 (25%) man days of female labours were employed.

3.5.6.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31 years. It is to be noted that during this tapping period, no female labours are employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the field is cleaned only one time in a year, for which a total of 3720 man days labour were employed, where male labour accounts for 100 per cent. The total labours employed for tapping purpose for the period 8-31 Years is 50400 man days labour, where male labour accounts for 100 per cent. Therefore the total employment generated for this tapping period is 54120 man days labour, where male labour accounts for 100 per cent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 201 man days labour were

employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 32-34 Years is 2160 man days, where male labour accounts for 100 percent. Therefore the total employment generated for this tapping period of three years is 2361 man days labour, where male labour accounts for 100 percent. The total employment generated from rubber plantation for the income group of Rs.30,000-Above in the state from 1-34 Years is 63491 man days, where male labour accounts for 61661 (97%) man days and female labour accounts for 1830 (3%) man days.

3.5.6.3: *Average employment.*

As shown in Table No.22, the average employment per house hold for the 1st Year is 950.00 man days, where the average employment per house hold for male and female labours is 716.00 and 234.00 respectively. The average employment per house hold for 2-3 Years is 680.00 man days, where the average employment per house hold for male and female labours is 484.00 and 196 respectively. The average employment per house hold for 4-7 Years is 706.67 man days, where the average employment per house hold for male labour is 526.67 and 180 respectively. The average employment per house hold for cleaning the field during the tapping period (8-31 Yrs) is 1240 man days, where male labour accounts for 100 percent. The average employment per house hold for tappers during the tapping period (8-31 Yrs) is 16800 man days, where male labour accounts for 100 percent. The average employment per house hold during the tapping period (8-31 Yrs) is 18040 man days, where male labour accounts for 100 percent. The average employment per house hold for cleaning the field during the tapping period (32-34 Yrs) is 67 man days, where male labour accounts for 100 percent, and the average employment per house hold for tappers during the tapping period (32-34Yrs) is 720 man days where male labour accounts for 100 percent. The average employment per house hold from 1-34 Years is 21163.67 man days, where the average employment per house hold for male labour accounts for 20553.66 man days, and the average employment per house hold for female labour accounts for 610 man days.

Table No.22. Income Group Rs.30000-Above. H/H=3.

Year	Items	Total Employment	Male	Female	Average Per H/H	Average Per H/H Male	Average Per H/H Female	% Male	% Female
1	Jungle cutting mulching and burning	840	580	260	280	193.33	86.6667	69	31
	Digging	320	292	28	106.667	97.333	9.33333	91	9
	Planting	210	192	18	70	64	6	91	9
	Clearing 2 times	1480	1084	396	493.333	361.33	132	73	27
	Total	**2850**	**2148**	**702**	**950**	**716**	**234**	**75**	**25**
2-3	Clearing 3 times	2040	1452	588	680	484	196	71	29
4-7	Clearing of the field 2 times	2120	1580	540	706.667	526.67	180	75	25
8-31	Clearing of the field 1 time	3720	3720	0	1240	1240	0	100	0
8-31	Tappers	50400	50400	0	16800	16800	0	100	0
32-34	Cleaning of the field 1 time	201	201	0	67	67	0	100	0
32-34	Tappers	2160	2160	0	720	720	0	100	0

	G.Total	**63491**	**61661**	**1830**	**21163.67**	**20553.66**	**610**	**97**	**3**

Source: Field Survey 2016-2017.

3.6: Total Employment (Hectare Wise): Wokha.

The total employment generated from rubber plantation for the district from 1-34 Years is 286144 man days labour, where male labour accounts for 276538 (97%) man days and female labour accounts for 9606 (3%) mandays.The average employment per hectare from 1-34 Years is 3179.38 man days, where the average employment per hectare for male and female labour is 3072.64 man days and 106.73 man days respectively. **3.6.3:** *Average employment***.**

As shown in Table No.23, the average employment per hectare for the 1st Year is 115.31 man days, where the average employment per hectare for male and female labour is 84.27 and 31.04 respectively. The average employment per hectare for 2-3 Years is 128.33 man days, where the average employment per hectare for male and female labour is 89.53 and 38.80 respectively. The average employment per hectare for 4-7 Years is 108.49 man days, where the average employment per hectare for male and female labour is 71.60 and 36.89 respectively. The average employment per hectare for cleaning the field during the tapping period (8-31 Yrs) is 157.87 man days, where male labours accounts for 100 percent. The average employment per hectare for tappers during the tapping period (8-31 Yrs) is 2520 man days, where male labour accounts for 100 percent. The average employment per hectare for cleaning the field during the tapping period (32-34 Yrs) is 9.38 man days, where male labour accounts for 100 percent, and the average employment per hectare for tappers during the tapping period (32-34Yrs) is 140 man days, where male labour accounts for 100 percent.

The overall correlation between farm size and employment for the district shows a positive relationship with r=0.97. Since the value of r is more than six times the probable error (P.Er=0.1163), the co-efficient of correlation between farm size and employment is significant which shows that as the farm size increases, the employment also increases. The co-efficient of

determinants on r^2 value shows that 94% of the variation in employment is explained by the farm size X, the regression values of employment (Y) on farm size (X) gave us.

$$Y= a+bx, \qquad Y= 1944.703+2531.144X$$

The result shows that the regression co-efficient byx is 2531.144. This explains that a unit change in farm size will lead to a change in employment by 2531.144. The p-value of 'byx' is 1.26E-19 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

3.6.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 10378 man days labour were employed, out of which 7584 (73%) man days were male labours and 2794 (27%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 3430 man days labours were employed, out of which 2330 (68%) man days were male labours and 1100 (32%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 1387 man days labours were employed, out of which male labour accounts for 1258 (91%) man days were male labours and 129 (9%) man days were female. In the 3rd stage for plantation work, a total of 851 man days labours were employed, out of which 752 (88%) man days were male labours and 99 (12%) man days were female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 4710 man days labours were employed, where male labours accounts for 3244 (69%) man days and female labours accounts for 1466 (31%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 11550 man days labours were employed, out of which 8058 (70%) man days were male labours and 3492 (30%) man days of female labours were employed. From 4th to 7 years, a total of 9764 man days labours were employed, where 6444 (66%) man days male labours and 3320 (34%) man days of female labours were employed.

3.6.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31 years. It is also to be noted that during this tapping period, no female labours are employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the

field is cleaned only one time in a year for which a total of 14208 man days labours were employed, where male labour accounts for 100 per cent. The total labours employed for tapping purpose for the period 8-31 Years is 226800 man days labours, where male labour accounts for 100 per cent. Therefore the total employment generated for this tapping period is 241008 man days labour, where male labours accounts for 100 per cent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 844 man days labours were employed, where male labour accounts for 100 per cent. The total labours employed for tapping purpose for the period 32-34 Years is 12600 man days, where male labour accounts for 100 per cent. Therefore the total employment for this tapping period from 32-34 Years is 13444 man days labour, where male labour accounts for 100 per cent.

Table No.23. Total Employment (Hectare Wise): Wokha. Total Hectare 90.

Year	Items	Total Employment	Male	Female	Average Per Hectare	Average Per Hectare Male	Average Per Hectare Female	% Male	% Female
1	Jungle cutting mulching and burning	3430	2330	1100	38.11	25.89	12.22	68	32
	Digging	1387	1258	129	15.41	13.98	1.43	91	9
	Planting	851	752	99	9.46	8.36	1.1	88	12
	Clearing 2 times	4710	3244	1466	52.33	36.04	16.29	69	31
	Total	**10378**	**7584**	**2794**	**115.31**	**84.27**	**31.04**	**73**	**27**
02-3	Clearing 3 times	11550	8058	3492	128.33	89.53	38.8	70	30
4-7	Clearing of the field 2 times	9764	6444	3320	108.49	71.6	36.89	66	34
8-31	Clearing of the field 1 time	14208	14208	0	157.87	157.87	0	100	0
8-31	Tappers	226800	226800	0	2520	2520	0	100	0
32-34	Cleaning of the field 1 time	844	844	0	9.38	9.38	0	100	0
32-34	Tappers	12600	12600	0	140	140	0	100	0
	G.Total	**286144**	**276538**	**9606**	**3179.38**	**3072.64**	**106.73**	**97**	**3**

Source: Field Survey 2016-2017.

3.7: Small Farm Size: Wokha.

The total employment generated from rubber plantation for the small farm size in the district from 1-34 Years is 69574 mandays labour where male labour accounts for 67763 (97%) mandays and female labour accounts 1811(3%) mandays. It was also found that the average employment per hectare from 1-34 Years is 4638.27 man days, where the average employment per hectare for male and female labour accounts for 4517.53 and 120.73 respectively.

As shown in Table No.24, the average employment per hectare for the 1st Year is 105.77 man days, where the average employment per hectare for male and female labours is 1166 and 413 respectively. The average employment per hectare for 2-3 Years is 130.67 man days, where the average employment per hectare for male and female labour is 1370 and 590 respectively. The average employment per hectare for 4-7 Years is 133.33 man days, where the average employment per hectare for male and female labour is 1192 and 808 respectively. The average employment per hectare for cleaning the field during the tapping period (8-31 Yrs) is 108.80 man days, where male labour accounts for 100 percent. The average employment per hectare for cleaning the field during the tapping period (32-34 Yrs) is 8.20 man days, where male labour accounts for 100 percent, and the average employment per hectare for tappers during the tapping period (32-34 Yrs) is 240 man days, where male labour accounts for 100 percent.

The correlation between farm size and employment for small farm size in the district shows a positive relationship with r=0.94. Since the value of r is more than six times the probable error (P.Er=0.0234), the co-efficient of correlation between farm size and employment is significant which shows that as the farm size increases, the employment also increases. The co-efficient of determinants on r^2 value shows that 88% of the variation in employment is explained by the farm size X, the regression values of employment (Y) on farm size (X) gave us.

$Y= a+bx,$ $Y= 4358.65+1732.5X$

The result shows that the regression co-efficient byx is 1732.5. This explains that a unit change in Farm Size will lead a change in employment by 1732.5. The p-value of 'byx' is 2.92E-05 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

3.7.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 1579 man days labour were employed, out of which 1166 (74%) man days were male labours and 413 (26%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 530 man days labour were employed, out of which 365 (69%) mandays were male labours and 165(31%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 228 man days labours were employed, out of which male labour accounts for 203 (89%) man days and 25 (11%) man days were female labour. In the 3rd stage for plantation work, a total of 141 man days labour were employed, out of which 120 (85%) man days were male labours and 21(15%) man days were female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 680 man days labour were employed, where male labour accounts for 478 (70%) man days and female labour accounts for 202 (30%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 1960 man days labour were employed, out of which 1370 (70%) man days were male labours and 590 (30%) man days of female labours were employed. From 4th to 7 years, a total of 2000 man days labour were employed, where 1192 (60%) man days'male labours and 808 (40%) man days of female labour were employed.

3.7.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8thYears onwards upto 31 years. It is also to be noted that during this tapping period, no female labours are employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the field is cleaned only one time in a year for which a total of 2712 man days labour were employed, where male labour accounts for 100 per cent. The total labours employed for tapping purpose for the period 8-31 Years is 57600 man days, where male labour accounts for 100 per cent. From 32-34 Years, the field is cleaned only one time in a year for which a total of

123 man days labour were employed, where male labour accounts for 100 per cent. The total labours employed for tapping purpose for the period 32-34 Years is 3600 man days labour, where male labour accounts for 100 per cent. Therefore the total employment generated for this tapping period from 32-34 Years is 3723 man days labour, where male labour accounts for 100 per cent.

Table No.24. Small Farm Size. **Total Hectare =15.**

Year	Items	Total Employment	Male	Female	Average Per Hectare	Average Per Hectare Male	Average Per Hectare Female	% Male	% Female
1	Jungle cutting mulching and burning	530	365	165	35.33	24.33	11	69	31
	Digging	228	203	25	15.2	13.53	1.67	89	11
	Planting	141	120	21	9.4	8	1.4	85	15
	Clearing 2 times	680	478	202	45.33	31.87	13.47	70	30
	Total	**1579**	**1166**	**413**	**105.27**	**77.73**	**27.53**	**74**	**26**
2-3	Clearing 3 times	1960	1370	590	130.67	91.33	39.33	70	30
4-7	Clearing of the field 2 times	2000	1192	808	133.33	79.47	53.87	60	40
8-31	Clearing of the field 1 time	2712	2712	0	180.8	180.8	0	100	0
8-31	Tappers	57600	57600	0	3840	3840	0	100	0
32-34	Cleaning of the field 1 time	123	123	0	8.2	8.2	0	100	0
32-34	Tappers	3600	3600	0	240	240	0	100	0
	G.Total	**69574**	**67763**	**1811**	**4638.27**	**4517.53**	**120.73**	**97**	**3**

Source: Field Survey 2016-2017.

3.8: Medium Farm Size: Wokha.

The total of employment generated from rubber plantation for the Medium farm Size in the District from 1-34 Years is 104150 mandays labour where male labour accounts for 100164 (96.%) mandays and female labour accounts 3986 (4%) mandays. It was also found that the average employment per hectare from 1-34 Years is 2853.42 man days, where the average employment per hectare for male and female labour accounts for 2744.21 and 109.205 respectively.

As shown in Table No.25, the average employment per hectare for the 1st Year is 104.44 man days, where the average employment per hectare for male and female labour is 77.48 and 26.96 respectively. The average employment per hectare for 2-3 Years is 124.66 man days, where the average employment per hectare for male and female labour is 82.96 and 41.70 respectively. The average employment per hectare for 4-7 Years is 115.18 man days, where the average employment per hectare for male and female labour is 74.63 and 40.55 respectively. The average employment per hectare for cleaning the field during the tapping period (8-31 Yrs) is 152.55 man days, where male labour accounts for 100 percent. The average employment per hectare for tappers during the tapping period (8-31 Yrs) is 2209.32 man days, where male labour accounts for 100 percent. The average employment per hectare for cleaning the field during the tapping period (32-34 Yrs) is 336 man days, where male labour accounts for 100 per cent, and the average employment per hectare for tappers during the tapping period (32-34 Yrs) is 5040 man days, where male labour accounts for 100 percent.

The correlation between farm size and employment for medium farm size in the district shows a positive relationship with r=0.97. Since the value of r is more than six times the probable error (P.Er=0.0102), the co-efficient of correlation between farm size and employment is significant which shows that as the farm size increases, the employment also increases. The co-efficient of determinants on r^2 value shows that 95% of the variation in employment is explained by the farm size X, the regression values of employment (Y) on farm size (X) gave us.

Y= a+bx, Y= 5973.581+562.188X

The result shows that the regression co-efficient byx is 562.188. This explains that a unit change in farm size will lead to a change in employment by 562.188. The p-value of 'byx' is 1.19E-09 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

3.8.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 3812 man days labour were employed, out of which 2828 (74%) man days were male labour and 984 (26%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 1340 man days labours were employed, out of which 1005 (75%) man days were male labours and 335 (25%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 566 man days labours were employed, out of which male labour accounts for 518 (92%) man days, and 48 (8%) man days were female labour. In the 3rd stage for plantation work, a total of 356 man days labour were employed, out of which 309 (87%) man days were male labours and 47 (13%) man days were female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 1550 man days labour were employed, where male labour accounts for 996 (64%) man days and female labour accounts for 554 (36%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 4550 man days labour were employed, out of which 3028 (67%) man days were male labour and 1522 (33%) man days of female labour were employed. From 4th to 7 years, a total of 4204 man days labour were employed, where 2724 (65%) man days male labour and 1480 (35%) man days of female labours were employed.

3.8.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31 years, It is also to be noted that during this tapping period, no female labours are employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the field is cleaned only one time in a year for which a total of 5568 man days labour were

employed, where male labour accounts for 100 per cent. The total labours employed for tapping purpose for the period 8-31 Years is 80640 man days labour, where male labour accounts for 100 per cent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 336 man days labour were employed, where male labour accounts for 100 per cent. The total labour employed for tapping purpose for the period 32-34 Years is 5040 man days labour, where male labour accounts for 100 per cent. Therefore the total employment generated for this tapping period from 32-34 Years is 5076 man days labour, where male labour accounts for 100 per cent. The total employment generated from rubber plantation for the medium farm size in the district from 1-34 Years is 144884 man days, where male labour accounts for 141585 (98%) mandays and female labour accounts 3299 (2%) mandays.

Table No.25: Medium Farm Size: Wokha. **Total Hectare =36.5**

Year	Items	Total Employment	Male	Female	Average Per Hectare	Average Per Hectare Male	Average Female Per Hectare	% Male	% Female
1	Jungle cutting mulching and burning	1340	1005	335	36.71	27.53	9.18	75	25
	Digging	566	518	48	15.51	14.19	1.32	92	8
	Planting	356	309	47	9.75	8.47	1.29	87	13
	Clearing 2 times	1550	996	554	42.47	27.29	15.18	64	36
	Total	**3812**	**2828**	**984**	**104.44**	**77.48**	**26.96**	**74**	**26**
2-3	Clearing 3 times	4550	3028	1522	124.66	82.96	41.7	67	33
4-7	Clearing of the field 2 times	4204	2724	1480	115.18	74.63	40.55	65	35
8-31	Clearing of the field 1 time	5568	5568	0	152.55	152.55	0	100	0
8-31	Tappers	80640	80640	0	2209.32	2209.32	0	100	0
32-34	Cleaning of the field 1 time	336	336	0	9.205479	9.205479	0	100	0

32-34	Tappers	5040	5040	0	138.0822	138.0822	0	100	0
	G.Total	**104150**	**100164**	**3986**	**2853.42**	**2744.21**	**109.205**	**96**	**4**

Source: field Survey 2016-2017.

3.9: Large Farm Size: Wokha.

The total employment generated from rubber plantation for the large farm size in the district from 1-34 Years is 112420 mandays labour where male labour accounts for 108611 (97%) mandays and female labour accounts 3809 (3%) mandays. It was also found that the average employment per hectare from 1-34 Years is 2920 man days, where the average employment per hectare for male and female labour is 2821.06 man days, and 98.94 man days respectively.

As shown in Table No.26, the average employment per hectare for the 1st Year is 129.53 man days, where the average employment per hectare for male and female labour is 93.25 and 36.29 respectively. The average employment per hectare for 2-3 Years is 130.91 man days, where the average employment per hectare for male and female labour is 95.06 and 35.84 respectively. The average employment per hectare for 4-7 Years is 92.47 man days, where the average employment per hectare for male and female labour is 65.66 and 26.81 respectively. The average employment per hectare for cleaning the field during the tapping period (8-31 Yrs) is 153.97 man days, where male labour accounts for 100 percent. The average employment per hectare for tappers during the tapping period (8-31 Yrs) is 2300.26 man days, where male labour accounts for 100 percent. The average employment per hectare for cleaning the field during the tapping period (32-34 Yrs) is 385 man days, where male labour accounts for 100 percent, and the average employment per hectare for tappers during the tapping period (32-34 Yrs) is 3960 man days, where male labour accounts for 100 percent.

The correlation between farm size and employment for large farm size in the district, shows a positive relationship with r=0.98. Since the value of r is more than six times the probable error (P.Er=0.0110), the co-efficient of correlation between farm size and employment is significant which shows that as the farm size increases, the employment also increases. The

co-efficient of determinants on r^2 value shows that 96% of the variation in employment is explained by the farm size X, the regression values of Employment (Y) on farm size (X) gave us.

Y= a+bx, Y= 2156.404+2583.937X

The result shows that the regression co-efficient byx is 2583.937. This explains that a unit change in farm size will lead to a change in employment by 2583.937. The p-value of 'byx' is 0.000507 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

3.9.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 4987 man days labour were employed, out of which 3590 (72%) mandays were male labour and 1397 (28%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 1560 man days labour were employed, out of which 960 (62%) man days were male labours and 600 (38%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 593 man days labour were employed, out of which male labour accounts for 537 (91%) man days were male labours and 56 (9%) man days were female. In the 3rd stage for plantation work, a total of 354 man days labour were employed, out of which 323 (91%) man days were male labours and 31 (9%) man days were female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 2480 man days labour were employed, where male labour accounts for 1770 (71%) man days and female labour accounts for 710 (29%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 5040 man days labours were employed, out of which 3660 (73%) man days were male labour and 1380 (27%) man days were female labour. From 4th to 7 years, a total of 3560 man days labour were employed, where 2528 (71%) man days male labour and 1032 (29%) man days of female labours were employed.

3.9.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31 years. It is also to be noted that during this tapping period, no female labours are employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the

field is cleaned only one time in a year for which a total of 5928 man days labour were employed, where male labours accounts for 100 per cent. The total labours employed for tapping purpose for the period 8-31 Years is 88560 mandays labour, where male labour accounts for 100 per cent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 385 man days labour were employed, where male labour accounts for 100 per cent. The total labours employed for tapping purpose for the period 32-34 Years is 3960 man days labour, where male labour accounts for 100 per cent. Therefore the total employment generated for this tapping period from 32-34 Years is 4345 man days labour, where male labour accounts for 100 per cent. The total employment generated from rubber plantation for the large farm size in the district from 1-34 Years is 112420 man days labour, where male labour accounts for 108611 (97%) mandays and female labour accounts 3809 (3%) mandays.

Table No.26: Large Farm Size. Total Hectare=38.5

Year	Items	Total Employment	Male	Female	Average Per Hectare	Average Per Hectare Male	Average Per Hectare Female	% Male	% Female
1	Jungle cutting mulching and burning	1560	960	600	40.52	24.94	15.58	62	38
	Digging	593	537	56	15.4	13.95	1.45	91	9
	Planting	354	323	31	9.19	8.39	0.81	91	9
	Clearing 2 times	2480	1770	710	64.42	45.97	18.44	71	29
	Total	**4987**	**3590**	**1397**	**129.53**	**93.25**	**36.29**	**72**	**28**
2-3	Clearing 3 times	5040	3660	1380	130.91	95.06	35.84	73	27
4-7	Clearing of the field 2 times	3560	2528	1032	92.47	65.66	26.81	71	29
8-31	Clearing of the field 1 time	5928	5928	0	153.97	153.97	0	100	0
8-31	Tappers	88560	88560	0	2300.26	2300.26	0	100	0
32-34	Cleaning of the field 1 time	385	385	0	10	10	0	100	0
32-34	Tappers	3960	3960	0	102.86	102.86	0	100	0
	G.Total	**112420**	**108611**	**3809**	**2920**	**2821.06**	**98.94**	**97**	**3**

Source: Field Survey 2016-2017.

3.10: Total Employment (Income Wise): Wokha.

The total employment generated from different income group through rubber plantation in the district is discussed.

3.10.1: *Income Group of Rs.5,000-10,000.*

3.10.1.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 4073 man days labour were employed, out of which 3031 (74%) man days were male labours and 1042 (26%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 1390 man days labour were employed, out of which 970 (70%) man days were male labours and 420 (30%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 570 man days labours were employed, out of which male labour accounts for 514 (90%) man days were and 56 (10%) man days were female labours. In the 3rd stage for plantation work, a total of 353 man days labour were employed, out of which 305 (86%) man days were male labours and 48 (14%) man days were female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, For which 1760 man days labours were employed, where male labour accounts for 1242 (71%) man days and female labour accounts for 518 (29%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 5200 man days labours were employed, out of which 3662 (70%) man days were male labours and 1538 (30%) man days of female labours were employed. From 4th to 7 years, a total of 4360 man days labour were employed, where 2824 (65%) man days'male labours and 1536 (35%) man days of female labours were employed.

3.10.1.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31 years. It is also to be noted that during this tapping period, no female labours are employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the field is cleaned only one time in a year for which a total of 6048 man days labour were

employed, where male labour accounts for 100 per cent. The total labours employed for tapping purpose for the period 8-31 Years is 1,08,000 man days labours were employed where male labour accounts for 100 per cent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 319 man days labours were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 32-34 Years is 6120 man days labour, where male labour accounts for 100 percent. Therefore the total employment generated for this tapping period from 32-34 Years is 6439 man days labour, where male labour accounts for 100 percent. The total employment generated from rubber plantation for the income group of Rs.5000-10000 in the district from 1-34 Years is 134120 man days labour, where male labour accounts for 130004 (97%) man days and female labour accounts for 4116 (3%) mandays.

3.10.1.3: *Average employment.*

As shown in Table No.27, the average employment per house hold for the 1st Year is 239.59 man days, where the average employment per house hold for male and female labours is 178.29 and the 61.29 respectively. The average employment per hectare for 2-3 Years is 30.88 man days, where the average employment per house hold for male and female labours is 215.41 and 90.47 respectively. The average employment per house hold for 4-7 Years is 256.47 man days, where the average employment per house hold for male and female labour is 166.12 and 90.35 respectively. The average employment per house hold for cleaning the field during the tapping period (8-31 Yrs) is 355.76 man days, where male labour accounts for 100 percent. The average employment per house hold for tappers during the tapping period (8-31 Yrs) is 6352.94 man days, where male labour accounts for 100 percent. The average employment per house hold for cleaning the field during the tapping period (32-34 Yrs) is 18.76 man days, where male labour accounts for 100 percent, and the average employment per house hold for tappers during the tapping period (32-34 Yrs) is 360 man days, where male labour accounts for 100 percent. The average employment per house hold from 1-34 Years is 7889.41 man days, where the average employment per house hold for male and female labour accounts for 7647.29 and 241.12 respectively.

Table No.27: Income Group of Rs.5,000-10,000. Total H/H=17.

Year	Items	Total Employment	Male	Female	Average Per H/H	Average Per H/H Male	Average Per H/H Female	% Male	% Female
1	Jungle cutting mulching and burning	1390	970	420	81.76	57.06	24.71	70	30
	Digging	570	514	56	33.53	30.24	3.29	90	10
	Planting	353	305	48	20.76	17.94	2.82	86	14
	Clearing 2 times	1760	1242	518	103.53	73.06	30.47	71	29
	Total	**4073**	**3031**	**1042**	**239.59**	**178.29**	**61.29**	**74**	**26**
02-3	Clearing 3 times	5200	3662	1538	305.88	215.41	90.47	70	30
4-7	Clearing of the field 2 times	4360	2824	1536	256.47	166.12	90.35	65	35
8-31	Clearing of the field 1 time	6048	6048	0	355.76	355.76	0	100	0
8-31	Tappers	108000	108000	0	6352.94	6352.94	0	100	0
32-34	Cleaning of the field 1 time	319	319	0	18.76	18.76	0	100	0
32-34	Tappers	6120	6120	0	360	360	0	100	0
	G.Total	**134120**	**130004**	**4116**	**7889.41**	**7647.29**	**242.12**	**97**	**3**

Source: Field Survey 2016-2017.

3.10.2: *Income Group of Rs.10,000-15,000.*

3.10.2.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 1003 man days labour were employed, out of which 707 (70%) man days were male labours and 296 (30%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 380 man days labour were employed, out of which 270 (71%) man days were male labours and 110 (29%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 156 man days labour were employed, out of which male labour accounts for 142 (91%) man days and 14 (9%) man days were female labour. In the 3rd stage for plantation work, a total of 97 man days labour were employed, out of which 85 (88%) man days were male labours and 12 (12%) man days were female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 370 man days labour were employed, where male labours accounts for 210 (57%) man days and female labour accounts for 160 (43%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 1110 man days labour were employed, out of which 750 (68%) man days were male labours and 360 (32%) man days of female labours were employed. From 4th to 7 years, a total of 1040 man days labours were employed, where 640 (62%) man days male labour and 400 (38%) man days of female labours were employed.

3.10.2.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards, upto 31 years. It is also to be noted that during this tapping period, no female labours were employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the field is cleaned only one time in a year for which a total of 1512 man days labour were employed, where male labour accounts for 100 per cent. The total labours employed for tapping purpose for the period 8-31 Years is 23040 man days labours were employed, where male labour accounts for 100 per cent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 93 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 32-34 Years is 1440 man days labour were employed, where male labour accounts for 100 percent. Therefore the

total employment generated for this tapping period from 32-34 Years is 1533 man days labour, where male labour accounts for 100 per cent. The total employment generated from rubber plantation for the income group of Rs.10,000-15,000 in the district from 1-34 Years is 29,238 man days labour, where male labour accounts for 28182 (96%) man days and female labour accounts 1056 (4%) man days.

3.10.2.3: *Average employment.*

As shown in the Table No.28, the average employment per house hold for the 1st Year is 250.75 man days, where the average employment per house hold for male and female labours is 176.75 and 74 respectively. The average employment per hectare for 2-3 Years is 2775.5 man days, where the average employment per house hold for male and female labours is 187.5 and 90 respectively. The average employment per house hold for 4-7 Years is 260 man days, where the average employment per house hold for male and female labour is 160 and 100 respectively. The average employment per house hold for cleaning the field during the tapping period (8-31 Yrs) is 378 man days, where male labours accounts for 100 percent. The average employment per house hold for tappers during the tapping period (8-31 Yrs) is 5760 man days, where male labour accounts for 100 percent.The average employment per house hold during the tapping period (8-31 Yrs) is 6138 man days, where male labour accounts for 100 percent. The average employment per house hold for cleaning the field during the tapping period (32-34 Yrs) is 23.25 man days, where male labour accounts for 100 percent and the average employment per house hold for tappers during the tapping period (32-34 Yrs) are 360 man days, where male labour accounts for 100 percent. The average employment per house hold from 1-34 Years for the district is 73095 man days, where the average employment per house hold for male and female labour 7045.5 and 264 respectively.

Table No.28: Income Group Rs.10000-15000. H/H=4.

Year	Items	Total Employment	Male	Female	Average Per H/H	Average Per H/H Male	Average Per H/H Female	% Male	% Female
1	Jungle cutting mulching and burning	380	270	110	95	67.5	27.5	71	29
	Digging	156	142	14	39	35.5	3.5	91	9
	Planting	97	85	12	24.25	21.25	3	88	12
	Clearing 2 times	370	210	160	92.5	52.5	40	57	43
	Total	**1003**	**707**	**296**	**250.75**	**176.75**	**74**	**70**	**30**
2-3	Clearing 3 times	1110	750	360	277.5	187.5	90	68	32
4-7	Clearing of the field 2 times	1040	640	400	260	160	100	62	38
8-31	Clearing of the field 1 time	1512	1512	0	378	378	0	100	0
8-31	Tappers	23040	23040	0	5760	5760	0	100	0
32-34	Cleaning of the field 1 time	93	93	0	23.25	23.25	0	100	0

32-34	Tappers	1440	1440	0	360	360	0	100	0
	G.Total	**29238**	**28182**	**1056**	**73095**	**7045.5**	**264**	**96**	**4**

Source: Field Survey 2016-2017.

3.10.3: *Income Group of Rs.15,000-20,000.*

3.10.3.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 1366 man days labour were employed, out of which 918 (67%) man days were male labours and 448 (33%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 460 man days labour were employed, out of which 280 (61%) man days were male labours and 180 (39%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 178 man days labours were employed, out of which male labour accounts for 161 (90%) man days, and 17 (10%) man days were female labour. In the 3rd stage for plantation work, a total of 108 man days labour were employed, out of which 97 (90%) man days were male labours and 11 (10%) man days were female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 620 man days labour were employed, where male labour accounts for 380 (61%) man days and female labour accounts for 240 (39%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 1860 man days labours were employed, out of which 1290 (69%) man days were male labours and 570 (31%) man days of female labours were employed. From 4th to 7 years, a total of 1004 man days labour were employed, where 628 (63%) man days male labour and 376 (37%) man days of female labours were employed.

3.10.3.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31years. It is to be noted that during this tapping period, no female labours are employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the field is cleaned only one time in a year for which a total of 1776 man days labour were employed where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 8-31 Years is 2808 man days labour were employed, where male labour accounts for 100 per cent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 124 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 32-34 Years is 1440 man days labour were employed, where male labour accounts for 100 percent. Therefore the total employment generated for this tapping period from 32-34 Years is 1564 man days labour, where male labour accounts for 100 percent. The total employment generated from rubber plantation for the income group of Rs.15,000-20,000 in the district from 1-34 Years is 35650 man days labour, where male labour accounts for 34256 (96%) man days and female labour accounts for 1394 (4%) mandays.

3.10.3.3: *Average employment.*

As shown in Table No.29, the average employment per house hold for the 1st Year is 455.33 man days, where the average employment per house hold for male and female labours is 306.00 and 149.33 respectively. The average employment per house hold for 2-3 Years is 620.00 man days, where the average employment per house hold for male and female labours is 430.00 and 190.00 respectively. The average employment per house hold for 4-7 Years is 334.67 man days, where the average employment per house hold for male and female labour is 209.33 and 125.33 respectively. The average employment per house hold for cleaning the field during the tapping period (8-31 Yrs) is 592.00 man days, where male labour accounts for 100 percent. The average employment per house hold for tappers during the tapping period (8-31 Yrs) is 9360.00 man days, where male labour accounts for 100 percent. The average employment per house hold during the tapping period (8-31 Yrs) is 9952.00 man days, where

male labours accounts for 100 percent. The average employment per house hold for cleaning the field during the tapping period (32-34 Yrs) is 41.33 man days, where male labour accounts for 100 percent, and the average employment per house hold for tappers during the tapping period (32-34 Yrs) is 480 man days, where male labour accounts for 100 percent. The average employment per hectare from 1-34 Years for the district is 11883.33 man days, where the average employment per house hold for male and female labours is 11418.66 man days and 464.67 man days respectively.

Table No.29: Income Group Rs.15000-20000. H/H=3

Year	Items	Total Employment	Male	Female	Average Per H/H	Average Per H/H Male	Average Per H/H Female	% Male	% Female
1	Jungle cutting mulching and burning	460	280	180	153.33	93.33	60	61	39
	Digging	178	161	17	59.33	53.67	5.67	90	10
	Planting	108	97	11	36	32.33	3.67	90	10
	Clearing 2 times	620	380	240	206.67	126.67	80	61	39
	Total	**1366**	**918**	**448**	**455.33**	**306**	**149.33**	**67**	**33**
2-3	Clearing 3 times	1860	1290	570	620	430	190	69	31
4-7	Clearing of the field 2 times	1004	628	376	334.67	209.33	125.33	63	37
8-31	Clearing of the field 1 time	1776	1776	0	592	592	0	100	0
8-31	Tappers	28080	28080	0	9360	9360	0	100	0
32-34	Cleaning of the field 1 time	124	124	0	41.33	41.33	0	100	0

32-34	Tappers	1440	1440	0	480	480	0	100	0
	G.Total	**35650**	**34256**	**1394**	**11883.33**	**11418.66**	**464.67**	**96**	**4**

Source: Field Survey 2016-2017.

3.10.4: *Income Group of Rs.20,000-25,000.*

3.10.4.1: *Total employment upto the bearing period.*

In the first year, a total of 420 man days labour were employed, out of which 321(76%) man days were male labours and 99 (24%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 140 man days labours were employed, out of which 110 (79%) man days were male labour and 30 (21%) man days were female labour. In the 2nd stage of digging of hole for rubber plantation, a total of 61 man days labour were employed, out of which male labour accounts for 56 (92%) man days, and 5 (8%) man days were female labour. In the 3rd stage for plantation work, a total of 39 man days labour were employed, out of which 33 (85%) man days were male labour and 6 (15%) man days were female labour. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 180 man days labour were employed, where male labour accounts for 122 (68%) man days and female labour accounts for 58 (32%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 540 man days labour were employed, out of which 366 (68%) man days were male labour and 174 (32%) man days of female labours were employed. From 4th to 7 years, a total of 480 man days labour were employed, where 320 (67%) man days male labours and 160 (33%) man days of female labours were employed.

3.10.4.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31 years. It is also to be noted that during this tapping period, no female labours are employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the

field is cleaned only one time in a year for which a total of 624 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 8-31 Years is 11520 man days labour were employed, where male labour accounts for 100 percent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 41 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 32-34 Years is 720 man days labour, where male labour accounts for 100 percent. Therefore the total employment generated for this tapping period from 32-34 Years is 761 man days labour, where male labour accounts for 100 percent. The total employment generated from rubber plantation for the the income group of Rs.20,000-25,000 in the district from 1-34 Years is 14345 man days labour, where male labour accounts for 13912 (97%) man days and female labour accounts for 433 (3%) mandays.

3.10.4.3: *Average employment (1-34 Years).*

As shown in Table No.30, the average employment per house hold for the 1st Year is 210 man days, where the average employment per house hold for male and female labours is 160.5 and 49.5 respectively. The average employment per house hold for 2-3 Years is 270 man days, where the average employment per house hold for male labours is 183 and 87 respectively. The average employment per house hold for 4-7 Years is 240 man days, where the average employment per house hold for male and female labour is160 and 80 respectively. The average employment per house hold for cleaning the field during the tapping period (8-31 Yrs) is 312 man days. where male labour accounts for 100 percent. The average employment per house hold for tappers during the tapping period (8-31 Yrs) is 5760 man days, where male labour accounts for 100 percent. The average employment per house hold for cleaning the field during the tapping period (32-34 Yrs) is 20.50 man days, where male labour accounts for 100 percent, and the average employment per house hold for tappers during the tapping period (32-34 Yrs) is 360 man days, where male labour accounts for 100 percent. The average employment per house hold from 1-34 Years is 7172.50 man days, where the average employment per house hold for male and female labour is 6956 and 216.50 respectively.

Table No.30: Income Group Rs.20,000 -25,000. H/H=2

Year	Items	Total Employment	Male	Female	Average Per H/H	Average Per H/H Male	Average Per H/H Female	% Male	% Female
1	Jungle cutting mulching and burning	140	110	30	70	55	15	79	21
	Digging	61	56	5	30.5	28	2.5	92	89
	Planting	39	33	6	19.5	16.5	3	85	15
	Clearing 2 times	180	122	58	90	61	29	68	32
	Total	**420**	**321**	**99**	**210**	**160.5**	**49.5**	**76**	**24**
2-3	Clearing 3 times	540	366	174	270	183	87	68	32
4-7	Clearing of the field 2 times	480	320	160	240	160	80	67	33
8-31	Clearing of the field 1 time	624	624	0	312	312	0	100	0
8-31	Tappers	11520	11520	0	5760	5760	0	100	0
32-34	Cleaning of the field 1 time	41	41	0	20.5	20.5	0	100	0
32-34	Tappers	720	720	0	360	360	0	100	0

	G.Total	**14345**	**13912**	**433**	**7172.5**	**6956**	**216.5**	**97**	**3**

Source: Field Survey 2016-2017.

3.10.5: *Income Group of Rs.25,000-30,000.*

3.10.5.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 1036 man days labour were employed, out of which 783 (76%) man days were male labours and 253 (24%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 340 man days labour were employed, out of which 220 (65%) man days were male labours and 120 (35%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 147 man days labour were employed, out of which male labour accounts for 133 (90%) man days and 14 (10%) man days were female labours. In the 3rd stage for plantation work, a total of 89 man days labour were employed, out of which 80 (90%) man days were male labours and 9 (10%) man days were female labours. The field is also cleaned 2 times in the first year, after all the above mentioned works are completed, for which 460 man days labour were employed, where male labour accounts for 350 (76%) man days and female labour accounts for 110 (24%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 1280 man days labours were employed, out of which 970 (76%) man days were male labours and 310 (24%) man days of female labours were employed. From 4th to 7 years, a total of 920 man days labours were employed, where 592 (64%) man days male labours and 328 (36%) man days of female labours were employed.

3.10.5.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31 years. It is also to be noted that during this tapping period, no female labours are employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the field is cleaned only one time in a year for which a total of 1488 man days labour were

employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 8-31 Years is 17280 man days labour, where male labour accounts for 100 percent. From 32-34 Years, the field is cleaned only one time in a year, for which a total of 102 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 32-34 Years is 1080 man days labour, where male labour accounts for 100 percent. Therefore the total employment generated for this tapping period from 32-34 Years is 1182 man days labour, where male labours accounts for 100 percent. The total employment generated from rubber plantation for the income group of Rs.25,000-30,000, in the district from 1-34 Years is 23186 man days labour, where male labour accounts for 22295 (96%) man days and female labour accounts for 891 (4%) mandays labour.

3.10.5.3*: Average employment (1-34 Years).*

As shown in Table No.31, the average employment per house hold for the 1st Year is 518 man days, where the average employment per house hold for male and female labours is 391.5 and 126.5 respectively. The average employment per house hold for 2-3 Years is 640 man days labour, where the average employment per house hold for male and female labours is 485 and 155 respectively. The average employment per house hold for 4-7 Years is 460 man days labour, where the average employment per house hold for male and female labour is 296 and 164 respectively. The average employment per house hold for cleaning the field during the tapping period (8-31 Yrs) is 744 man days labour, where male labour accounts for 100 percent. The average employment per house hold for tappers during the tapping period (8-31 Yrs) is 8640 man days labour, where male labour accounts for 100 percent. The average employment per house hold during the tapping period (8-31 Yrs) is 9384 man days labour, where male labours accounts for 100 percent. The average employment per house hold for cleaning the field during the tapping period (32-34 Yrs) is 51 man days labour, where male labour accounts for 100 percent, and the average per house hold for tappers during the tapping period (32-34 Yrs) is 540 man days labour, where male labour accounts for 100 percent. The average employment

per house hold from 1-34 Years is 11593 man days labour, where the average employment per house hold for male and female labours is 111475 man days, and 445.50 man days respectively.

Table No.31: Income Group Rs.25,000-30,000. H/H=2

Year	Items	Total Employment	Male	Female	Average Per H/H	Average Per H/H Male	Average Per H/H Female	(%) Male	(%) Female
1	Jungle cutting mulching and burning	340	220	120	170	110	60	65	35
	Digging	147	133	14	73.5	66.5	7	90	10
	Planting	89	80	9	44.5	40	4.5	90	10
	Clearing 2 times	460	350	110	230	175	55	76	24
	Total	**1036**	**783**	**253**	**518**	**391.5**	**126.5**	**76**	**24**
2-3	Clearing 3 times	1280	970	310	640	485	155	76	24
4-7	Clearing of the field 2 times	920	592	328	460	296	164	64	36
8-31	Clearing of the field 1 time	1488	1488	0	744	744	0	100	0
8-31	Tappers	17280	17280	0	8640	8640	0	100	0
32-34	Cleaning of the field 1 time	102	102	0	51	51	0	100	0
32-34	Tappers	1080	1080	0	540	540	0	100	0

	G.Total	**23186**	**22295**	**891**	**11593**	**111475**	**445.5**	**96**	**4**

Source: Field Survey 2016-2017.

3.10.6: *Income Group of Rs. 30,000-Above.*

3.10.6.1: *Total employment upto the bearing period (1-7 Years):*

In the first year, a total of 2480 man days labour were employed, out of which 1824 (74%) man days were male labours and 656 (26%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 720 man days labour were employed, out of which 480 (67%) man days were male labours and 240 (33%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 275 man days labour were employed, out of which male labour accounts for 252 (92%) man days and 23 (8%) man days were female labours. In the 3rd stage for plantation work, a total of 165 man days labour were employed, out of which 152 (92%) man days were male labours and 13 (8%) man days were female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 1320 man days labour were employed, where male labour accounts for 940 (71%) man days and female labour accounts for 380 (29%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 1560 man days labours were employed, out of which 1020 (68%) man days were male labours and 540 (65%) man days of female labours were employed. From 4th to 7 years, a total of 1960 man days labours were employed, where 1440 (73%) man days male labours and 520 (27%) man days of female labours were employed.

3.10.6.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31 years. It is also to be noted that during this tapping period, no female labours are employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the field is cleaned only one time in a year for which a total of 2760 man days labours were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 8-31 Years is 38880 man days labour, where male labour accounts for

100 percent. From 32-34 Years, the field is cleaned only one time in a year, for which a total of 165 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 32-34 Years is 1800 man days labour, where male labour accounts for 100 percent. Therefore the total employment generated for this tapping period from 32-34 Years is 1965 man days labour, where male labour accounts for 100 percent. The total employment generated from rubber plantation for the income group of Rs.30,000-Above, in the district from 1-34 Years is 49605 man days labour, where male labour accounts for 47889 (97%) mandays and female labour accounts for 1716 (3%) mandays.

3.10.6.3: *Average employment (1-34 Years).*

As shown in Table No.32, the average employment per house hold for the 1st Year is 1240 man days labour, where the average employment per house hold for male and female labours is 912 and 328 respectively. The average employment per house hold for 2-3 Years is 780 man days, where the average employment per house hold for male and female labours is 510 and 270 respectively. The average employment per house hold for 4-7 Years is 980 man days, where the average employment per house hold for male and female labour is 720 and 260 respectively. The average employment per house hold for cleaning the field during the tapping period (8-31 Yrs) is 1380 man days, where male labour accounts for 100 percent. The average employment per house hold for tappers during the tapping period (8-31 Yrs) is 19440 man days labour, where male labour accounts for 100 percent. The average employment per house hold during the tapping period (8-31 Yrs) is 20820 man days labour, where male labour accounts for 100 percent. The average employment per house hold for cleaning the field during the tapping period (32-34 Yrs) is 82.50 man days labour, where male labour accounts for 100 percent, and the average employment per house hold for tappers during the tapping period (32-34 Yrs) is 900 man days, where male labour accounts for 100 percent. The average employment per house hold from 1-34 Years is 24802.50 man days labour, where the average employment per house hold for male and female labourr is 23944.5 man days labour and the 858 man days labour respectively.

Table No.32: Income Group Rs.30,000-Above. H/H=2.

Year	Items	Total Employment	Male	Female	Average Per H/H	Average Per H/H Male	Average Per H/H Female	% Male	% Female
1	Jungle cutting mulching and burning	720	480	240	360	240	120	67	33
	Digging	275	252	23	137.5	126	11.5	92	8
	Planting	165	152	13	82.5	76	6.5	92	8
	Clearing 2 times	1320	940	380	660	470	190	71	29
	Total	**2480**	**1824**	**656**	**1240**	**912**	**328**	**74**	**26**
2-3	Clearing 3 times	1560	1020	540	780	510	270	65	35
4-7	Clearing of the field 2 times	1960	1440	520	980	720	260	73	27
8-31	Clearing of the field 1 time	2760	2760	0	1380	1380	0	100	0
8-31	Tappers	38880	38880	0	19440	19440	0	100	0
32-34	Cleaning of the field 1 time	165	165	0	82.5	82.5	0	100	0
32-34	Tappers	1800	1800	0	900	900	0	100	0
	G.Total	**49605**	**47889**	**1716**	**24802.5**	**23944.5**	**858**	**97**	**3**

Source: Field Survey 2016-2017.

3.11: Total Employment (Hectare Wise): Mokokchung.

The total employment generated from rubber plantation for the District from 1-34 Years is 144257 mandays where male labour accounts for 141317 (98%) mandays and female labour accounts for 3040 (2%) mandays. It was also found that the average employment per hectare from 1-34 Years is 2646.92 man days labour, where the average employment per hectare for male and female labours is 2592.97 and 55.78 respectively.

As shown in Table No.33, the average employment per hectare for the 1st Year is 88.15 man days labour, where the average employment per hectare for male and female labours is 88.15 and 88.15 respectively. The average employment per hectare for 2-3 Years is 120 man days labour, where the average employment per hectare for male and female labours is 120 and 120 respectively. The average employment per hectare for 4-7 Years is 26.31 man days labour, where the average employment per hectare for male and female labour is 26.31 and 26.31 respectively. The average employment per hectare for cleaning the field during the tapping period (8-31 Yrs) is 154.10 man days labour, where male labour accounts for 100 percent. The average employment per hectare for tappers during the tapping period (8-31 Yrs) is 2304 man days labour, where male labour accounts for 100 percent. The average employment per hectare during the tapping period (8-31 Yrs) is 1800 man days labour, where male labour accounts for 100 percent. The average employment per hectare for cleaning the field during the tapping period (32-34 Yrs) is 9.25 man days labour, where male labour accounts for 100 percent, and the average employment per hectare for tappers during the tapping period (32-34 Yrs) is 202.57 man days labour, where male labour accounts for 100 percent

The overall correlation between size of farming per hectare and employment for the district shows a positive relationship with r=0.97. Since the value of r is more than six times the probable error (P.Er=0.00615), the co-efficient of correlation between farm size and employment is significant which shows that as the size of farm increases, the employment also increases. The co-efficient of determinants on r^2 value shows that 95% of the variation in

employment is explained by the farm size X, the regression values of employment (Y) on farm size (X) gave us.

Y= a+bx, Y= 1177.149+1998.946X

The result shows that the regression co-efficient byx is 1998.946. This explains that a unit change in farm size will lead a change in employment by 1998.946. The p-value of 'byx' is 1.05E-20 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

3.11.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 4451 man days labour were employed, out of which 3341 (75.06%) man days were male labours and 1110 (24.93%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 1418 man days labour were employed, out of which 1037 (73.13%) man days were male labours and 381 (26.86%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 490 man days labours were employed, out of which male labour accounts for 414 (84.49%) man days, and 76 (15.51%) man days were female labours. In the 3rd stage for plantation work, a total of 493 man days labours were employed, out of which 414 (83.97%) man days were male labours and 79 (16.02%) man days were female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 2050 man days labour were employed, where male labour accounts for 1476 (72%) man days and female labour accounts for 574 (28%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 6150 man days labour were employed, out of which 4428 (72%) man days were male labours and1722 (28%) man days of female labours were employed. From 4th to 7 years, a total of 1872 man days labour were employed, where 1664 (94.23%) man days male labour and 208 (11.11%) man days of female labours were employed.

3.11.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31 years. It is also to be noted that during this tapping period, no female labours are employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the

field is cleaned only one time in a year, for which a total of 8640 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 8-31 Years is 8640 man days labour, where male labour accounts for 100 percent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 504 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 32-34 Years is 11040 man days labour, where male labour accounts for 100 percent. Therefore the total employment generated for this tapping period from 32-34 Years is 11544 man days labour, where male labour accounts for 100 percent. The total employment generated from rubber plantation for the district from 1-34 Years is 144257 man days labour, where male labour accounts for 141317 (98%) mandays and female labour accounts 3040 (2%) man days.

Table No.33: Total Employment (Hectare Wise): Mokokchung. Hectare= 54.5

Year	Items	Total Employment	Male	Female	Average Per Hectare	Average Per Hectare Male	Average Per Hectare Female	% Male	% Female
1	Jungle cutting mulching and burning	1418	1037	381	26.02	19.03	6.99	73	27
	Digging	490	414	76	8.99	7.6	1.39	84	16
	Planting	493	414	79	9.05	7.6	1.45	84	16
	Clearing 2 times	2050	1476	574	37.61	27.08	10.53	72	28
	Total	**4451**	**3341**	**1110**	**81.67**	**61.3**	**20.37**	**75**	**25**
2-3	Clearing 3 times	6150	4428	1722	112.84	81.25	31.6	72	28
4-7	Clearing of the field 2 times	1872	1664	208	34.35	32.37	3.82	94	12
8-31	Clearing of the field 1 time	8640	8640	0	158.53	158.53	0	100	0
8-31	Tappers	111600	111600	0	2047.71	2047.71	0	100	0
32-34	Cleaning of the field 1 time	504	504	0	9.25	9.25	0	100	0
32-34	Tappers	11040	11040	0	202.57	202.57	0	100	0

	G.Total	**144257**	**141217**	**3040**	**2646.92**	**2592.97**	**55.78**	**98**	**2**

Source: Field Survey 2016-17.

3.12: Total Employment (Small Farm Size): Mokokchung.

The total employment generated from rubber plantation for the Small farm Size in the District from 1-34 Years is 75310 mandays labour where male labour accounts for 73822 (98%) mandays and female labour accounts for 1488 (2%) mandays. It was also found that the average employment per hectare from 1-34 Years is 3012.40 man days labour, where the average employment per hectare for male and female labour accounts for 2952.88 and 59.52 respectively.

As shown in Table No.34, the average employment per hectare for the 1st Year is 84.24 man days labour, where the average employment per hectare for male and female labours is 62.4 and 21.84 respectively. The average employment per hectare for 2-3 Years is 121.2 man days labour, where the average employment per hectare for male and female labours is 86.88 and 34.32 respectively. The average employment per hectare for 4-7 Years is 43.36 man days labour, where the average employment per hectare for male and female labour is 40 and 3.36 respectively. The average employment per hectare for cleaning the field during the tapping period (8-31 Yrs) is 161.28 man days labour, where male labour accounts for 100 percent. The average employment per hectare for tappers during the tapping period (8-31 Yrs) is 2304 man days labour, where male labour accounts for 100 percent. The average employment per hectare for cleaning the field during the tapping period (32-34 Yrs) is 10.32 man days labour, where male labour accounts for 100 percent, and the average employment per hectare for tappers during the tapping period (32-34 Yrs) is 288 man days labour, where male labour accounts for 100 percent.

The correlation between farm size and employment for the small farm size in the district shows a positive relationship with r=0.98. Since the value of r is more than six times the probable error (P.Er=0.0045), the co-efficient of correlation between farm size and employment is significant, which shows that as the farm size increases, the employment also increases. The co-efficient of determinants on r^2 value shows that 97% of the variation in employment is explained by the farm size X, the regression values of Employment (Y) on farm size (X) gave us.

Y= a+bx, Y= 3060+564.4X

The result shows that the regression co-efficient byx is 564.4. This explains that a unit change in farm size will lead a change in employment by 564.4. The p-value of 'byx' is 2.43E-15 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

3.12.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 2106 man days labour were employed, out of which 1560 (74%) man days were male labours and 546 (26%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 638 man days labour were employed, out of which 456 (71%) man days were male labours and 182 (29%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 228 man days labour were employed, out of which male labour accounts for 190 (83%) man days, and female labour accounts for 40 (17%) man days. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 1010 man days labour were employed, where male labour accounts for 724 (72%) man days and female labour accounts for 286 (28%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 3030 man days labours were employed, out of which 2172 (72%) man days were male labours and 858 (28%) man days of female labours were employed. From 4th to 7 years, a total of 1084 man days labour were employed, where 1000 (92%) man days'male labours and 84 (8%) man days of female labours were employed.

3.12.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31 years. It is also to be noted that during this tapping period, no female labours are employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the field is cleaned only one time in a year for which a total of 4032 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 8-31 Years is 57600 man days labour, where male labour accounts for 100 percent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 258 man days labour were employed, where male labour accounts for 100 per cent. The total labours employed for tapping purpose for the period 32-34 Years is 7200 man days labour, where male labour accounts for 100 percent. Therefore the total employment for this tapping period from 32-34 Years is 7458 man days labour, where male labour accounts for 100 percent. The total employment generated from rubber plantation for the small farm size in the district from 1-34 Years is 75310 man days labour, where male labour accounts for 73822 (98%) mandays and female labour accounts for 1488 (2%) man days.

Table No.34: Total Employment (Small Farm Size): Mokokchung. Total Hectare=25.

Year	Items	Total Employment	Male	Female	Average Per Hectare	Average Per Hectare Male	Average Per Hectare Female	% Male	% Female
1	Jungle cutting mulching and burning	638	456	182	25.52	18.24	7.28	71	29
	Digging	228	190	38	9.12	7.6	1.52	83	17
	Planting	230	190	40	9.2	7.6	1.6	83	17
	Clearing 2 times	1010	724	286	40.4	28.96	11.44	72	28
	Total	**2106**	**1560**	**546**	**84.24**	**62.4**	**21.84**	**74**	**26**
2-3	Clearing 3 times	3030	2172	858	121.2	86.88	34.32	72	28
4-7	Clearing of the field 2 times	1084	1000	84	43.36	40	3.36	92	8
8-31	Clearing of the field 1 time	4032	4032	0	161.28	161.28	0	100	0
8-31	Tappers	57600	57600	0	2304	2304	0	100	0
32-34	Cleaning of the field 1 time	258	258	0	10.32	10.32	0	100	0
32-34	Tappers	7200	7200	0	288	288	0	100	0
	G.Total	**75310**	**73822**	**1488**	**3012.4**	**2952.88**	**59.52**	**98**	**2**

Source: Field Survey 2016-17.

3.13: Total Employment (Medium Farm Size): Mokokchung.

The total employment generated from rubber plantation for the Medium farm Size in the District from 1-34 Years is 44877 mandays labour where male labour accounts for 43620 (97%) mandays and female labour accounts for 1257 (3%) mandays. It was also found that the average employment per hectare from 1-34 Years is 2361.95 man days labour, where the average employment per hectare for male and female labours is 2295.78 and 66.16 respectively.

As shown in Table No.35, the average employment per hectare for the 1st Year is 88.16 man days labour, where the average employment per hectare for male and female labours is 64.21 and 23.95 respectively. The average employment per hectare for 2-3 Years is 120 man days labour, where the average employment per hectare for male and female labour is 81.79 and 38.21 respectively. The average employment per hectare for 4-7 Years is 26.32 man days labour, where the average employment per hectare for male and female labour is 22.32 and 4 respectively. The average employment per hectare for cleaning the field during thetapping period (8-31 Yrs) is 154.11. where male labour accounts for 100 percent. The average employment per hectare for tappers during the tapping period (8-31 Yrs) is 1800 man days labour, where male labour accounts for100 percent. The average employment per hectare for cleaning the field during the tapping period (32-34 Yrs) is 9.16 man days labour, where male labour accounts for100 percent, and the average employment per hectare for tappers during the tapping period (32-34 Yrs) is 164.21 man days labour, where male labour accounts for 100 percent.

3.13.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 1675 man days labour were employed, out of which 1220 (73%) man days were male labours and 455 (27%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 560 man days labour were employed, out of which 406 (73%) man days were male labours and 154 (28%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 177 man days labours were employed, out of which male labour accounts for 148 (84%) mandays and 29 (16%) man days were female labours. In the 3rd stage for plantation work, a total of 170 man

days labour were employed, out of which 148 (83%) man days were male labours and 30 (17%) man days were female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 760 man days labour were employed, where male labour accounts for 518 (68%) man days and female labour accounts for 242 (32%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 2280 man days labour were employed, out of which 1554 (68%) man days were male labours and 726 (32%) man days of female labours were employed. From 4th to 7 years, a total of 500 man days labour were employed, where 424 (85%) man days male labour and 76 (15%) man days of female labours were employed.

3.13.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31 years. It is also to be noted that during this tapping period, no female labours are employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the field is cleaned only one time in a year for which a total of 2928 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 8-31 Years is 34200 man days labours were employed, where male labour accounts for 100 percent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 174 man days labours were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 32-34 Years is 3120 man days labour were employed, where male labour accounts for 100 percent. Therefore the total employment generated for this tapping period from 32-34 Years is 3294 man days labour, where male labour accounts for 100 percent. The total employment generated from rubber plantation for the medium farm size in the district from 1-34 Years is 44877 man days labour, where male labour accounts for 43620 (97%) man days and female labour accounts for 1257 (3%) man days.

Table No.35: Total Employment (Medium Farm Size): Mokokchung. Total Hectare=19.

Year	Items	Total Employment	Male	Female	Average Per Hectare	Average Per Hectare Male	Average Per Hectare Female	% Male	% Female
1	Jungle cutting mulching and burning	560	406	154	29.47	21.37	8.11	73	28
	Digging	177	148	29	9.32	7.79	1.53	84	16
	Planting	178	148	30	9.37	7.79	1.58	83	17
	Clearing 2 times	760	518	242	40	27.26	12.74	68	32
	Total	**1675**	**1220**	**455**	**88.16**	**64.21**	**23.95**	**73**	**27**
2-3	Clearing 3 times	2280	1554	726	120	81.79	38.21	68	32
4-7	Clearing of the field 2 times	500	424	76	26.32	22.32	4	85	15
8-31	Clearing of the field 1 time	2928	2928	0	154.11	154.11	0	100	0
8-31 years	Tappers	34200	34200	0	1800	1800	0	100	0
32-34	Cleaning of the field 1 time	174	174	0	9.16	9.16	0	100	0
32-34	**Tappers**	3120	3120	0	2361.95	164.21	0	100	0
	G.Total	**44877**	**43620**	**1257**	**164.21**	**2295.78**	**66.16**	**97**	3

Source: Field Survey 2016-17.

3.14: Total Employment (Large Farm Size): Mokokchung.

The total employment generated from rubber plantation for the Large Farm Size in the District from 1-34 Years is 24070 mandays labour where male labour accounts for 23775 (99%) mandays and female labour accounts 295 (1%) mandays. It was also found that the average employment per hectare from 1-34 Years is 2292.38 where the average employment per hectare for male and female labours is 2264.28 and 28.10 respectively.

As shown in Table No.36, the average employment per hectare for the 1st Year is 63.81 man days labour, where the average employment per hectare for male and female labours is 53.43 and 10.38 respectively. The average employment per hectare for 2-3 Years is 80 man days labour, where the average employment per hectare for male and female labours is 66.86 and 13.14 respectively. The average employment per hectare for 4-7 Years is 27.43 man days labour, where the average employment per hectare for male and female labour is 22.86 and 4.57 respectively. The average employment per hectare for cleaning the field during the tapping period (8-31 Yrs) is 160 man days labour, where male labour accounts for 100 percent. The average employment per hectare for tappers during the tapping period (8-31 Yrs) is 1885.71 man days labour, where male labour accounts for 100 percent. The average employment per hectare for cleaning the field during the tapping period (32-34 Yrs) is 6.86 man days labour, where male labour accounts for 100 percent, and the average employment per hectare for tappers during the tapping period (32-34 Yrs) is 68.57 man days labour, where male labour accounts for 100 percent.

The correlation between farm size and employment for both medium farm size and large farm size in the district is combined and calculated, because their total farm size is very small. The result shows a positive relationship with r=0.98. Since the value of r is more than six times the probable error (P.Er=0.0063), the co-efficient of correlation between farm size and employment is significant which shows that as the farm size increases, the employment also increases. The co-efficient of determinants on r^2 value shows that 97% of the variation in

employment is explained by the farm size X, the regression values of employment (Y) on farm size (X) gave us.

Y= a+bx, Y= 89.46741+2306.859X

The result shows that the regression co-efficient byx is 2306.859. This explains that a unit change in farm size will lead to a change in employment by 2306.859. The p-value of 'byx' is 6.89E-08, which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

3.14.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 670 man days labour were employed, out of which 561 (83.73%) man days were male labours and 109 (16.26%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 220 man days labour were employed, out of which 175 (79.54%) man days were male labours and 45 (20.45%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 85 man days labours were employed, out of which male labour accounts for 76 (89.41%) man days and 9 (10.58%) man days were female labour. In the 3rd stage for plantation work, a total of 85 man days labour were employed, out of which 76 (89.41%) man days were male labours and 9 (10.58%) man days were female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 280 man days labour were employed, where male labour accounts for 234 (83.57%) man days and female labour accounts for 46 (16.42%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 840 man days labours were employed, out of which 702 (83.57%) man days were male labours and 138 (16.42%) man days of female labours were employed. From 4th to 7 years, a total of 288 man days labour were employed, where 240 (83.33%) man days'male labours and 48 (16.66%) man days of female labours were employed.

3.14.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31 years. It is also to be noted that during this tapping period, no female labours are employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the

field is cleaned only one time in a year for which a total of 1680 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 8-31 Years is 19800 man days labour, where male labour accounts for 100 percent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 72 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 32-34 Years is 720 man days labour, where male labour accounts for 100 percent. Therefore the total employment generated for this tapping period from 32-34 Years is 792 man days labour, where male labour accounts for 100 percent. The total employment generated from rubber plantation for the large farm size in the district from 1-34 Years is 24070 man days labour, where male labour accounts for 23775 (99%) mandays and female labour accounts for 295 (1%) mandays.

Table No.36. Total Employment (Large Farm Size): Mokokchung. Total Hectare=10.5.

Year	Items	Total Employment	Male	Female	Average Per Hectare	Average Per Hectare Male	Average Per Hectare Female	% Male	% Female
1	Jungle cutting mulching and burning	220	175	45	20.95	16.67	4.29	80	20
	Digging	85	76	9	8.1	7.24	0.86	89	11
	Planting	85	76	9	8.1	7.24	0.86	89	11
	Clearing 2 times	280	234	46	26.67	22.29	4.38	84	16
	Total	**670**	**561**	**109**	**63.81**	**53.43**	**10.38**	**84**	16
2-3	Clearing 3 times	840	702	138	80	66.86	13.14	84	16

4-7	Clearing of the field 2 times	288	240	48	27.43	22.86	4.57	83	17
8-31	Clearing of the field 1 time	1680	1680	0	160	160	0	100	0
8-31	Tappers	19800	19800	0	1885.71	1885.71	0	100	0
32-34	Cleaning of the field 1 time	72	72	0	6.86	6.86	0	100	0
32-34	Tappers	720	720	0	68.57	68.57	0	100	0
	G.Total	**24070**	**23775**	**295**	**2292.38**	**2264.28**	**28.1**	**99**	**01**

Source: Field Survey 2016-17.

3.15: Total Employment (Income-Wise): Mokokchung.

The total employment generated from different income group through rubber plantation in the district is discussed below.

3.15.1: *Income Group of Rs.5,000-10,000.*

3.15.1.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 2381 man days labour were employed, out of which 1775 (75%) man days were male labours and 606 (25%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 770 man days labour were employed, out of which 555 (72%) man days were male labours and 215 (28%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 265 man days labours were employed, out of which male labour accounts for 223 (84%) man days, and 42 (16%) man days were female labours. In the 3rd stage for plantation work, a total of 266 man days labour were employed, out of which 223 (84%) man days were male labours and 43 (16%) man days were female labours. The field is also cleaned 2 times in the first year, after all the

above mentioned works are completed, for which 1080 man days labour were employed, where male labour accounts for 774 (72%) man days and female labour accounts for 306 (28%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 3240 man days labour were employed, out of which 2322 (72%) man days were male labours and 918 (28%) man days of female labours were employed. From 4th to 7 years, a total of 885 man days labour were employed, where 776 (88%) man days'male labours and 109 (12%) man days of female labours were employed.

3.15.1.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31 years, It is also to be noted that during this tapping period, no female labours are employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the field is cleaned only one time in a year for which a total of 4368 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 8-31 Years is 57480 man days labours were employed, where male labour accounts for 100 percent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 282 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 32-34 Years is 5880 man days labour, where male labour accounts for 100 percent. Therefore the total employment generated for this tapping period from 32-34 Years is 6162 man days labour, where male labour accounts for 100 percent. The total employment generated from rubber plantation for the income group of Rs.5,000-10,000/- in the district from 1-34 Years is 74516 man days labour, where male labour accounts for 72883 (98%) mandays and female labour accounts for 1633 (2%) man days.

3.15.1.3: *Average employment (1-34 Years).*

As shown in Table No.37, the average employment per house hold for the 1st Year is 148.5 man days, where the average employment per house hold for male and female labours is 110.93 and 37.87 respectively. The average employment per house hold for 2-3 Years is 202.5 man days, where the average employment per house hold for male and female labours is

145.12 and 57.37 respectively. The average employment per hectare for 4-7 Years is 55.31 man days, where the average employment per house hold for male and female labour is 48.5 and 6.81 respectively. The average employment per house hold for cleaning the field during the tapping period (8-31 Yrs) is 273 man days, where male labours accounts for 100 percent. The average employment per house hold for tappers during the tapping period (8-31 Yrs) is 273 man days, where male labour accounts for 100 percent. The average employment per hectare during the tapping period (8-31 Yrs) is 1800 man days, where male labour accounts for 100 percent. The average employment per house hold for cleaning the field during the tapping period (32-34 Yrs) is 17.63 man days, where male labour accounts for 100 percent, and the average employment per house hold for tappers during the tapping period (32-34 Yrs) is 367.50 man days, where male labour accounts for 100 percent. The average employment per house hold from 1-34 Years is 4657.25 man days, where the average employment per house hold for male and female labours is 4555.18 and 102.06 respectively.

Table No.37: Total Employment (Rs.5,000-10,000): Mokokchung. H/H- 16.

Year	Items	Total Employment	Male	Female	Average Per H/H	Average Per H/H Male	Average Per H/H Female	% Male	% Female
1	Jungle cutting mulching and burning	770	555	215	48.13	34.69	13.44	72	28%
	Digging	265	223	42	16.56	13.94	2.63	84	16%
	Planting	266	223	43	16.63	13.94	2.69	84	16%
	Clearing 2 times	1080	774	306	67.5	48.38	19.13	72	28%
	Total	**2381**	**1775**	**606**	**148.81**	**110.94**	**37.88**	**75**	**25**
2-3	Clearing 3 times	3240	2322	918	202.5	145.13	57.38	72	28
4-7	Clearing of the field 2 times	885	776	109	55.31	48.5	6.81	88	12
8-31	Clearing of the field 1 time	4368	4368	0	273	273	0	100	0
8-31	Tappers	57480	57480	0	3592.5	3592.5	0	100	0
32-34	Cleaning of the field 1 time	282	282	0	17.63	17.63	0	100	0
32-34	Tappers	5880	5880	0	367.5	367.5	0	100	0

	G.Total	**74516**	**72883**	**1633**	**4657.25**	**4555.18**	**102.06**	**98**	**2**

Source: Field Survey 2016-17.

3.15.2: *Income Group of Rs.10,000-15,000: Mokokchung.*

3.15.2.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 260 man days labour were employed, out of which 190 (73%) man days were male labours and 70 (27%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 80 man days labour were employed, out of which 56 (70%) man days were male labours and 24 (30%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 25 man days labours were employed, out of which male labour accounts for 21 (84%) man days and 4 (16%) man days were female. In the 3rd stage for plantation work, a total of 25 man days labour were employed, out of which 21 (84%) man days were male labours and 4 (16%) man days were female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 130 man days labour were employed, where male labour accounts for 92 (71%) man days and female labour accounts for 38 (29%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 390 man days labour were employed, out of which 276 (71%) man days were male labours and 114 (29%) man days of female labours were employed. From 4th to 7 years, a total of 364 man days labour were employed, where 340 (93%) man days male labours and 24 (7%) man days of female labours were employed.

3.15.2.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31 years. It is also to be noted that during this tapping period, no female labours are employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the field is cleaned only one time in a year for which a total of 528 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 8-31 Years is 8640 man days labour, where male labour accounts for 100 percent. From 32-34 Years, the field is cleaned only one time in a year for which a total of

32 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 32-34 Years is 1080 man days labour, where male labour accounts for 100 percent. Therefore the total employment generated for this tapping period from 32-34 Years is 1112 man days labour, where male labour accounts for 100 percent. The total employment generated from rubber plantation for the income group of Rs.10,000-15,000 in the District from 1-34 Years is 11294 man days labour, where male labour accounts for 11086 (98%) mandays and female labour accounts for 208 (2%) man days.

3.15.2.3: *Average employment (1-34 Years).*

As shown in Table No.38, the average employment per house hold for the 1st Year is 86.67 man days, where the average employment per hectare for male and female labours is 63.33 and 23.33 respectively. The average employment per house hold for 2-3 Years is 130 man days labour, where the average employment per house hold for male and female labours is 92 and 38 respectively. The average employment per hectare for 4-7 Years is 121.33 where the average employment per house hold for male labour is 113.33 and 8 respectively. The average employment per house hold for cleaning the field during the tapping period (8-31 Yrs) is 176 man days labour, where male labour accounts for 100 percent. The average employment per house hold for tappers during the tapping period (8-31 Yrs) is 2880 man days labour, where male labour accounts for 100 percent. The average employment per house hold for cleaning the field during the tapping period (32-34 Yrs) is 10.67 where male labour accounts for 100 percent, and the average employment per house hold for tappers during the tapping period (32-34 Yrs) is 360, where male labour accounts for 100 percent. The average employment per house hold from 1-34 Years is 3764.67 man days labour, where the average employment per house hold for male and female labours is 3695.33 and 69.33 respectively.

Table No.38: Total Employment (Rs.10,000-15,000): Mokokchung. H/H = 3.

Year	Items	Total Employment	Male	Female	Average Per H/H	Average Per H/H Male	Average Per H/H	% Male	% Female

							Female		
1	Jungle cutting mulching and burning	80	56	24	26.67	18.67	8	70	30
	Digging	25	21	4	8.33	7	1.33	84	16
	Planting	25	21	4	8.33	7	1.33	84	16
	Clearing 2 times	130	92	38	43.33	30.67	12.67	71	29
	Total	**260**	**190**	**70**	**86.67**	**63.33**	**23.33**	**73**	**27**
2-3	Clearing 3 times	390	276	114	130	92	38	71	29
4-7	Clearing of the field 2 times	364	340	24	121.33	113.33	8	93	7
8-31	Clearing of the field 1 time	528	528	0	176	176	0	100	0
8-31	Tappers	8640	8640	0	2880	2880	0	100	0
32-34	Cleaning of the field 1 time	32	32	0	10.67	10.67	0	100	0
32-34	Tappers	1080	1080	0	360	360	0	100	0
	G.Total	**11294**	**11086**	**208**	**3764.67**	**3695.33**	**69.33**	**98**	**2**

Source: Field Survey 2016-17.

3.15.3: *Income Group of Rs.15000-20000.*

3.15.3.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 511 man days labour were employed, out of which 372 (72.79%) man days were male labours and 139 (27.20%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 160 man days labour were employed, out of which 110 (68.75%) man days were male labours and 50 (31.25%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 55 man days labours were employed, out of which male labour accounts for 47 (85.45%) man days, and 8 (14.54%) man days were female labour. In the 3rd stage for plantation work, a total of 56 man days labour were employed, out of which 47 (83.92%) man days were male labours and 9 (16.06%) man days were female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 240 man days labour were employed, where male labour accounts for 168 (70%) man days and female labour accounts for 72 (30%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 720 man days labour were employed, out of which 504 (70%) man days were male labours and 216 (30%) man days of female labours were employed. From 4th to 7 years, a total of 179 man days labour were employed, where 160 (89.39%) man days male labour and 19 (10.61%) man days of female labours were employed. **3.15.3.2:** *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31 years. It is also to be noted that during this tapping period, no female labours are employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the field is cleaned only one time in a year for which a total of 984 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 8-31 Years is 11520 man days labour, where male labour accounts for 100 percent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 56 man days labours were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 32-34 Years is 1440 man days labour, where male labour accounts for 100 percent. Therefore the total employment generated for this tapping period from 32-34 Years is 1496 man days labour, where male labour accounts for 100 per cent. The total employment generated from rubber plantation for the income group of

Rs.15,000-20,000 in the district from 1-34 Years is 15410 man days labour, where male labour accounts for 15036 (98%) man days and female labour accounts for374 (2%) man days.

3.15.3.3: *Average employment (1-34 Years).*

As shown in Table No.39, the average employment per house hold for the 1st Year is 127.75 man days labour, where the average employment per house hold for male labours is 93 and the average employment per house hold for female labours is 34.75. The average employment per house hold for 2-3 Years is 180 man days labour, where the average employment per house hold for male and female labours is 126 and 54 respectively. The average employment per house hold for 4-7 Years is 44.75 man days labour, where the average employment per house hold for male and female labour is 40 and 4.75 respectively. The average employment per house hold for cleaning the field during the tapping period (8-31 Yrs) is 246 man days labour, where male labour accounts for 100 percent. The average employment per house hold for tappers during the tapping period (8-31 Yrs) is 2880 man days labour, where male labour accounts for100 percent. The average employment per house hold during the tapping period (8-31 Yrs) is 14 man days labour, where male labour accounts for 100 percent. The average employment per house hold for cleaning the field during the tapping period (32-34 Yrs) is 360 where male labour accounts for 100 percent, The average employment per house hold from 1-34 Years is 3852.50 man days labour, where the average employment per hectare for male and female labours is 3759 and 93.50 respectively.

Table No.39: Total Employment (Rs.15000-20000): Mokokchung. H/H =4.

Year	Items	Total Employment	Male	Female	Average Per H/H	Average Per H/H Male	Average Per H/H Female	% Male	% Female
1	Jungle cutting mulching and burning	160	110	50	40	27.5	12.5	68.75	31.25
	Digging	55	47	8	13.75	11.75	2	85.45	14.54
	Planting	56	47	9	14	11.75	2.25	83.92	16.06
	Clearing 2 times	240	168	72	60	42	18	70	30
	Total	**511**	**372**	**139**	**127.75**	**93**	**34.75**	**72.79**	**27.20**
2-3	Clearing 3 times	720	504	216	180	126	54	70	30
4-7	Clearing of the field 2 times	179	160	19	44.75	40	4.75	89.38	10.61
8-31	Clearing of the field 1 time	984	984	0	246	246	0	100	0
8-31	Tappers	11520	11520	0	2880	2880	0	100	0
32-34	Cleaning of the field 1 time	56	56	0	14	14	0	100	0
32-34	Tappers	1440	1440	0	360	360	0	100	0
	G.Total	**15410**	**15036**	**374**	**3852.5**	**3759**	**93.5**	**98**	**2**

Source: Field Survey 2016-17.

3.15.4: *Income Group of Rs.20,000-25,000.*

3.15.4.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 765 man days labour were employed, out of which 569 (74%) man days were male labours and 196 (26%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 238 man days labours were employed, out of which 181 (76%) man days were male labours and 57 (24%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 83 man days labours were employed, out of which male labour accounts for 69 (83%) man days were male labours and 14 (17%) man days were female. In the 3rd stage for plantation work, a total of 84 man days labours were employed, out of which 69 (82%) man days were male labours and 15 (18%) man days were female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 360 man days labours were employed, where male labour accounts for 250 (69%) man days and female labour accounts for 110 (31%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 1080 man days labour were employed, out of which 750 (69%) man days were male labours and 330 (31%) man days of female labours were employed. From 4th to 7 years, a total of 252 man days labour were employed, where 220 (87%) man days male labour and 32(13%) man days of female labours were employed.

3.15.4.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31 years. It is also to be noted that during this tapping period, no female labours are employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the field is cleaned only one time in a year for which a total of 1464 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 8-31 Years is 18720 man days labour, where male labour accounts for 100 percent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 80 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 32-34 Years is 1920 man days labour,

where male labour accounts for 100 percent. Therefore the total employment generated for this tapping period from 32-34 Years is 2000 man days labour, where male labour accounts for 100 percent. The total employment generated from rubber plantation for the income group of Rs.20,000-25,000 in the district from 1-34 Years is 24281 man days labour, where male labour accounts for 23723 (98%) man days and female labour accounts for 558 (2%) mandays.

3.15.4.3: *Average employment (1-34 Years).*

As shown in Table No.40, the average employment per house hold for the 1st Year is 153 man days labour, where the average employment per house hold for male and female labours is 113.8 and 39.2 respectively. The average employment per house hold for 2-3 Years is 216 man days labour, where the average employment per house hold for male and female labours is 150 and 66 respectively. The average employment per house hold for 4-7 Years is 50.4 man days labour, where the average employment per house hold for male and female labour is 44 and 6.4 respectively. The average employment per house hold for cleaning the field during the tapping period (8-31 Yrs) is 292.8 man days labour, where male labour accounts for 100 percent. The average employment per house hold for tappers during the tapping period (8-31 Yrs) is 3744 man days labour, where male labour accounts for 100 percent. The average employment per house hold for cleaning the field during the tapping period (32-34 Yrs) is 16 man days labour, where male labour accounts for 100 percent, and the average employment per house hold for tappers during the tapping period (32-34 Yrs) is 384 man days labour, where male labour accounts for 100 percent. The average employment per house hold from 1-34 Years is 4856.20 man days labour, where the average employment per house hold for male and female labour accounts for 4744.6 and 111.60 respectively.

Table No.40: Total Employment (Rs.20,000-25,000): Mokokchung. H/H =5.

Year	Items	Total Employment	Male	Female	Average Per H/H	Average Per H/H Male	Average Per H/H Female	% Male	% Female

1	Jungle cutting mulching and burning	238	181	57	47.6	36.2	11.4	76	24
	Digging	83	69	14	16.6	13.8	2.8	83	17
	Planting	84	69	15	16.8	13.8	3	82	18
	Clearing 2 times	360	250	110	72	50	22	69	31
	Total	**765**	**569**	**196**	**153**	**113.8**	**39.2**	**74**	**26**
2-3	Clearing 3 times	1080	750	330	216	150	66	69	31
4-7	Clearing of the field 2 times	252	220	32	50.4	44	6.4	87	13
8-31	Clearing of the field 1 time	1464	1464	0	292.8	292.8	0	100	0
8-31	Tappers	18720	18720	0	3744	3744	0	100	0
32-34	Cleaning of the field 1 time	80	80	0	16	16	0	100	0
32-34	Tappers	1920	1920	0	384	384	0	100	0
	G.Total	**24281**	**23723**	**558**	**4856.2**	**4744.6**	**111.6**	**98**	**2**

Source: Field Survey 2016-17.

3.15.5: *Income Group of Rs.25,000-30,000.*

3.15.5.1*: Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 164 man days labour were employed, out of which 111 (68%) man days were male labours and 53 (32%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 50 man days labour were employed, out of

which 35 (70%) man days were male labours and 15 (30%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 17 man days labour were employed, out of which male labour accounts for 14 (82%) man days, and 3 (18%) man days were female labours. In the 3rd stage for plantation work, a total of 17 man days labour were employed, out of which 14 (82%) man days were male labours and 3 (18%) man days were female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 80 man days labour were employed, where male labour accounts for 48 (60%) man days and female labour accounts for 32 (40%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 240 man days labour were employed, out of which 144 (60%) man days were male labours and 96 (40%) man days of female labours were employed. From 4th to 7 years, a total of 32 man days labour were employed, where 28 (88%) man days male labour and 4 (13%) man days of female labours were employed.

3.15.5.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31 years. It is also to be noted that during this tapping period, no female labours are employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the field is cleaned only one time in a year, for which a total of 336 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 8-31 Years is 3720 man days labour were employed, where male labour accounts for 100 percent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 18 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 32-34 Years is 360 man days labour, where male labour accounts for 100 percent. Therefore the total employment generated for this tapping period from 32-34 Years is 378 man days labour, where male labour accounts for 100 percent. The total employment generated from rubber plantation for the income group of Rs.25,000-30,000 in the district from 1-34 Years is 4870 man days labour,

where male labour accounts for 4717 (97%) man days and female labour accounts for 153 (3%) man days.

3.15.5.3: *Average employment (1-34 Years).*

As shown in Table No.41, the average employment per house hold for the 1st Year is 164 man days, where the average employment per house hold for male and female labours is 111 and 53 respectively. The average employment per house hold for 2-3 Years is 240 man days, where the average employment per hectare for male and female labours is 144 and 96 respectively. The average employment per house hold for 4-7 Years is 32 man days, where the average employment per hectare for male and female labour is 28 and 4 respectively. The average employment per house hold for cleaning the field during the tapping period (8-31 Yrs) is 336 man days, where male labour accounts for 100 percent. The average employment per house hold for tappers during the tapping period (8-31 Yrs) is 3720 man days, where male labour accounts for 100 percent. The average employment per house hold for cleaning the field during the tapping period (32-34 Yrs) is 18 man days, where male labour accounts for 100 percent, and the average employment per house hold for tappers during the tapping period (32-34 Yrs) is 360 man days, where male labour accounts for 100 percent. The average employment per hectare from 1-34 Years is 4870 where the average employment per house hold for male and female labour is 4717 and 153 respectively.

Table No.41: Total Employment (Rs.25,000-30,000): Mokokchung. H/H=1.

Year	Items	Total Employment	Male	Female	Average Per H/H	Average Per H/H Male	Average Per H/H Female	% Male	% Female
1	Jungle cutting mulching and burning	50	35	15	50	35	15	70	30
	Digging	17	14	3	17	14	3	82	18

	Planting	17	14	3	17	14	3	82	18
	Clearing 2 times	80	48	32	80	48	32	60	40
	Total	**164**	**111**	**53**	**164**	**111**	**53**	**68**	**32**
2-3	Clearing 3 times	240	144	96	240	144	96	60	40
4-7	Clearing of the field 2 times	32	28	4	32	28	4	88	13
8-31	Clearing of the field 1 time	336	336	0	336	336	0	100	0
8-31	Tappers	3720	3720	0	3720	3720	0	100	0
32-34	Cleaning of the field 1 time	18	18	0	18	18	0	100	0
32-34	Tappers	360	360	0	360	360	0	100	0
	G.Total	**4870**	**4717**	**153**	**4870**	**4717**	**153**	**97**	**3**

Source: Field Survey 2016-2017.

3.15.6: *Income Group of Rs.30000-Above.*

3.15.6.1: *Total employment upto the bearing period (1-7 Years).*

In the first year, a total of 370 man days labour were employed, out of which 324 (88%) mandays were male labours and 46 (12%) man days were female labours. In the 1st stage of jungle cutting, mulching and burning, a total of 120 man days labour were employed, out of which 100 (83%) man days were male labours and 20 (17%) man days were female labours. In the 2nd stage of digging of hole for rubber plantation, a total of 45 man days labour were employed, out of which male labour accounts for 40 (89%) man days and 5 (11%) man days were female labours. In the 3rd stage for plantation work, a total of 45 man days labour were

employed, out of which 40 (89%) man days were male labours and 5 (11%) man days were female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 160 man days labour were employed, where male labour accounts for 144 (90%) man days and female labour accounts for 16 (10%) man days. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 480 man days labours were employed, out of which 432 (90%) man days were male labours and 48 (10%) man days of female labours were employed. From 4th to 7 years, a total of 160 man days labour were employed, where 140 (88%) man days male labour and 20 (13%) man days of female labours were employed.

3.15.6.2: *Total employment during the tapping period (8-34 Years).*

The rubber tree starts tapping from the 8th Years onwards upto 31 years. It is to be noted that during this tapping period, no female labours are employed as it is inconvinent and not practical for female labours for the job under the study area. From 8-31 Years (24 Yrs), the field is cleaned only one time in a year for which a total of 960 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 8-31 Years is 11520 man days labour, where male labour accounts for 100 percent. From 32-34 Years, the field is cleaned only one time in a year for which a total of 36 man days labour were employed, where male labour accounts for 100 percent. The total labours employed for tapping purpose for the period 32-34 Years is 360 man days labour, where male labour accounts for 100 percent. Therefore the total employment generated for this tapping period from 32-34 Years is 396 man days labour, where male labour accounts for 100 percent. The total employment generated from rubber plantation for the income group of Rs.30,000-Above in the district from 1-34 Years is 13886 man days labour, where male labour accounts for 13772 (99%) man days and female labour accounts for 114(1%) man days.

3.15.6.3: *Average employment (1-34 Years).*

As shown in Table No.42, the average employment per house hold for the 1st Year is 370 man days, where the average employment per house hold for male and female labours is 324 and 46 respectively. The average employment per house hold for 2-3 Years is 480 man

days, where the average employment per house hold for male and female labours is 432 and 48 respectively. The average employment per house hold for 4-7 Years is 160 man days, where the average employment per house hold for male and female labour is 140 and 20 respectively. The average employment per house hold for cleaning the field during the tapping period (8-31 Yrs) is 960 man days, where male labour accounts for 100 percent, and the average employment per house hold for tappers during the tapping period (8-31 Yrs) is 11520 man days, where male labour accounts for 100 percent. The average employment per house hold for cleaning the field during the tapping period (32-34 Yrs) is 36 man days, where male labour accounts for 100 percent, and the average employment per house hold for tappers during the tapping period (32-34 Yrs) is 360 man days, where male labour accounts for 100 percent. The average employment per house hold from 1-34 Years is 13886 man days, where the average employment per house hold for male and female labours is 13772 and 114 respectively.

Table No.42: Total Employment (30000-Above): Mokokchung. H/H =1.

Year	Items	Total Employment	Male	Female	Average Per H/H	Average Per H/H Male	Average Per H/H Female	% Male	% Female
1	Jungle cutting mulching and burning	120	100	20	120	100	20	83	17
	Digging	45	40	5	45	40	5	89	11
	Planting	45	40	5	45	40	5	89	11
	Clearing 2 times	160	144	16	160	144	16	90	10
	Total	**370**	**324**	**46**	**370**	**324**	**46**	**88**	**12**
2-3	Clearing 3 times	480	432	48	480	432	48	90	10
4-7	Clearing of the field 2 times	160	140	20	160	140	20	88	13
8-31	Clearing of the field 1 time	960	960	0	960	960	0	100	0
8-31	Tappers	11520	11520	0	11520	11520	0	100	0
32-34	Cleaning of the field 1 time	36	36	0	36	36	0	100	0
32-34	Tappers	360	360	0	360	360	0	100	0
	G.Total	**13886**	**13772**	**114**	**13886**	**13772**	**114**	**99**	**1**

Source: Field Survey 2016-2017.

Chapter 4

Cost and Revenue

This chapter analysis the cost and revenue aspects of the natural rubber production in the state under the study area. The first section examines the overall benefit–cost analysis followed by hectare-wise and income- wise benefit-cost analysis for the state of Nagaland. The second section talks about the benefit-cost analysis of the state in terms of Farm Size followed by Wokha district and Mokokchung district as a whole. The third section talks about the benefit–cost analysis in terms of Income-Wise for the state of Nagaland, followed by Wokha district and Mokokchung district.

4.1: Cost and Revenue: Nagaland. This section highlights the benefit-cost for the state of Nagaland as a whole as shown in Table No.43.

4.1.1: Cost.

The rubber plantation in the state by the rubber farmers was not done at the same year, therefore for fixation of the wages of labour, 2016-2017 was taken as the base year. As such the wages of male labour per man-day was taken as Rs.250 and the wages of female labour as Rs.200 per man day. The total cost for the rubber farmers in the first year for the state is Rs.65,02,010/- which includes expenditures like jungle cutting, jungle burning, clearing of the field for three times, rubber stem, toilet, digging, plantation, pruning, weeding and mulching, farm house, lunch and wage of labour. In the 2nd and 3rd year, a total of Rs.57,39,700/- was spent which includes expenditure on farm house, toilet, wages of labour and lunch for cleaning the whole field for three times per year. From 4-7th years, the cost includes expenses on lunch and wages of labour for cleaning the field two times per year, and the total expenditure came out to be Rs.38,21,500/- The total cost incurred from 8-34 years includes expenditures like wages on labour and lunch for cleaning the field for one time per year, smoke house, tapping materials, roller machine, firewood, formid acid and wages for the tappers, where the total expenditure came out to be Rs. 13,06,38,040/-.

The year wise cost of farming (as shown by Table No.43) shows that the highest cost incurred on farming was during the 8th year (Rs.7,98,63,180) which is mainly due to increased investment in both fixed and variable cost as the tapping of the rubber starts. The lowest cost incurred during farming was found to be on the 7th year (Rs.8,71,450). This is mainly attributed to investment only on lunch and wages. Moreover, less labour was also employed during this year because rubber farms are cleaned only two times which is done roughly. The total cost incurred by the rubber farmers in the state from 1-34 years is Rs.14,67,01,250/- and the average cost for the whole farming period is Rs.43,14,742.647/- per annum for the state. The percentage distribution of the both fixed and variable cost incurred during the entire course of farming for 34 years are as follows, farm House Rs.1204000 (0.82%), Smoke House Rs.1467000 (1%),Tapping Materials Rs.493000 (0.34%), LunchRs.2748300 (1.87%), Rubber Stem Rs.1525460 (1.04%), Roller machine Rs.1649000 (1.12%), toilet Rs.176500 (0.12%) firewood Rs.6615000 (4.51%), formid acid Rs.23855040 (16.26%), and labour Rs.106967950 (72.92%). The highest cost incurred by the rubber farmers is on wages for labour with 72.92% of the total cost.

4.1.2: Revenue.

In the field of rubber industry in the world, the gestation or bearing period of rubber trees is 6-7 Years depending upon the geographical locations and will of the rubber farmers. However under the study area, the tapping starts on the 8th year and the trees are being tapped for 8 months (April-November) every year. Therefore the revenue from the natural rubber plantation starts accruing only from the 8th year when the farmers are able to sell their final produce which is dispose either through cooperative or through spot market. In the case of Wokha district, their produce is either dispose in Dimapur or in Merapani (Assam), but for the case of Mokokchung district, their produce is dispose in the state of Assam through spot market. As for the price of natural rubber sheet it mainly depends upon the demand and supply factor in rubber industry. However, the price of natural rubber sheet at Rs.105 per kg during 2016-17 was taken for calculating the revenue of the rubber farmers. Under the study area the total rubber trees tapped are basically divided into three parts i.e. 8-10 years, 11-31 years and 32-34 years. This is mainly done because all the rubber trees are not tapped at the same year as

all the rubber trees are not planted at the same year; in fact some more rubber trees were planted as an extension after three years. Therefore, from 8-10 Years the first batch of the rubber trees is tapped and from 11-31 Years all the standing rubber trees are tapped and from 32-34 Years only those rubber trees planted as an extension are being tapped. The aged rubber trees are cut down and are used as furniture in many industry and house hold purposes. Therefore it was calculated at a minimum price @ of Rs.300 per tree.

The first batch of tapping starts on the 8th year onwards, and the same number of rubber trees is tapped for a period of three years i.e from 8-10 years, therefore from a total of 37,010 rubber trees, it produces 8,32,725 Kgs. of natural rubber sheet ready for sale in the market and the revenue earned from this produce for the period is Rs.8,74,36,125/- on an average revenue of Rs.2,91,45,375/- per annum. From the 11-31st Years, all the rubber trees are tapped and a total of 55,220 rubber trees are tapped, which produces 86,97,150 Kgs. of rubber sheet as a final output ready for sale in the market and the total revenue earned from the sale of the produce for the period is Rs.91,32,00,750/- on an average of Rs.4,34,85,750/- per year for 21years. From 32-34 years, only the rubber trees which were planted as an extension are tapped for a period of three years. The total number of rubber trees tapped for this period is 18210 which produces 409725 Kgs. of smoked rubber sheets as a final output ready for sale in the market and the total revenue earned from the sale of this product is Rs.4,30,21,125/- on an average of Rs.1,43,40,375/- per annum for the period. The revenue earned from the sale of the aged rubber trees is also added in this period and the total revenue earned from the sale of these trees is Rs.1,65,66,000/- on an average of Rs.55,22,000/-.

4.1.3: Benefit –Cost Analysis.

The Net Present Value is calculated by taking the current market rate of interest @ 6.85. As there was no revenue generation for 1-7 years, the result of the net present value came out to be negative for the same period. The net present value for 1st year is -6085175, 2nd year is Rs.-2728713, 3rd year is Rs. -2151286, 4th year is Rs. -804282, 5th year is Rs. -707486, 6th year is Rs. -615764 and 7th year is Rs. -548051. The net present value for the 8th year is Rs.12467367, and

the following net present values for the various years are clearly shown in the Table No 4.1.1 below.

The present value for the entire farming period from 1-34th year is Rs. 24,81,54,491/- which is higher than the cost incurred (Rs.14,67,01,250) worked out at a discount rate of 6.85%, there is profitability in this investment. The benefit-cost ratio came out to be 5.71 indicating that a rupee invested will return back Rs. 5.71. Thus the net present value and benefit-cost ratio indicates that investing in rubber farming or plantation is profitable in the state.

Table No.43: Cost and Revenue: Nagaland.

YEAR	Revenue (Rs.)	Total Cost (Rs.)	Revenue-Cost (Rs.)	Discount rate (6.85%)	NPV (Rs.)
1	0	6502010	-6502010	0.94	-6085175
2	0	3115350	-3115350	0.88	-2728713
3	0	2624350	-2624350	0.82	-2151286
4	0	1048350	-1048350	0.77	-804282
5	0	985350	-985350	0.72	-707486
6	0	916350	-916350	0.67	-615764
7	0	871450	-871450	0.63	-548051
8	29145375	7963180	21182195	0.59	12467367
9	29145375	4600680	24544695	0.55	13520318
10	29145375	4600680	24544695	0.52	12653550
11	43485750	5277960	38207790	0.48	18434532
12	43485750	5031460	38454290	0.45	17364028
13	43485750	5031460	38454290	0.42	16250845
14	43485750	5031460	38454290	0.4	15209027
15	43485750	5031460	38454290	0.37	14233998
16	43485750	5031460	38454290	0.35	13321477
17	43485750	5031460	38454290	0.32	12467456
18	43485750	5031460	38454290	0.3	11668185
19	43485750	5031460	38454290	0.28	10920155
20	43485750	5031460	38454290	0.27	10220079
21	43485750	5031460	38454290	0.25	9564885
22	43485750	5031460	38454290	0.23	8951694

23	43485750	5031460	38454290	0.22	8377813
24	43485750	5031460	38454290	0.2	7840724
25	43485750	5031460	38454290	0.19	7338066
26	43485750	5031460	38454290	0.18	6867633
27	43485750	5031460	38454290	0.17	6427359
28	43485750	5031460	38454290	0.16	6015311
29	43485750	5031460	38454290	0.15	5629678
30	43485750	5031460	38454290	0.14	5268767
31	43485750	5031460	38454290	0.13	4930994
32	19862375	2522113	17340262	0.12	2080994
33	19862375	2522113	17340262	0.11	1947584
34	19862375	2522113	17340262	0.11	1822727
Total	**1060224000**	**146701250**	**913522750**	**--**	**248154491**

Source: Field Survey 2016-17.

4.2: Cost and Revenue (Hectare-Wise): Nagaland. This section highlights the benefit-cost analysis for the state of Nagaland according to the farm size as shown in Table No.44.

4.2.1: Cost.

The total cost for the rubber farmers includes expenditures like jungle cutting, jungle burning, clearing of the field, rubber stem, toilet, digging, plantation, pruning, weeding and mulching, farm house, lunch and wage of labour, farm house, smoke house, tapping materials, roller machine, toilet, firewood, and formid acid,

Under Small Farm Size for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.4,71,33,320/- and the average cost for the same period is Rs.13,86,274.11. Under Medium Farm Size for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.5,30,12,390/- and the average cost for the same period is Rs.1559187.94. Under

Large Farm Size for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.4,65,55,540/- and the average cost for the same period is Rs. 1369280.588.

The percentage distribution of cost for different farm size shows that the medium farm size contributes the highest with 36.13% and the least by large farm size with 31.73%.

4.2.2: Revenue.

In the field of rubber industry in the world, the gestation or bearing period of rubber trees is 6-7 Years depending upon the geographical locations and will of the rubber farmers. However under the study area, tapping starts on the 8th years and the trees are being tapped for 8 months (April-November) every year. Therefore the revenue from the rubber plantation starts accruing only from the 8th year when the farmers are able to sell their produce which is dispose either through cooperative or through spot market.

Under the Small Farm Size for the state, the total revenue earned by the rubber farmers from the entire farming period i.e 1-34 years is Rs.28,37,76,000/- and the average revenue for the same period is Rs.83,46,352.94. Under the Medium Farm Size for the state, the total revenue earned by the rubber farmers from the entire farming period i.e 1-34 years is Rs.41,49,12,000/ and the average revenue for the same period is Rs.1,22,03,294.11. Under the Large Farm Size for the state, the total revenue earned by the rubber farmers from the entire farming period i.e 1-34 years is Rs.36,15,36,000/- and the average revenue for the same period is Rs.1,06,33,411.76.

The percentage distribution of revenue for different farm size shows that the medium farm size contributes the highest with 39.13% and the least by small farm size with 26.77%.

4.2.3: Benefit –Cost Analysis.

The Net Present Value is calculated by taking the current market rate of interest @ 6.85. As there was no revenue generation for the bearing period from 1-7 years, the result of the net present value came out to be negative for the same period.

Under the Small Farm Size for the state, the present value for the entire farming period from 1-34th year is Rs.6,46,77,953.43/- and the average present value for the same period is Rs.19,02,292.74 per annum. Therefore it can be seen that the total Net Present Value (Rs. 6,46,77,953.43) for the small farm size for the state is higher than the cost incurred (Rs.47133320). The Benefit–Cost Ratio came out to be 4.99 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under small farm size for the state.

Under the Medium Farm Size for the state, the present value for the entire farming period from 1-34th year is Rs.9,81,27,887/- and the average present value for the same period is Rs.28,86,114.32. Therefore it can be seen that the total Net Present Value (Rs. 9,81,27,887) for the medium farm size for the state is higher than the cost incurred (Rs.5,30,12,390). The Benefit –Cost Ratio came out to be 6.04 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under medium farm size for the state.

Under the Large Farm Size for the state, the present value for the entire farming period from 1-34th year is Rs.8,53,48,651/- and the average present value for the same period is Rs.25,10,254.44 per annum. Therefore it can be seen that the total Net Present Value (Rs. 8,53,48,651) for the large farm size for the state is higher than the cost incurred (Rs.4,65,55,540). The Benefit–Cost Ratio came out to be 4.99 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under large farm size for the state.

The percentage distribution of revenue for different farm size shows that the medium farm size contributes the highest with 39.54% and the least by small farm size with 26.06%.

Table No.44: Cost and Revenue (Hectare-Wise): Nagaland.

FARM SIZE	Revenue (Rs.)	Total Cost (Rs.)	Revenue-Cost (Rs.)	Net Present Value (Rs.)

SMALL	283776000 (26.77%)	47133320 (32.12%)	236642680 (25.90%)	64677953.4 (26.06%)
MEDIUM	414912000 (39.13%)	53012390 (36.13%)	361899610 (39.62%)	98127887 (39.54%)
LARGE	361536000 (34.10%)	46555540 (31.73%)	314980460 (34.48%)	85348651 (34.39%)
TOTAL	**1060224000 (100%)**	**146701250 (100%)**	**913522750 (100%)**	**248154491 (100%)**

Source: Field Survey 2016-17.

4.3: Cost and Revenue (Income-Wise): **Nagaland.** This section highlights the benefit-cost analysis for the state of Nagaland according to income wise of the rubber farmers as shown in Table No.45.

The total cost for the rubber farmers includes expenditures like jungle cutting, jungle burning, clearing of the field, rubber stem, toilet, digging, plantation, pruning, weeding and mulching, farm house, lunch and wage of labour, farm house, smoke house, tapping materials, roller machine, toilet, firewood, and formid acid,

Under income size of Rs.5,000-10,000 for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.6,97,94,450/- and the average cost for the same period is Rs.20,52,777.94. Under income size of Rs.10,000-15,000 for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.1,40,18,290/- and the average cost for the same period is Rs.4,12,302.64. Under income size of Rs.15,000-20,000 for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.1,77,04,030/- and the average cost for the same period is Rs.5,20,706.76. Under income size of Rs.20,000-25,000 for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.1,34,36,630/- and the average cost for the same period is Rs.3,95,195. Under income size of Rs.25,000-30,000 for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.1,00,04,840/- and the average

cost for the same period is Rs.2,94,260. Under income size of Rs.30,000-Above for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.2,17,43,010/- and the average cost for the same period is Rs.6,39,500.29.

The percentage distribution of cost for different income size of the state shows that the income group of Rs.5,000-10,000 contributes the highest with 47.58% and the least by income group of Rs.25,000-30,000 with 6.82%.

4.3.1: Revenue.

In the field of rubber industry in the world, the gestation or bearing period of rubber trees is 6-7 Years depending upon the geographical locations and will of the rubber farmers. However under the study area, tapping starts on the 8th years and the trees are being tapped for 8 months (April-November) every year. Therefore the revenue from the rubber plantation starts accruing only from the 8th year when the farmers are able to sell their produce which is dispose either through cooperative or through spot market.

Under income group of Rs. 5,000-10,000 for the state, the total revenue earned by the rubber farmers from 1-34 years is Rs.47,71,20,000/- and the average Revenue for the same period is Rs.1,40,32,941.17. Under income size of Rs. 10,000-15,000 for the state, the total revenue incurred by the rubber farmers from 1-34 years is Rs.9,75,36,000/- and the average revenue for the same period is Rs.28,68,705.88. Under income size of Rs.15,000-20,000 for the state, the total revenue incurred by the rubber farmers from 1-34 years is Rs13,19,04,000/- and the average revenue for the same period is Rs.38,79,529.41. Under income size of Rs.20,000-25,000 for the state, the total revenue earned by the rubber farmers from 1-34 years is Rs.9,42,72,000/- and the average revenue for the same period is Rs.27,72,705.88. Under income size of Rs.25,000-30,000 for the state, the total revenue earned by the rubber farmers from 1-34 years is Rs.86,59,200/- and the average revenue for the same period is Rs.25,46,823.52. Under income size of Rs.30,000-Above for the state, the total revenue earned

by the rubber farmers from 1-34 years is Rs.1,72,80,000/- and the average revenue for the same period is Rs.50,82,352.94.

The percentage distribution of revenue for different income size of the state shows that the income group of Rs.5,000-10,000 contributes the highest with 45% and the least by income group of Rs.25,000-30,000 with 8.17%.

4.3.2: Benefit –Cost Analysis.

The Net Present Value is calculated by taking the current market rate of interest @ 6.85. As there was no revenue generation for the bearing period from 1-7 years, the result of the net present value came out to be negative for the same period.

Under the income group of Rs.5,000-10,000 for the state, the present value for the entire farming period from 1-34th year is Rs.11,10,01,571/- and the average present value for the same period is Rs.32,64,752.08. Therefore it can be seen that the total Net Present Value(Rs. 11,10,01,571) for the income group of Rs.5,000-10,000 for the state is higher than the cost incurred (Rs.6,97,94,450).The Benefit–Cost Ratio came out to be 5.49 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under income group of Rs 5,000-10,000 for the state.

Under the income group of Rs.10,000-15,000 for the state, the present value for the entire farming period from 1-34th year is Rs.2,25,25,557/- and the average present value for the same period is Rs.6,62,516.38. Therefore it can be seen that the total Net Present Value (Rs.2,25,25,557) for the income group of Rs.10,000-15,000 for the state is higher than the cost incurred (Rs.1,40,18,290).The Benefit–Cost Ratio came out to be 5.42 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under income group of Rs 10,000-15,000 for the state.

Under the income group of Rs. 15,000-20,000 for the state, the present value for the entire farming period from 1-34th year is Rs.3,08,26,684/- and the average present value for the same period is Rs.9,06,667.17.Therefore it can be seen that the total Net Present Value (Rs.3,08,26,684) for the income group of Rs.15,000-20,000 for the state is lower than the cost

incurred (Rs.1,77,04,030).The Benefit–Cost Ratio came out to be 5.78 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under income group of Rs.15,000-20,000 for the state.

Under the income group of Rs.20,000-25,000 for the state, the present value for the entire farming period from 1-34th year is Rs.2,19,71,162/- and the average present value for the same period is Rs.6,46,210.64. Therefore it can be seen that the total Net Present Value(Rs.2,19,71,162) for the income group of Rs.20,000-25,000 for the state is higher than the cost incurred (Rs.1,34,36,630).The Benefit–Cost Ratio came out to be 5.59 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under income group Rs.20,000-25,000 for the state.

Under the income group of Rs.25,000-30,000 for the state, the present value for the entire farming period from 1-34th year is Rs.2,05,52,013/- and the average present value for the same period is Rs.6,04,470.97. Therefore it can be seen that the total Net Present Value (Rs.2,05,52,013) for the income group of Rs.25,000-30,000 for the state is higher than the cost incurred (Rs.1,00,04,840).The Benefit–Cost Ratio came out to be 6.58 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under income group Rs.25,000-30,000 for the state.

Under the income group of Rs.30,000-Above for the state, the present value for the entire farming period from 1-34th year is Rs.4,12,77,504/- and the average present value for the same period is Rs.12,14,044.23.Therefore it can be seen that the total Net Present Value (Rs. 4,12,77,504) for the income group of Rs.30,000-Above for the state is higher than the cost incurred (Rs.2,17,43,010). The Benefit –Cost Ratio came out to be 6.2 which is more than unity. Thus the net present value and the benefit-cost ratio indicates that investing in rubber farming or plantation is profitable under income group Rs.30,000-Above for the state.

The percentage distribution of Net Present Value for different income group of the state shows that the income group of Rs.5,000-10,000 contributes the highest with 44.73% and the least by the income group of Rs.25,000-30,000 with 8.28%.

Table No.45: Cost and Revenue (Income-Wise): **Nagaland.**

INCOME (Rs.)	Revenue (Rs.)	Total cost (Rs.)	Revenue-Cost (Rs.)	Net Present Value (Rs.)
5000-10000	477120000 (45.00%)	69794450 (47.58%)	407325550 (44.59%)	111001571 (44.73%)
10000-15000	97536000 (9.20%)	14018290 (9.56%)	83517710 (9.14%)	22525557 (9.08%)
15000-20000	131904000 (12.44%)	17704030 (12.07%)	114199970 (12.50%)	30826684 (12.42%)
20000-25000	94272000 (8.89%)	13436630 (9.16%)	80835370 (8.85%)	21971162 (8.85%)
25000-30000	86592000 (8.17%)	10004840 (6.82%)	76587160 (8.85%)	20552013 (8.28%)
30000 above	172800000 (16.30%)	21743010 (14.82%)	151056990 (16.54%)	41277504 (16.63%)
TOTAL	**1060224000 (100 %)**	**146701250 (100%)**	**913522750 (100%)**	**248154491 (100%)**

Source: Field Survey 2016-2017. Figure in parenthesis represents percentage.

4.4: Cost and Revenue: Wokha. This section highlights the benefit-cost for the Wokha District as a whole which is well explained in table No.46.

4.4.1: Cost.

The rubber plantation in the district by the rubber farmers was not done at the same year. Therefore for fixation of the wages of labour, 2016-2017 was taken as the base year. As

such the wages of male labour per man days was taken as Rs.250 and the wages of female labour as Rs.200 per man day. The total cost for the rubber farmers in the first year for the District is Rs.44,95,310/- which includes expenditures like jungle cutting, jungle burning, clearing of the field for three times, rubber stem, toilet, digging, plantation, pruning, weeding and mulching, farm house, lunch and wage of labour. In the second and third year, a total of Rs.3,70,930/- was spent which includes expenditure on farm house, toilet, wages of labour and lunch for cleaning the whole field for three times per year. From 4-7th years, the cost includes expenses on lunch and wages of labour for cleaning the field two times per year, and the total expenditure came out be Rs.29,67,700/-. The total cost incurred from 8-34 years includes expenditures like wages on labour and lunch for cleaning the field for one time per year, smoke house, tapping materials, roller machine, firewood, formid acid and wages for the tappers, where the total expenditure came out to be Rs.8,43,51,680/-.

The year wise cost of farming (as shown in the Table No.46) shows that the highest cost was incurred on farming were during the 8th Year (Rs.46,92,180) this is mainly due to increased investment on both fixed and variable cost as the tapping of the rubber starts. The lowest cost was incurred on the 7th year (Rs.6,85,750). This is mainly attributed to investment only on lunch and wages. Moreover, less labour was also employed during this year because rubber farms are cleaned only two times and are done roughly. The total cost incurred by the rubber farmers in the district from 1-34 years is Rs.9,55,23,990 and the average cost for the whole farming period is Rs.28,09,529.11 per annum. The percentage distribution of the various cost are as follows, farm House Rs.8,50,000(0.89%), Smoke House Rs.7,97,000(0.83%),Tapping Materials Rs.2,93,000(0.31%), LunchRs.18,56,900(1.94%), Rubber Stem Rs.9,09,710(0.95%), Roller machine Rs.7,32,000(0.77%), toilet Rs.1,13,000(0.12%) firewood Rs.36,93,000(3.87%), formid acid Rs.1,52,23,680(16%), and labour Rs.7,10,55,700(74%). The highest cost incurred by the rubber farmers is on wages for labour with 74% of the total cost.

4.4.2: Revenue.

In the field of rubber industry in the world, the gestation or bearing period of rubber trees is 6-7 Years depending upon the geographical locations and will of the rubber farmers.

However under the study area, the tapping starts on the 8th year and the trees are being tapped for 8 months (April-Nov) every year. Therefore the revenue from the rubber plantation starts accruing only from the 8th year when the farmers are able to sell their produce which is dispose either through cooperative or through spot market. In the case of Wokha district, their produce is either dispose in Dimapur or in Merapani (Assam). As for the price of natural rubber sheet it mainly depends upon the demand and supply factor in rubber industry. However, the price of natural rubber sheet at Rs. 105 per kg during 2016-17 was taken for calculating the revenue of the rubber farmers. Under the study area the total rubber trees tapped are basically divided into three parts i.e. 8-10 years, 11-31 years and 32-34 years. This is mainly done because all the rubber trees are not tapped at the same year as all the rubber trees are not planted at the same year, in fact some more rubber trees were planted as an extension after three years. Therefore from 8-10 Years the first batch of the rubber trees is tapped and from 11-31 Years all the rubber trees are tapped and from 32-34 Years only those rubber trees planted as an extension are being tapped.

The total number of rubber trees tapped on the 8th- -10 years is 23510 trees which produces 5,28,975 Kgs. of smoked rubber sheets as a final output ready for sale in the market and the total revenue earned from the sale of this produce is Rs.5,55,42,375/- on an average of Rs. 1,85,14,125/- per annum for the District. From the 11 Years onwards, the second batch of rubber trees starts tapping till 31st year. The total number of rubber trees tapped on the 11th - 31st year is 35240 which produces 55,50,300 Kgs. of rubber sheets as a final output ready for sale in the market and the total revenue earned from the sale of this product is Rs.58,27,81,500/- for the period with an average revenue of Rs.27,751,500/- per annum for the district. The last batch of rubber trees are tapped which was planted as an extension for a period of three years i.e. 32-34 years. The total number of rubber trees tapped on the 32nd -34th years is 11,730 which produces 26,3,925 Kgs. of rubber sheets as a final output ready for sale in the market and the total revenue earned from the sale of this product is Rs.3,82,84,125/- for the period with an average revenue of Rs.12761375 per annum for the district. The total revenue earned by the rubber farmers from 1-34th years is Rs.67,66,08,000/- with an average revenue of Rs.1,99,00,235.29 per annum.

4.4.3: Benefit –Cost Analysis.

The Net Present Value is calculated by taking the current market rate of interest @ 6.85. As there was no revenue generation for the bearing period from 1-7 years, the result of the net present value came out to be negative for the same period. The net present value for 1st year is -681535, 2nd year is Rs.-312621, 3rd year is Rs. -241482, 4th year is Rs. -133205, 5th year is Rs. -109721, 6th year is Rs. -102073 and 7th year is Rs. -89528. The net present value for the 8th year is Rs.1443884, and the following net present values for the various years are clearly shown in the table no 4.2.1 below.

The present value for the entire farming period from 1-34th year is Rs.15,72,45,450/- and the average present value for the same period is Rs.46,24,866.17 per annum. The highest present value is in the 11th year with Rs.1,17,27,511/- and the least is in the 1th year with Rs. -4207122.

Therefore it can be seen that the total Net Present Value (Rs.15,72,45,450) for the district is higher than the cost incurred (Rs.9,55,23,990) which is worked out at a discount rate of Rs.6.85 and shows profitably in this investment. The Benefit–Cost Ratio came out to be 5.54 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable for the district

Table No.46: Cost and Revenue: Wokha.

YEAR	Revenue (Rs.)	Total Cost (Rs.)	Revenue-Cost (Rs.)	Discount rate (6.85)	NPV (Rs.)
1	0	4495310	-4495310	0.94	-4207122
2	0	1997650	-1997650	0.88	-1749727
3	0	1711650	-1711650	0.82	-1403109
4	0	801950	-801950	0.77	-615247
5	0	767750	-767750	0.72	-551248

6	0	712250	-712250	0.67	-478614
7	0	685750	-685750	0.63	-431265
8	18514125	4692180	13821945	0.59	8135288
9	18514125	3016680	15497445	0.55	8536687
10	18514125	3016680	15497445	0.52	7989412
11	27751500	3444820	24306680	0.48	11727511
12	27751500	3298320	24453180	0.45	11041829
13	27751500	3298320	24453180	0.42	10333953
14	27751500	3298320	24453180	0.40	9671459
15	27751500	3298320	24453180	0.37	9051435
16	27751500	3298320	24453180	0.35	8471161
17	27751500	3298320	24453180	0.32	7928087
18	27751500	3298320	24453180	0.30	7419829
19	27751500	3298320	24453180	0.28	6944154
20	27751500	3298320	24453180	0.27	6498974
21	27751500	3298320	24453180	0.25	6082334
22	27751500	3298320	24453180	0.23	5692405
23	27751500	3298320	24453180	0.22	5327473
24	27751500	3298320	24453180	0.20	4985936
25	27751500	3298320	24453180	0.19	4666295
26	27751500	3298320	24453180	0.18	4367145
27	27751500	3298320	24453180	0.17	4087174
28	27751500	3298320	24453180	0.16	3825151
29	27751500	3298320	24453180	0.15	3579926

30	27751500	3298320	24453180	0.14	3350422
31	27751500	3298320	24453180	0.13	3135632
32	12761375	1404973.3	11356402	0.12	1362875
33	12761375	1404973.3	11356402	0.11	1275503
34	12761375	1404973.3	11356402	0.11	1193732
Total	**676608000**	**95523990**	**581084010**	**157245450**	

Source: Field Survey 2016-2017.

4.2.2:Cost and Revenue (Hectare Wise): Wokha. This section highlights the benefit-cost analysis for the Wokha District according to farm size as shown in Table No.47.

4.2.2.1: Cost.

The total cost for the rubber farmers includes expenditures like jungle cutting, jungle burning, clearing of the field, rubber stem, toilet, digging, plantation, pruning, weeding and mulching, farm house, lunch and wage of labour, farm house, smoke house, tapping materials, roller machine, toilet, firewood, and formid acid,

Under Small Farm Size for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs.2,13,22,510/- and the average cost for the same period is Rs.6,27,132.64 per annum. Under Medium Farm Size for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs.3,61,73,400/- and the average cost for the same period is Rs.10,63,923.52. Under Large Farm Size for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs.3,80,28,080/- and the average cost for the same period is Rs. 11,18,472.94.

The percentage distribution of cost for different farm size shows that the large farm size contributes the highest with 39.81% and the least by small farm size with 22.32% for the district.

4.2.2.2: Revenue.

In the field of rubber industry in the world, the gestation or bearing period of rubber trees is 6-7 Years depending upon the geographical locations and will of the rubber farmers. However under the study area, the tapping starts on the 8th year and the rubber trees are being tapped for 8 months (April-Nov) every year. Therefore the revenue from the rubber plantation starts accruing only from the 8th year when the farmers are able to sell their produce which is dispose either through cooperative or through spot market.

Under the Small Farm Size for the district, the total revenue earned by the rubber farmers from the entire farming period i.e 1-34 years is Rs.10,79,04,000/- and the average revenue for the same period is Rs.31,73,647.05 per annum. Under the Medium Farm Size for the district, the total revenue earned by the rubber farmers from the entire farming period i.e 1-34 years is Rs.27,82,08,000/- and the average revenue for the same period is Rs.81,82,588.23 per annum for the district. Under the Large Farm Size for the district, the total revenue earned by the rubber farmers from the entire farming period i.e 1-34 years is Rs.29,04,96,000/- with an average revenue of Rs.85,44,000/- per annum for the district.

The percentage distribution of revenue for different farm size shows that the large farm size contributes the highest with 42.93% and the least by small farm size with 15.95% for the district.

4.2.2.3: Benefit –Cost Analysis.

The Net Present Value is calculated by taking the current market rate of interest @ 6.85. As there was no revenue generation for the bearing period from 1-7 years, the result of the net present value came out to be negative for the same period.

Under the Small Farm Size for the district, the present value for the entire farming period from 1-34th year is Rs.2,36,59,089/- and the average present value for the same period is Rs.6,95,855.55 per annum. Therefore it can be seen that the total Net Present Value (Rs.2.36.59.089) for the small farm for the district is higher than the cost incurred (Rs.2,13,22,510). The Benefit –Cost Ratio came out to be 4.21 which is more than unity. Thus

the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under small farm size for the district.

Under the Medium Farm Size for the district, the present value for the entire farming period from 1-34th year is Rs.6,56,10,290/- and the average present value for the same period is Rs.19,29,714.41. Therefore it can be seen that the total Net Present Value (Rs. 19,29,714.41) for the medium farm size for the district is higher than the cost incurred (Rs.3,61,73,400). The Benefit –Cost Ratio came out to be 5.94 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under medium farm size for the district.

Under the Large Farm Size for the district, the present value for the entire farming period from 1-34th year is Rs.6,79,76,072/- and the average present value for the same period is Rs.19,99,296.23 per annum. Therefore it can be seen that the total Net Present Value (Rs.6,79,76,072) for the large farm size for the district is higher than the cost incurred (Rs.3,80,28,080).The Benefit–Cost Ratio came out to be 5.86 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under large farm size for the district.

The percentage distribution of revenue for different farm size shows that the large farm size contributes the highest with 43.23% and the least by small farm size with 15.05%.

Table No.47: Cost and Revenue (Hectare Wise): Wokha.

FARM SIZE	Revenue (Rs.)	Total cost (Rs.)	Revenue-Cost (Rs.)	Net Present Value (Rs.)
SMALL	107904000 (15.95%)	21322510 (22.32%)	86581490 (14.90%)	23659089 (15.05%)
MEDIUM	278208000 (41.12%)	36173400 (37.87%)	242034600 (41.65%)	65610290 (41.72%)

LARGE	290496000 (42.93%)	38028080 (39.81%)	252467920 (43.45%)	67976072 (43.23%)
TOTAL	**676608000 (100%)**	**95523990 (100%)**	**581084010 (100%)**	**157245451 (100%)**

Source: Field Survey 2016-2017.

4.2.3: Cost and Revenue (Income-Wise): **Wokha.** This section highlights the benefit-cost for the district according to income wise of the rubber farmers as shown in Table No.48.

4.2.3.1: Cost

The total cost for the rubber farmers includes expenditures like jungle cutting, jungle burning, clearing of the field, rubber stem, toilet, digging, plantation, pruning, weeding and mulching, farm house, lunch and wage of labour, farm house, smoke house, tapping materials, roller machine, toilet, firewood and formid acid,

Under income size of Rs.5,000-10,000 for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs.4,33,22,640/- and the average cost for the same period is Rs.12,74,195.29 per annum for the district. Under income size of Rs.10,000-15,000 for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs.1,02,86,540/- and the average cost for the same period is Rs.3,02,545.29 per annum. Under income size of Rs.15,000-20,000 for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs.1,21,87,340/- and the average cost for the same period is Rs.3,58,451.17 per annum for the district. Under income size of Rs.20,000-25,000 for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs.46,29,300/- and the average cost for the same period is Rs.1,36,155.88 per annum for the district. Under income size of Rs.25,000-30,000 for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs.82,27,970/- and the average cost for the same period is Rs.2,41,999.11 per annum for the district. Under income size of Rs.30,000-Above for the district, the total cost incurred by the rubber farmers from 1-34

years is Rs1,68,70,200/- and the average cost for the same period is Rs.4,96,182.35 per annum for the district.

The percentage distribution of cost for different income size of the district shows that the income group of Rs.5,000-10,000 contributes the highest with 45.35% and the least by income group of Rs.20,000-25,000 with 4.85%.

4.2.3.2: Revenue.

In the field of rubber industry in the world, the gestation or bearing period of rubber trees is 6-7 Years depending upon the geographical locations and will of the rubber farmers. However under my study area, the bearing period ends at 7 years and tapping starts by the month of April-Nov on the 8th years. Therefore the revenue from the rubber plantation starts accruing only from the 8th year when the farmers are able to sell their produce which is dispose either through cooperative or through spot market.

Under income group of Rs. 5,000-10,000 for the district, the total revenue earned by the rubber farmers from 1-34 years is Rs.27,70,56,000/- and the average revenue for the same period is Rs.81,48,705.88 per annum for the district. Under income size of Rs. 10,000-15,000 for the district, the total revenue earned by the rubber farmers from 1-34 years is Rs.7,48,80,000/- and the average revenue for the same period is Rs.22,02,352.94 per annum for the district. Under income size of Rs.15,000-20,000 for the district, the total revenue earned by the rubber farmers from 1-34 years is Rs.8,83,20,000/- and the average revenue for the same period is Rs.25,97,647.05 per annum for the district. Under income size of Rs.20,000-25,000 for the district, the total revenue earned by the rubber farmers from 1-34 years is Rs.2,97,60,000/- and the average revenue for the same period is Rs.8,75,294.11 per annum for the district. Under income size of Rs.25,000-30,000 for the district, the total revenue earned by the rubber farmers from 1-34 years is Rs.7,21,92,000/- and the average revenue for the same period is Rs.21,23,294.11 per annum for the district. Under income size of Rs.30,000-Above for the district, the total revenue earned by the rubber farmers from 1-34 years is Rs.13,44,00,000/- and the average revenue for the same period is Rs.39,52,941.17 per annum for the district.

The percentage distribution of revenue for different income size of the district shows that the income group of Rs.5,000-10,000 contributes the highest with 40.95% and the least by income group of Rs.20,000-25,000 with 4.40%.

4.2.3.3: Benefit –Cost Analysis.

The Net Present Value is calculated by taking the current market rate of interest @ 6.85. As there was no revenue generation for the bearing period from 1-7 years, the result of the net present value came out to be negative for the same period.

Under the income group of Rs.5,000-10,000 for the district, the present value for the entire farming period from 1-34th year is Rs.6,36,82,884/- and the average present value for the same period is Rs.18,73,026 per annum for the district. Therefore it can be seen that the total Net Present Value (Rs. 6,36,82,884) for the income group of Rs.5,000-10,000 for the district is higher than the cost incurred (Rs.4,33,22,640).The Benefit–Cost Ratio came out to be 5.12 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under income group of Rs 5,000-10,000 for the district.

Under the income group of Rs.10,000-15,000 for the district, the present value for the entire farming period from 1-34th year is Rs.1,73,70,340/- and the average present value for the same period is Rs.5,10,892.35 per annum for the district. Therefore it can be seen that the total Net Present Value (Rs.1,73,70,340) for the income group of Rs.10,000-15,000 for the district is higher than the cost incurred (Rs.1,02,86,540). The Benefit –Cost Ratio came out to be 5.56 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under income group of Rs 10,000-15,000 for the district.

Under the income group of Rs. 15,000-20,000 for the state, the present value for the entire farming period from 1-34th year is Rs.2,03,61,211/- and the average present value for the same period is Rs.5,98,859.14 per annum for the district. Therefore it can be seen that the total Net Present Value (Rs.2,03,61,211) for the income group of Rs.15,000-20,000 for the district is

lower than the cost incurred (Rs.1,21,87,340) The Benefit–Cost Ratio came out to be 5.52 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under income group of Rs.15,000-20,000 for the district.

Under the income group of Rs.20,000-25,000 for the district, the present value for the entire farming period from 1-34th year is Rs.67,71,751/- and the average present value for the same period is Rs.1,99,169.14. Therefore it can be seen that the total Net Present Value (Rs.67,71,751) for the income group of Rs.20,000-25,000 for the district is higher than the cost incurred (Rs.4629300).The Benefit–Cost Ratio came out to be 5.15 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under income group of Rs.20,000-25,000 for the district.

Under the income group of Rs.25,000-30,000 for the district, the present value for the entire farming period from 1-34th year is Rs.1,71,01,700/- and the average present value for the same period is Rs.5,02,991.17.Therefore it can be seen that the total Net Present Value (Rs.1,71,01,700) for the income group of Rs.25,000-30,000 for the district is higher than the cost incurred (Rs.82,27,970).The Benefit–Cost Ratio came out to be 6.61 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under income group of Rs.25,000-30,000 for the district.

Under the income group of Rs.30,000-Above for the district, the present value for the entire farming period from 1-34th year is Rs.3,19,57,564/- and the average present value for the same period is Rs.9,39,928.35.Therefore it can be seen that the total Net Present Value (Rs.3,19,57,564) for the income group of Rs.30,000-Above for the district is higher than the cost incurred (Rs.16,8,70,200).The Benefit–Cost Ratio came out to be 6.17 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under income group of Rs.30,000-Above for the district.

The percentage distribution of Net Present Value for different income group of the district shows that the income group of Rs.5,000-10,000 contributes the highest with 40.50% and the least by the income group of Rs.20,000-25,000 with 4.31%.

Table No.48: Cost and Revenue (Income-Wise): **Wokha.**

Income-Wise (Rs.)	Revenue (Rs.)	Total cost (Rs.)	Revenue-cost (Rs.)	NPV (Rs.)
5000-10000	277056000 (40.95%)	43322640 (45.35%)	233733360 (40.22%)	63682884 (40.50%)
10000-15000	74880000 /(11.07%)	10286540 (10.77%)	64593460 (11.12%)	17370340 (11.05%)
15000-20000	88320000 (13.05%)	12187340 (12.76%)	76132660 (13.10%)	20361210.9 (12.95%)
20000-25000	29760000 (4.40%)	4629300 (4.85%)	25130700 (4.32) %	6771751.43 (4.31%)
25000-30000	72192000 (10.67%)	8227970 (8.61%)	63964030 (11.01%)	17101700 (10.88%)
30000 above	134400000 (19.86%)	16870200 (17.66%)	117529800 (20.2%3)	31957564 (20.32%)
TOTAL	**676608000 (100%)**	**95523990 (100%)**	**581084010 (100%)**	**157245450 (100%)**

Source: Field Survey 2016-2017. Figures in parenthesis represent percentage.

4.3.1: Cost and Revenue: Mokokchung. This section highlights the benefit-cost of rubber farmers for the Mokokchung District as a whole as shown in Table No.49.

4.3.1.1: Cost:

The rubber plantation in the district by the rubber farmers was not done at the same year. Therefore for fixation of the wages of labour, 2016-2017 was taken as the base year. As

such the wages of male labour per man day was taken as Rs.250 and the wages of female labour as Rs.200 per man days.

The total cost for the rubber farmers in the first year for the district is Rs.20,06,700/- which includes expenditures like jungle cutting, jungle burning, clearing of the field for three times, rubber stem, toilet, digging, plantation, pruning, weeding and mulching, farm house, lunch and wage of labour. In the second and third year, a total of Rs.20,30,400/- was spent which includes expenditure on farm house, toilet, wages of labour and lunch for cleaning the whole field for three times per year. From 4-7th years, the cost includes expenses on lunch and wages of labour for cleaning the field two times per year, and the total expenditure came out be Rs.8,53,800/-The total cost incurred from 8-34 years includes expenditures like wages on labour and lunch for cleaning the field for one time per year, smoke house, tapping materials, roller machine, firewood, formid acid and wages for the tappers, where the total expenditure came out to be Rs.4,62,86,360/-

The year wise cost of farming (as shown by Table No.49) shows that the highest cost on farming was during the 8th Year (Rs.32,71,000) this is mainly due to increased investment on both fixed and variable cost as the tapping of the rubber trees starts. The lowest cost was incurred on the 7th (Rs.1,85,700).This is mainly attributed to investment only on lunch and wages. Moreover, less labour was also employed during this year because rubber farms are cleaned only two times and are done roughly. The total cost incurred by the rubber farmers in the district from 1-34 years is Rs.5,11,77,260/- and the average cost for the whole farming period is 15,05,213.52 per annum for the district. The percentage distribution of the various cost incurred in the district are as follows, farm House Rs.3,54,000(0.69%), Smoke House Rs.6,70,000(1.31%),Tapping Materials Rs.2,00,000(0.39%), Lunch Rs.8,91,400(1.74%), Rubber Stem Rs.6,15,750(1.20%), Roller machine Rs.9,17,000(1.80%), toilet Rs.63,500(0.12%) firewood Rs.29,22,000(5.71%),formid acid Rs.86,31,360(16.87%), and labour Rs.3,59,12,250(70.17%). The highest cost incurred by the rubber farmers is on wages for labour with 70.17% of the total cost.

4.3.1.2: Revenue.

In the field of rubber industry in the world, the gestation or bearing period of rubber trees is 6-7 Years depending upon the geographical locations and will of the rubber farmers. However under the study area, the tapping starts on the 8th year and the trees are being tapped for 8 months (April-Nov) every year. Therefore the revenue from the rubber plantation starts accruing only from the 8th year when the farmers are able to sell their produce which is dispose either through cooperative or through spot market. In the case of Mokokchung District, their produce is dispose in the state of Assam through spot market. As for the price of natural rubber sheet it mainly depends upon the demand and supply factor in rubber industry. However, the price of natural rubber sheet at Rs. 105 per kg during 2016-17 was taken for calculating the revenue of the rubber farmers. Under the study area the total rubber trees tapped are basically divided into three parts i.e. 8-10 years, 11-31 years and 32-34 years. This is mainly done because all the rubber trees are not tapped at the same year as all the rubber trees are not planted at the same year, in fact some more rubber trees were planted as an extension after three years. Therefore from 8-10 Years the first batch of the rubber trees is tapped and from 11-31 Years all the rubber trees are tapped, and from 32-34 Years only those rubber trees planted as an extension are being tapped.

The total number of rubber trees tapped on the 8th- -10 years is 13,500 trees which produces 303750 Kgs. of smoked rubber sheet as a final output ready for sale in the market and the total revenue earned from the sale of this produce is Rs.3,18,93,750/- with an average revenue of Rs.1,06,31,250/- per annum for the district. From the 11 Years onwards, the second batch of rubber trees starts tapping till 31st year. The total number of rubber trees tapped on the 11th -31st year is 19,980 trees which produces 31,46,850Kgs. of rubber sheet as a final output ready for sale in the market and the total revenue earned from the sale of this product is Rs.33,04,19,250/- for the period with an average revenue of Rs.1,57,34,250/- per annum for the District. The last batch of rubber trees are tapped which was planted as an extension for a period of three years i.e 32-34 years. The total number of rubber trees tapped on the 32nd -34th years is 6,480 trees which produces 1,45,800 Kgs. of rubber sheet as a final output ready for sale in the market and the total revenue earned from the sale of this product is Rs.2,13,03,000/- for the period with an average revenue of Rs.71,01,000/-

per annum for the district. The total revenue earned by the rubber farmers from 1-34th years is Rs.38,36,16,000/- with an average revenue of Rs.1,12,82,823.52 annually for the district.

4.3.1.3: Benefit –Cost Analysis.

The Net Present Value is calculated by taking the current market rate of interest @ 6.85. As there was no revenue generation for 1-7 years, the result of the net present value came out to be negative for the same period. The net present value for 1st year is -1878053, 2nd year is Rs.-978985, 3rd year is Rs. -748177, 4th year is Rs. -189035, 5th year is Rs. -156238, 6th year is Rs. -137150 and 7th year is Rs. -116786. The net present value for the 8th year is Rs.4332079, and the following net present values for the various years are clearly shown in the table no 5.3.1 below.

The present value for the entire farming period from 1-34th year is Rs.9,09,09,041/- and the average present value for the same period is Rs.26,73,795.32 per annum for the district. The highest present value is in the 11th year with Rs.67,07,021/- and the least is in the 1th year with Rs. -18,78,053/-.

Therefore it can be seen that the total Net Present Value (Rs.9,09,09,041.) for the district is higher than the cost incurred (Rs.5,11,77,260).The Benefit–Cost Ratio came out to be 6.04 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable in the district.

Table No.49: Cost and Revenue: Mokokchung.

YEAR	Revenue (Rs.)	Total cost (Rs.)	Revenue-Cost (Rs.)	Discount rate (6.85)	NPV (Rs.)
1	0	2006700	-2006700	0.94	-1878053
2	0	1117700	-1117700	0.88	-978985
3	0	912700	-912700	0.82	-748177
4	0	246400	-246400	0.77	-189035
5	0	217600	-217600	0.72	-156238
6	0	204100	-204100	0.67	-137150
7	0	185700	-185700	0.63	-116786
8	10631250	3271000	7360250	0.59	4332079
9	10631250	1584000	9047250	0.55	4983631
10	10631250	1584000	9047250	0.52	4664137
11	15734250	1833140	13901110	0.48	6707021
12	15734250	1733140	14001110	0.45	6322199
13	15734250	1733140	14001110	0.42	5916892
14	15734250	1733140	14001110	0.40	5537568
15	15734250	1733140	14001110	0.37	5182563
16	15734250	1733140	14001110	0.35	4850316
17	15734250	1733140	14001110	0.32	4539369
18	15734250	1733140	14001110	0.30	4248357
19	15734250	1733140	14001110	0.28	3976001
20	15734250	1733140	14001110	0.27	3721105
21	15734250	1733140	14001110	0.25	3482550
22	15734250	1733140	14001110	0.23	3259289

23	15734250	1733140	14001110	0.22	3050341
24	15734250	1733140	14001110	0.20	2854788
25	15734250	1733140	14001110	0.19	2671771
26	15734250	1733140	14001110	0.18	2500488
27	15734250	1733140	14001110	0.17	2340185
28	15734250	1733140	14001110	0.16	2190159
29	15734250	1733140	14001110	0.15	2049751
30	15734250	1733140	14001110	0.14	1918345
31	15734250	1733140	14001110	0.13	1795362
32	7101000	1117140	5983860	0.12	718119
33	7101000	1117140	5983860	0.11	672082
34	7101000	1117140	5983860	0.11	628995
Total	**383616000**	**51177260**	**332438740**		**90909041**

Source: Field Survey 2016-2017. Figures in parenthesis represent percentage.

4.3.2: Cost and Revenue (Hectare-Wise): Mokokchung. This section highlights the benefit –cost for the District as shown in Table No.50.

4.3.2.1: Cost:

The total cost for the rubber farmers includes expenditures like jungle cutting, jungle burning, clearing of the field, rubber stem, toilet, digging, plantation, pruning, weeding and mulching, farm house, lunch and wage of labour, farm house, smoke house, tapping materials, roller machine, toilet, firewood, and formid acid,

Under Small Farm size for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs.2,58,10,810/- and the average cost for the same period is Rs.7,59,141.47 per annum for the district. Under Medium Farm Size for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs.1,68,38,990/- and the average cost for the same period is Rs.4,95,264.41 per annum for the district. Under large Farm size for the district, the total cost

incurred by the rubber farmers from 1-34 years is Rs.85,27,460/- and the average cost for the same period is Rs.2,50,807.64 per annum for the district.

The percentage distribution of cost for different farm size shows that the small farm size contributes the highest with 50.43% and the least by large farm size with 16.66%.

4.2.2.2: Revenue.

In the field of rubber industry in the world, the gestation or bearing period of rubber trees is 6-7 Years depending upon the geographical locations and will of the rubber farmers. However under the study area, the tapping starts on the 8th year and the trees are being tapped for 8 months (April-Nov) every year. Therefore the revenue from the rubber plantation starts accruing only from the 8th year when the farmers are able to sell their produce which is dispose either through cooperative or through spot market.

Under the Small Farm Size for the district, the total revenue earned by the rubber farmers from the entire farming period i.e 1-34 years is Rs.17,58,72,000/- and the average revenue for the same period for the district is Rs.51,72,705.88 per annum. Under the Medium Farm Size for the district, the total revenue earned by the rubber farmers from the entire farming period i.e 1-34 years is Rs.13,67,04,000/- with an average revenue of Rs.40,20,705.88 per annum for the same the district. Under the Large Farm Size for the district, the total revenue earned by the rubber farmers from the entire farming period i.e 1-34 years is Rs.7,10,40,000/- with an average revenue of Rs.20,89,411.76 per annum for the district.

The percentage distribution of revenue for different farm size in the district shows that the small farm size contributes the highest with 45.85% and the least by large farm size with 18.52% .

4.2.2.3: Benefit –Cost Analysis.

The Net Present Value is calculated by taking the current market rate of interest @ 6.85. As there was no revenue generation for the bearing period from 1-7 years, the result of the net present value came out to be negative for the same period.

Under the small size of farming for the district, the present value for the entire farming period from 1-34th year is Rs.4,10,18,865/- and the average present value for the same period is Rs.1206437.20 per annum for the district. Therefore it can be seen that the total Net Present Value (Rs.4,10,18,865) for the small farm size for the district is higher than the cost incurred (Rs.2,58,10,810). The Benefit –Cost Ratio came out to be 5.64 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under small farm size in the district.

Under the medium farm size for the district, the present value for the entire farming period from 1-34th year is Rs.3,25,17,597/- and the average present value for the same period is Rs.9,56,399.91 per annum for the district. Therefore it can be seen that the total Net Present Value (Rs.3,25,17,597) for the medium farm size in the district is higher than the cost incurred (Rs.1,68,38,990). The Benefit –Cost Ratio came out to be 6.25 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under medium farm size in the district.

Under the large farm size for the district, the present value for the entire farming period from 1-34th year is Rs.1,73,72,579/- with an average present value of Rs.510958.20 per annum for the district. Therefore it can be seen that the total Net Present Value (Rs1,73,72,579) for the large farm size in the district is higher than the cost incurred (Rs.85,27,460). The Benefit – Cost Ratio came out to be 6.76 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under large farm size in the district.

The percentage distribution of revenue for different farm size shows that the small farm size contributes the highest with 45.12% and the least by large farm size with 19.11%.

Table No.50: Cost and Revenue (Hectare-Wise): Mokokchung.

Farm Size	Revenue (Rs.)	Total cost (Rs.)	Revenue-Cost (Rs.)	NPV (Rs.)
Small	175872000 (45.85%)	25810810 (50.43%)	150061190 (45.14%)	41018865 (45.12%)
Medium	136704000 (35.64%)	16838990 (32.90%)	119865010 (36.06%)	32517597 (35.77%)
Large	71040000 (18.52%)	8527460 (16.66%)	62512540 (18.80%)	17372579 (19.11) %
Total	**383616000 (100%)**	**51177260 (100%)**	**332438740 (100%)**	**90909041 (100%)**

Source: Field Survey 2016-2017. Figures in parenthesis represent percentage.

4.3.3: Cost and Revenue (Income-Wise): Mokokchung. This section highlights the benefit-cost for the district according to income wise of the rubber farmers as shown in Table No.51.

4.3.3.1: Cost

The total cost for the rubber farmers includes expenditures like jungle cutting, jungle burning, clearing of the field, rubber stem, toilet, digging, plantation, pruning, weeding and mulching, farm house, lunch and wage of labour, farm house, smoke house, tapping materials, roller machine, toilet, firewood, and formid acid,

Under income size of Rs.5,000-10,000 for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs.2,64,71,810/- and the average cost for the same period is Rs.7,78,582.64 per annum for the district. Under income size of Rs.10,000-15,000 for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs.37,31,750/- and the

average cost for the same period is Rs.1,09,757.35 per annum for the district. Under income size of Rs.15,000-20,000 for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs.55,16,690/- and the average cost for the same period is Rs.1,62,255.58 per annum for the district. Under income size of Rs.20,000-25,000 for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs.88,07,330/- and the average cost for the same period is Rs.2,59,039.11 per annum for the district. Under income size of Rs.25,000-30,000 for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs.17,76,870/- and the average cost for the same period is Rs.52,260.88 per annum for the district. Under income size of Rs.30,000-Above for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs.48,72,810/- and the average cost for the same period is Rs.1,43,317.94 per annum for the district.

The percentage distribution of cost for different income size in the district shows that the income group of Rs.5,000-10,000 contributes the highest with 51.73% and the least by income group of Rs.25,000-30,000 with 3.75%.

4.3.3.2: Revenue.

In the field of rubber industry in the world, the gestation or bearing period of rubber trees is 6-7 Years depending upon the geographical locations and will of the rubber farmers. . However under the study area, the tapping starts on the 8th year and the trees are being tapped for 8 months (April-Nov) every year. Therefore the revenue from the rubber plantation starts accruing only from the 8th year when the farmers are able to sell their produce which is dispose either through cooperative or through spot market.

Under income group of Rs. 5,000-10,000 for the district, the total revenue earned by the rubber farmers from 1-34 years is Rs.20,00,64,000/- and the average revenue for the same period is Rs.58,84,235.29 per annum for the district. Under income group of Rs.10,000-15,000 for the district, the total revenue earned by the rubber farmers from 1-34 years is Rs.2,26,56,000/- and the average revenue for the same period is Rs.6,66,352.94 per annum for the district. Under income group of Rs.15,000-20,000 for the district, the total revenue earned by the rubber farmers from 1-34 years is Rs.4,35,84,000/- and the average revenue for the

same period is Rs.12,81,882.35 per annum for the district. Under income group of Rs.20,000-25,000 for the district, the total revenue earned by the rubber farmers from 1-34 years is Rs.6,45,12,000/- and the average revenue for the same period is Rs.18,97,411.76 per annum for the district. Under income group of Rs.25,000-30,000 for the district, the total revenue earned by the rubber farmers from 1-34 years is Rs.1,44,00,000/- and the average revenue for the same period is Rs.4,23,529.41 per annum for the district. Under income group of Rs.30,000-Above for the district, the total revenue earned by the rubber farmers from 1-34 years is Rs.3,84,00,000/- and the average revenue for the same period is Rs.11,29,411.76 per annum for the district.

The percentage distribution of revenue for different income group in the district shows that the income group of Rs.5,000-10,000 contributes the highest with 52.15% and the least by income group of Rs.25,000-30,000 with 3.75%.

4.3.3.3: Benefit –Cost Analysis.

The Net Present Value is calculated by taking the current market rate of interest @ 6.85. As there was no revenue generation for the bearing period from 1-7 years, the result of the net present value came out to be negative for the same period.

Under the income group of Rs.5,000-10,000 for the district, the present value for the entire farming period from 1-34th year is Rs.4,73,18,687/- and the average present value for the same period is Rs.13,91,726.08 per annum for the district. Therefore it can be seen that the total Net Present Value (Rs.4,73,18,687) for the income group of Rs.5,000-10,000 for the district is higher than the cost incurred (Rs.2,64,71,810).The Benefit–Cost Ratio came out to be 6.09 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under income group of Rs 5,000-10,000 for the district.

Under the income group of Rs.10,000-15,000 for the district, the present value for the entire farming period from 1-34th year is Rs.51,55,217/- and the average present value for the same period is Rs.1,51,624.02 per annum for the district. Therefore it can be seen that the total

Net Present Value (Rs. 51,55,217) for the income group of Rs.10,000-15,000 for the district is higher than the cost incurred (Rs.37,31,750).The Benefit–Cost Ratio came out to be 5.02 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under income group Rs.10,000-15,000 in the district.

Under the income group of Rs.15,000-20,000 for the district, the present value for the entire farming period from 1-34th year is Rs.1,04,65,473/- and the average present value for the same period is Rs.3,07,808.02 per annum for the district. Therefore it can be seen that the total Net Present Value (Rs.1,04,65,473) for the income group of Rs.15,000-20,000 for the district is higher than the cost incurred (Rs.55,16,690).The Benefit–Cost Ratio came out to be 6.42 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under income group of Rs.15,000-20,000 in the district.

Under the income group of Rs.20,000-25,000 for the district, the present value for the entire farming period from 1-34th year is Rs.15,19,941/- and the average present value for the same period is Rs.4,47,041.5. Therefore it can be seen that the total Net Present Value (Rs.1,51,99,411) for the income group of Rs.20,000-25,000 for the district is higher than the cost incurred (Rs.88,07,330).The Benefit–Cost Ratio came out to be 5.82 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under income group of Rs.20,000-25,000 in the district.

Under the income group of Rs.25,000-30,000 for the district, the present value for the entire farming period from 1-34th year is Rs.34,50,313/- and the average present value for the same period is Rs.1,01,479.79. Therefore it can be seen that the total Net Present Value (Rs.34,50,313) for the income group of Rs.25,000-30,000 for the district is higher than the cost incurred (Rs.17,76,870). The Benefit –Cost Ratio came out to be 6.45 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under income group of Rs.25,000-30,000 in the district.

Under the income group of Rs.30,000-Above for the district, the present value for the entire farming period from 1-34th year is Rs.93,19,940/- and the average present value for the same period is Rs.2,74,115.88. Therefore it can be seen that the total Net Present Value (Rs.93,19,940) for the income group of Rs.30,000-Above for the district is higher than the cost incurred (Rs.48,72,810).The Benefit–Cost Ratio came out to be 6.35 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under income group of Rs.30,000-Above in the district.

The percentage distribution of Net Present Value for different income group of the district shows that the income group of Rs.5,000-10,000 contributes the highest with 52.05% and the least by the income group of Rs.25,000-30,000 with 3.80%.

Table No.51: Cost and Revenue (Income-Wise): Mokokchung.

Income-Wise (Rs.)	Revenue (Rs.)	Total cost (Rs.)	Revenue-cost (Rs.)	NPV (Rs.)
5000-10000	200064000 (52.15%)	26471810 (51.73%)	173592190 (52.22%)	47318687 (52.05%)
10000-15000	22656000 (5.91%)	3731750 (97.29%)	18924250 (5.69%)	5155217 (5.67) %
15000-20000	43584000 (11.36%)	5516690 (10.78%)	38067310 (11.45%)	10465473 (11.51%)
20000-25000	64512000 (16.82%)	8807330 (17.21%)	55704670 (16.76%)	15199411 (16.72%)
25000-30000	14400000 (3.75%)	1776870 (3.47%)	12623130 (3.80%)	3450313 (3.80%)
30000- Above	38400000 (10.01%)	4872810 (9.52%)	33527190 (10.09%)	9319940 (10.25%)
Total	**383616000 (100%)**	**51177260 (100%)**	**332438740 (100%)**	**90909041 (100%)**

Source: Field Survey 2016-2017. Figures in parenthesis represent percentage

Chapter-5

Findings and Conclusion.

This chapter highlights the finding of the study.

5.1: Total Area and Average Size of Holdings:

i. In Nagaland under the study area, It was found that a total of 144.5 hectares are under rubber farming with an average holding of 2.4 hectare per rubber farmer. Under small farm size, a total area of 40 hectares is under rubber cultivation with an average size of holding as 1.33 hectare per rubber farmer. The medium farm size shows that a total area of 55.5 hectares with an average size of holding as 2.5 hectares per rubber farmer. Under large farm size, the total area under rubber cultivation is 49 hectares with an average size of holding as 6.12 hectares per rubber farmer.

ii. It was found that in Wokha District the total area under rubber cultivation was 90 hectares with an average size of 3 hectare per rubber farmer. While in Mokokchung District it was 54.5 hectares with an average size of 1.81 hectares per rubber farmer.

iii. The income-wise distribution of farm size for the rubber farmers in the state shows that the income group of Rs.5,000-10,000 group has a total area of 64.5 hectares with an average of 1.95 hectares, income group of Rs.10,000-15,000 has an area of 13.5 hectares with an average size of as 1.92 hectares, income group of Rs.15,000-20,000 has an area of 17.5 hectares with an average size of 2.5 hectares, income group of Rs.20,000-25,000 has an area of 13.5 hectares with an average size of 1.92 hectares, income group of Rs.25,000-30,000 has an area of 12 hectares with an average size of 4 hectares, income group of Rs.30,000-Above group has an area of 23.5 hectares with an average size of 7.83 hectares.

5.2: Survival Rate of the Rubber Tree:

i. The survival rate of rubber trees for the state came out to be 94.58 per cent. Under small farm size, the survival rate is 96.09 percent, Under medium farm size, the survival rate was 94.20 percent and Under large farm size, the survival rate was 93.86 percent. On comparison among different farm size for the state, it was found that the small farm size has the highest survival rate than the rest, which is even higher than the survival rate of the state. The overall correlation between farm size and survival rate for the state shows a negative relationship with r= - 0.14079. However, since the value of correlation(r) is less than the probable error (P.Er=0.8535), there is no evidence of correlation between farm size and survival rate within the state.

ii. On comparison among the different income group of the rubber farmers in the state, it was found that the income group ranging from Rs.20,000-25,000 has the highest survival rate than the rest.

iii. The survival rate of rubber tree in Wokha District was 93.51 percent. On comparison among the different farm size, it was found that the medium farm size has the highest survival rate than the rest.

iv. Among the different income group for Wokha district, it was found that the income group of Rs. 15,000-20,000 has the highest survival rate than the rest.

v. In Mokokchung District, the survival rate is 96.28 percent. On comparison among the different farm size, it was found that the small farm size has the highest survival rate than the rest.

vi. Among the different income group for Mokokchung district, it was found that the income group of Rs.20,000-25,000 has the highest survival rate than the rest.

vii. On comparison between the two districts under the study area, it was found that Mokokchung district has the highest survival rate with 96.28%.

5.3: Farm Size and Productivity: Nagaland.

i. The total area under rubber cultivation in the study area for the state is 144.5 hectares with an average size of holding as 2.40 hectare per house hold. The total production for the state during the whole period of tapping (8-34 years) was 993960 Kgs of rubber sheet with an average productivity or yield per hectare of 68786.16 Kgs On comparison among the different farm size in the state, it was found that the medium farm size has the highest yield per hectare with 70086.48 Kgs accounting for 39.13% of the total production.

ii. The overall correlation between farm size and production of rubber sheet for the State shows a positive relationship with r=0.99. Since the value of r is more than six times the probable error (P.Er=0.0017), the co-efficient of correlation between farm size and productivity is significant which shows that as the size of the farm increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 98% of the variation in production is explained by the farm size X, the regression values of Production (Y) on farm size (X) gave us.

Y= a+bx, Y= -5261.71 + 70915X

The result shows that the regression co-efficient byx is 70915. This explains that a unit change in Farm Size will lead a change in production by 70915. The p-value of 'byx' is 3.61E-57 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%. Thus, the hypothesis which states that higher the farm size higher is the rubber productivity has been proved.

iii. *8-10 Years of Tapping***.** The production of rubber sheet for the state came out to be 832725 Kgs. for the period and the productivity per hectare is 5762 Kgs. The overall correlation between farm size and production of rubber sheet for the State shows a positive relationship with r=0.99. The co-efficient of determinants on r^2 value shows that 98% of the variation in production is explained by the farm size. This shows that higher the farm size higher is the productivity. The result shows that the regression co-efficient byx is 5830.841 which is significant at 5%. Thus, the hypothesis which states that higher the farm size higher is the rubber productivity has been proved.

Among the different farm size for the state, it was found that the medium farm size has the highest yield per hectare than the rest. It was also found that all the farm size has a positive

relation with production proving the hypothesis true. However, on comparison among the different farm size, it was found that the large farm size has the highest correlation between farm size and production.

iv. *11-31 Years of Tapping.* The production of rubber sheet for the state came out to be 8697150 Kgs. for the period, and the productivity or yield per hectare is 60187Kgs. The overall correlation between farm size and production of rubber sheet for the State shows a positive relationship with r=0.99. The co-efficient of determinants on r^2 value shows that 98% of the variation in production is explained by the farm size. This shows that higher the farm size higher is the productivity. The result shows that the regression co-efficient byx is 5830.841 which is significant at 5%. Thus, the hypothesis which states that higher the farm size higher is the rubber productivity has been proved.

Among the different farm size for the state, it was found that the medium farm size has the highest yield per hectare than the rest. It was also found that all the farm size has a positive relation with production proving the hypothesis true. However, in comparison among the different farm size for the state, it was found that the large farm size has the highest correlation between farm size and production.

v. *32-34 Years of Tapping.* The production of rubber sheet for the state came out to be 409725 Kgs for the period and the productivity or yield per hectare is 2835 Kgs. The overall correlation between size of farming per hectare and production of rubber sheet for the State shows a positive relationship with r=0.96. The co-efficient of determinants on r^2 value shows that 93% of the variation in production is explained by the farm size. This shows that higher the farm size higher is the productivity. The result shows that the regression co-efficient byx is 62051.31 which is significant at 5%. Thus, the hypothesis which states that higher the farm size higher is the rubber productivity has been proved.

Amongst the different farm size for the state, it was found that the large size of holding has the highest yield per hectare per annum than the rest. It was also found that all the farm size has a positive relation with production proving the hypothesis true. However, large farm

size has the highest correlation between farm size and production amongst the different farm size for the state.

5.4: Farm Size and Productivity: Wokha District.

i. The total area under rubber cultivation in the study area for Wokha district is 90 hectares with an average size of holding as 3 hectares per house hold. The total production for the district during the whole period of tapping (8-34 years) was 6343200 Kgs of rubber sheet with an average productivity or yield per hectare of 70480 Kgs. On comparison among different farm size, it can be seen that the large farm size has the highest yield per hectare accounting for 42% of the total production.

The overall correlation between farm size and production of rubber sheet for the district shows a positive relationship with r=0.99. Since the value of r is more than six times the probable error (P.Er=0.002), the co-efficient of correlation between farm size and productivity is significant which shows that as the size of farm increases, the productivity of rubber also increases. The co-efficient of determinants on r^2 value shows that 98% of the variation in Production is explained by the farm size X, the regression values of farm size (Y) on Production (X) gave us.

$Y= a+bx,$ $Y= -3348.06 + 71596.02X$

The result shows that the regression co-efficient byx is 71596.02. This explains that a unit change in Farm Size will lead a change in Production by 71596.02. The p-value of 'byx' is 7.36E-31 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%. Thus, the hypothesis which states that higher the size of the farm higher is the rubber productivity has been proved.

iii. *8-10 Years of Tapping.* The production of rubber sheet for the district came out to be 528975 Kgs. for the period with an average productivity or yield per hectare as 5877.50 Kgs. The overall correlation between farm size and production of rubber sheet for the district shows a positive relationship with r=0.99. The co-efficient of determinants on r^2 value shows that 98% of the variation in production is explained by the farm size. This shows that higher the farm size higher

is the productivity. The result shows that the regression co-efficient byx is 5762.42 which is significant at 5%. Thus, the hypothesis which states that higher the farm size higher is the rubber productivity has been proved.

Among the different farm size for the state, it was found that the medium farm size has the highest yield per hectare per annum than the rest and was also found that all the farm size has a positive relation with production proving the hypothesis true. However, it was also found that the large farm size has the highest correlation between farm size and production among the farm size in the district.

iv. *11-31 Years of Tapping***.** The production of rubber sheet for the state came out to be 5550300 Kgs for the period, and the productivity or yield per hectare is 61670 Kgs. The overall correlation between farm size and production of rubber sheet for the district shows a positive relationship with r=0.99. The co-efficient of determinants on r^2 value shows that 99% of the variation in production is explained by the farm size. This shows that higher the farm size higher is the productivity. The result shows that the regression co-efficient byx is 62656.8 which is significant at 5%. Thus, the hypothesis which states that higher the farm size higher is the rubber productivity has been proved true.

Among the different farm size for the district, it was found that the medium farm size has the highest yield per hectare than the rest and was also found that all the farm size has a positive relation with production proving the hypothesis true. However, it was also found that the large farm size has the highest correlation between farm size and production among the different farm size of the district.

v. *32-34 Years of Tapping.* The production of rubber sheet for the district came out to be 263925 Kgs of rubber sheet for the period, and the productivity or yield per hectare is 2932.50 Kgs. The overall correlation between farm size and production of rubber sheet for the district shows a positive relationship with r=0.98. The co-efficient of determinants on r^2 value shows that 96% of the variation in production is explained by the farm size. This shows that higher the farm size higher is the productivity. The result shows that the regression co-efficient byx is

3188.544 which is significant at 5%. Thus, the hypothesis which states that higher the farm size higher is the rubber productivity has been proved.

In comparison among the different farm size for the district, it was found that the large farm size has the highest yield per hectare than the rest and was also found that all the farm size has a positive relation with production proving the hypothesis true. However, it was found that the large farm size has the highest correlation between farm size and production amongst the different farm size.

5.5: Farm Size and Productivity: Mokokchung.

i. The total area under rubber cultivation in the study area for the district is 54.5 hectares with an average size of holding as 1.81 hectare per house hold. The total production for the district during the whole period of tapping (8-34 years) was 3596400 Kgs of rubber sheet with an average productivity or yield of 65989 Kgs per hectare. On comparison among different farm size, it was found that the small farm size has the highest yield per hectare accounting for 45.85% of the total production.

ii. The overall correlation between farm size and production of rubber sheet for the district shows a positive relationship with r=0.98. Since the value of r is more than six times the probable error (P.Er=0.0036), the co-efficient of correlation between farm size and productivity is significant which shows that as the farm size increases, the production of rubber also increases. The co-efficient of determinants on r2 value shows that 97% of the variation in Production is explained by the farm size X, the regression values of farm size (Y) on Production (X) gave us.

$Y= a+bx,$ $Y= 4361.55+ 63588.1X$

The result shows that the regression co-efficient byx is 65989. This explains that a unit change in Farm Size will lead a change in Production by 65989. The p-value of 'byx' is 2.4E-24 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%. Thus, the hypothesis which states that higher the farm size higher is the rubber productivity has been proved.

iii. *8-10 Years of Tapping***.** The production of rubber sheet in terms of Kg. for the came out to be 303750 Kgs. for the period, and the productivity or yield per hectare is 5573.39 Kgs. The overall correlation between farm size per hectare and production of rubber sheet for the district shows a positive relationship with r=0.98. The co-efficient of determinants on r^2 value shows that 96% of the variation in production is explained by the farm size. This shows that higher the farm size higher is the productivity. The result shows that the regression co-efficient byx is 5894.52 which is significant at 5%. Thus, the hypothesis which states that higher the farm size higher is the rubber productivity has been proved.

Among the different farm size for the district, it was found that the large farm size has the highest yield per hectare than the rest and was also found that all the farm size has a positive relation with production proving the hypothesis true. However, in comparison amongst the different farm size, it was found that the large farm size has the highest correlation between farm size and production.

iv. *11-31 Years of Tapping.* The production of rubber sheet for the district came out to be 3146850 Kgs.for the period, and the productivity or yield per hectare is 57740.37 Kgs. The overall correlation between farm size and production of rubber sheet for the district shows a positive relationship with r=0.98. The co-efficient of determinants on r^2 value shows that 97% of the variation in production is explained by the farm size. This shows that higher the farm size higher is the productivity. The result shows that the regression co-efficient byx is 55536.7 which is significant at 5%. Thus, the hypothesis which states that higher the farm size higher is the rubber productivity has been proved true.

Among the different farm size for the district, it was found that the medium size of holding has the highest yield per hectare per annum than the rest. It was also found that all the farm size has a positive relation with production proving the hypothesis true. However, large farm size has the highest correlation between farm size and production amongst the farm size.

v. *32-34 Years of Tapping.* The production of rubber sheet for the state came out to be 14580 Kgs. of for this period of three years, and the productivity or yield per hectare is 2675 Kgs. The overall correlation between farm size and production of rubber sheet for the district shows a

positive relationship with r=0.86. The co-efficient of determinants on r^2 value shows that 74% of the variation in production is explained by the farm size. This shows that higher the farm size higher is the productivity. The result shows that the regression co-efficient byx is 2039.294 which is significant at 5%. Thus, the hypothesis which states that higher the farm size higher is the rubber productivity has been proved.

Among the different farm size for the state, it was found that the medium farm size has the highest yield per hectare per annum than the rest and was also found that all the farm size has a positive relation with production proving the hypothesis true. However, in comparison amongst the different farm size, it was found that the large farm size has the highest correlation between farm size and production.

5.6: Farm size and productivity (Income -Wise Distribution): Nagaland.

i. The total area under rubber cultivation in the study area for the state is 144.5 hectares and the total monthly income for the rubber farmers in the state is Rs.781300 with average monthly income of Rs. 13021.67 per household. The total production of rubber sheet under the study area for the state from 8-34 Years is 9939600 Kgs with an average productivity of 68786.16 Kgs per annum for the period.

On comparison among different income group in the state for the period 8-34 years, it was found that the income group of Rs.15,000-20,000 has the highest yield per hectare than the rest, which is even higher than the yield per hectare in the district. It was also found that the highest percentage of land under rubber cultivation for the state is within the income group of Rs.5,000-10,000 and the least was found to be from the income group of Rs. 25000- 30,000.

ii. *8-10 Years of Tapping.* The production of rubber sheet for the state came out to be 832725 Kgs. for the period, and the productivity or yield per hectare is 5762 Kgs. Among the different income groups for the state, it was found that the income group of Rs.30000-Above has the highest yield per hectare per annum than the rest and was also found that the highest percentage of land under rubber cultivation for the state is within the income group of Rs.5,000-10,000 and the least was found to be from the income group of Rs.25000-30,000.

iii. *11-31 Years of Tapping***.** The production of rubber sheet for the state came out to be 8697150 Kgs. for the period, and the productivity or yield per hectare is 60187.89 Kgs. Among the different income group for the state, it was found that the income group of Rs.15000-20000 has the highest yield per hectare than the rest. It was also found that the highest percentage of land under rubber cultivation for the state is within the income group of Rs.5,000-10,000 and the least was from the income group of Rs.25000-30,000.

iv. *32-34 Years of Tapping.* The production of rubber sheet for the state came out to be 409725 Kgs. for the period, and the productivity or yield per hectare is 6829 Kgs. Among the different income group for the state, it was found that the income group of Rs 25000-30,000 has the highest yield per hectare than the rest. It was also found that the highest percentage of land under rubber cultivation for the state is within the income group of Rs.5,000-10,000 and the least was from the income group of Rs.25000-30,000.

v. *Relation between Income and Farm Size*: *Nagaland.* The total area under rubber cultivation in the study area for the state is 144.5 hectares and the total monthly income of the rubber farmers in the state was Rs.781300. The overall correlation between farm size and income of rubber farmers shows a positive relationship with r=0.87. Since the value of r is more than six times the probable error (P.Er=0.0209), the co-efficient of correlation between farm size and income is significant which shows that as income increases, the farm size also increases. The co-efficient of determinants on r^2 value shows that 76% of the variation in farm size is explained by the income X, the regression values of farm size (Y) on income (X) gave us.

Y= a+bx, Y= -16.78647+ 0.000313X

The result shows that the regression co-efficient byx is 0.000313. This explains that a unit change in income will lead a change in farm size by 0.000313. The p-value of 'byx' is 0.022107 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%. Thus, the hypothesis which states that higher the income higher is the size of holding has been proved.

5.7: Farm size and productivity (Income Wise Distribution): Wokha District.

i. The total area under rubber cultivation in the study area for the district is 90 hectares and the total monthly income for the rubber farmers in the district is Rs.405000 with average monthly income of Rs.13,500 per household. The total production of rubber sheet under the study area for the district from 8-34 Years is 63,43,200 Kgs. with an average productivity of 70480 Kgs. per annum for the period. On comparison among different income group in the district for the period 8-34 years, it was found that the income group of Rs.15,000-20,000 and income group of Rs.30,000-Above has the highest yield per hectare than the rest, which is even higher than the yield per hectare in the district. It was also found that the highest percentage of land under rubber cultivation for the state is within the income group of Rs.5,000-10,000 and the least was found to be from the income group of Rs.20,000- 25,000.

ii. *8-10 Years of Tapping.* The production of rubber sheet for the state came out to be 528975 Kgs. for the period, and the productivity or yield per hectare is 5877.5 Kgs. Amongst the different income groups for the district, it was found that the income group of Rs.5000-10000 has the highest yield per hectare than the rest. It was also found that the highest percentage of land under rubber cultivation for the district is within the income group of Rs.5,000-10,000 and the least was found to be from the income group of Rs. 30,000- above.

iii. *11-31 Years of Tapping.* The production of rubber sheet in terms of Kg. for the district came out to be 5550300 Kgs. for the period, and the productivity or yield per hectare is 61670 Kgs. Among the different income group for the district, it was found that the income group of Rs.15000-20000 and 30000-Above has the highest yield per hectare per annum than the rest. It was also found that the highest percentage of land under rubber cultivation for the district is within the income group of Rs.5,000-10,000 and the least was found to be from the income group of Rs.30,000 - above.

iv. *32-34 Years of Tapping.* The production of rubber sheet for the district came out to be 263925 Kg. for the period, and the productivity or yield per hectare is 2932.5 Kgs. Among the different income group for the district, it was found that the income group of Rs 25000-30,000 has the highest yield per hectare than the rest. It was also found that the highest percentage of

land under rubber cultivation for the district is within the income group of Rs.5,000-10,000 and the least was found to be from the income group of Rs. 30,000 - above.

v. *Relation between Income and Farm Size*: *Wokha.*The total area under rubber cultivation in the study area for Wokha district is 90 hectares and the total monthly income for the district is Rs. 405000. The overall correlation between income and farm size for the district shows a positive relationship with r=0.99. Since the value of r is more than six times the probable error (P.Er=0.002), the co-efficient of correlation between farm size and income is significant which shows that as the income of the farmer increases, the farm size also increases. The co-efficient of determinants on r^2 value shows that 98% of the variation in farm size is explained by the income X, the regression values of farm size (Y) on income (X) gave us.

$$Y= a+bx, \qquad Y= -4.267 + .00029X$$

The result shows that the regression co-efficient byx is .00029. This explains that a unit change in income will lead a change in farm size by .00029. The p-value of 'byx' is .03872 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%. Thus, the hypothesis which states that higher the income higher is the size of holding has been proved.

5.8: Farm size and productivity (Income Wise Distribution): Mokokchung.

i. The total area under rubber cultivation in the study area for the district is 54.5 hectares and the total monthly income for the rubber farmers in the district is Rs.3,76,300 with average monthly income of Rs.12,543.33 per household. The total production of rubber sheet under the study area for the district from 8-34 Years is 3596400 Kgs. with an average productivity of 65988.99 Kgs. per annum for the period.

Among the different income group, it was found that of Rs. 5000–10000 has the highest production with 1875600 kgs accounting for 52.15% of the total production during the entire period (8-34 years). On comparison among different income group in the district for the period 8-34 years, it was found that the income group of Rs.5,000-10,000 has the highest yield per hectare than the rest, which is even higher than the yield per hectare in the district. It was also found that the highest percentage of land under rubber cultivation for the district is within the

income group of Rs.5,000-10,000 and the least was found to be from the income group of Rs.25,000- 30,000.

ii. *8-10 Years of Tapping.* The production of rubber sheet for the district came out to be 303750 Kgs. for the period, and the productivity or yield per hectare is 5573 Kgs. Among the different income group for the district, it was found that the income group of Rs. 15000-20000 has the highest yield per hectare than the rest. It was also found that the highest percentage of land under rubber cultivation for the district is within the income group of Rs.5,000-10,000 and the least was found to be from the income group of Rs. 25000-30,000.

iii. *11-31 Years of Tapping.* The production of rubber sheet in terms of Kg. for the district came out to be 3146850 Kgs. for the period, and the productivity or yield per hectare is 57740 Kgs. Among the different income group for the district, it was found that the income group of Rs. 5000-10000 has the highest yield per hectare per annum than the rest and was also found that the highest percentage of land under rubber cultivation for the district is within the income group of Rs.5,000-10,000 and the least was found to be from the income group of Rs. 25000-30,000.

iv. *32-34 Years of Tapping.* The production of rubber sheet for the district came out to be 145800 Kgs. for the period, and the productivity or yield per hectare is 2675.23 Kgs. Among the different income group for the district, it was found that the income group of Rs 5000-10000 has the highest yield per hectare than the rest. It was also found that the highest percentage of land under rubber cultivation for the district is within the income group of Rs.5,000-10,000 and the least was found to be from the income group of Rs. 25000-30,000.

v. *Relation between Income and Farm Size: Mokokchung.* The total area under rubber cultivation in the study area for Mokokchung district is 54.5 hectares. The total monthly income of the rubber farmers for the district is Rs.376300. The overall correlation between farm size and income of rubber farmers shows a positive relationship with r=0.82. Since the value of r is more than six times the probable error (P.Er=0.0209), the co-efficient of correlation between farm size and income is significant which shows that as income increases, the farm size also

increases. The co-efficient of determinants on r^2 value shows that 67% of the variation in farm size is explained by the income X, the regression values of farm size (Y) on income (X) gave us.

Y= a+bx, Y= -3.11347+ 0.00015X

The result shows that the regression co-efficient byx is 0.00015. This explains that a unit change in income will lead a change in farm size by 0.00015. The p-value of 'byx' is 0.043 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%. Thus, the hypothesis which states that higher the income higher is the size of holding has been proved. **5.9: Rubber Plantation and Employment: Nagaland.**

i. The total employment generated from rubber plantation for the state from 1-34 Years is 4,30,401 man days where male labour accounts for 4,17,755 (97%) man days and female labour accounts for 12646 (3%) man days. It was also found that from 1-34 Years, the average employment per hectare for the state was 2978.55 man days for the period, where the average employment per hectare for male and female labour was 2891.038 man days, and 87.51 man days respectively. The overall correlation between farm size and Employment for the State shows a positive relationship with r=0.96. Since the value of r is more than six times the probable error (P.Er=0.0069), the co-efficient of correlation between farm size and employment is significant which shows that as the farm size increases, employment also increases. The co-efficient of determinants on r^2 value shows that 92% of the variation in employment is explained by the farm size X , the regression values of Employment(Y) on farm size (X) gave us.

Y= a+bx, Y= 966.4361+ 2577.265X

The result shows that the regression co-efficient byx is 2577.265. This explains that a unit change in Farm Size will lead a change in employment by 2577.265. The p-value of 'byx' is 6.49E-35 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

ii. *1st Year.* In the first year, a total of 14829 man days labour were employed, out of which 10925 (74%) man days were male labours and 390926 (26%) man days were Female labours.

In the 1st stage of jungle cutting, mulching and burning, a total of 4848 man days labours were employed, out of which 3367 (69%) man days were male labours and 1481 (31%) man days were female labours.

In the 2nd stage of Digging of hole for rubber plantation, a total of 1877 man days labours were employed, Out of which male labours accounts for 1672 (89%) mandays and 205 (11%) mandays were Female labours.

In the 3rd stage for plantation, a total of 1344 man days labours were employed, out of which 1166 (87%) mandays were male labours and 178 (13%) man days were Female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, for which 6760 man days labours were employed, where male labours accounts for 4720 (70%) mandays and female labours account for 2040 (30%) mandays.

iii. *2nd and 3rd year.*In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 17700 mandays labours were employed, out of which 12486 (71%) man days were male labours and 5214 (29%) mandays of female labours were employed.

iv. *4th to 7 Years.* From 4th to 7 years, a total of 11636 mandays labours were employed, where 8108 (70%) mandays male labours and 3528 (30%) mandays of female labours were employed.

v. *8-31 Years.* The total labours employed for tapping purpose from 8-31 Years is 338400 mandays labours where male labours accounts for 100 per cent.

vi. *32-34 Years.* The total labours employed for tapping purpose for 32-34 Years is 23640 man days labour where male labours accounts for 100 per cent. Therefore the total employment for this tapping period of three years is 24988 man days labour where male labours accounts for 100 per cent.

5. 10. Rubber Plantation and Employment (Hectare-Wise): Nagaland.

i. *Small Farm Size.*

The total employment generated from rubber plantation for the small farm size from 1-34 Years is 144884 man days labour, where male labour accounts for 141585 (98%) mandays and female labour accounts for 3299 (2%) mandays. It was also found that from 1-34 Years, the average employment per hectare for the small farm size was 3622.1 man days for the period, where the average employment per hectare for male and female labour was 3539.62 man days, and 82.47 man days respectively.

The correlation between farm size and employment for small farm size shows a positive relationship with r=0.56. Since the value of r is more than six times the probable error (P.Er=0.0849), the co-efficient of correlation between farm size and employment is significant which shows that as the farm size increases, employment also increases. The co-efficient of determinants on r^2 value shows that 31% of the variation in employment is explained by the farm size. The regression value byx comes out to be 3571.074 which is significant at 5%.

ii. *Medium Farm Size.*

The total employment generated from rubber plantation for the medium farm Size from 1-34 Years is 149027 man days labour where male labour accounts for 143784 (96%) mandays and female labour accounts for 5243 (4%) mandays. It was also found that from 1-34 Years, the average employment per hectare for the small farm size was 2685.17 man days for the period, where the average employment per hectare for male and female labour was 2590.7 man days, and 94.46man days respectively.

The correlation between farm size and employment for medium farm size in the State shows a positive relationship with r=0.68. Since the value of r is more than six times the probable error (P.Er=0.0776), the co-efficient of correlation between farm size and employment is significant which shows that as the farm size increases, employment also increases. The co-efficient of determinants on r^2 value shows that 46% of the variation in employment is explained by the farm size X, the regression values of Employment (Y) on farm size (X) gave us.

Y= a+bx, Y= 1862.274+ 1946.973X

The result shows that the regression co-efficient byx is 1946.973. This explains that a unit change in farm size will lead a change in employment by 1946.973. The p-value of 'byx' is 0.000583 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

iii. *Large Farm Size.*

The total employment generated from rubber plantation for the large farm size from 1-34 Years is 136490 man days labour where male labour accounts for 1323686 (97%) mandays and female labour accounts4104 (3%) mandays. It was also found that from 1-34 Years, the average employment per hectare for the large farm size was 2785.51 man days for the period, where the average employment per hectare for male and female labour was 2701.75 man days, and 83.76 man days respectively.

The correlation between farm size and employment for large farm size is r=0.93 and the regression byx is 2648.201 which is significant at 5%.

Among different farm size, it was found that the medium farm size has the highest number of employment (149027) accounting for 34.62 percent of the total employment.

5.11. Rubber Plantation and Employment (Income-Wise): Nagaland.

i. *Income Group of Rs.5000-10000.*

The total employment generated from rubber plantation for the income group of Rs.5000-10000 in the State from 1-34 Years is 208636 mandays labour where male labour accounts for 202887 (97%) mandays and female labour accounts for 5749 (3%) mandays. The average employment per household from 1-34 Years is 6322.30 where male labour accounts for 6148.09 and female labour accounts for 174.21.

ii. *Income Group of Rs.10000-15000.*

The total employment generated from rubber plantation for the income group of Rs.10000-15000 in the State from 1-34 Years is 40532 mandays labour where male labour accounts for 39268 (97%) mandays and female labour accounts for 1264 (3%) mandays. The average employment per household from 1-34 Years is 5790.28 where male labours accounts for 5609.71 and female labours accounts for 180.57.

iii. *Income Group of Rs.15000-20000.*

The total employment generated from rubber plantation for the income group of Rs.15000-20000 in the State from 1-34 Years is 51060 man days labour where male labour accounts for 49292 (97%) mandays and female labour accounts for 1768 (3%) mandays. The average employment per household from 1-34 Years is 7294.28 where male labour accounts for 7041.71 and female labour accounts for 252.57.

iv. *Income Group of Rs.20000-25000.* The total employment generated from rubber plantation for the income group of Rs.20000-25000 in the State from 1-34 Years is 38626 man days labour where male labour accounts for 37635 (97%) mandays and female labour accounts 991 (3%) mandays labour accounts for 49292 (97%) mandays and female labour accounts 1768 (3%) mandays. The average employment per household from 1-34 Years is 5518 where -male labour accounts for 5376.42 and female labour accounts for 141.57.

v. *Income Group of Rs.25000-30000.*

The total employment generated from rubber plantation for the income group of Rs.25000-30000 in the State from 1-34 Years is 28056 man days labour where male labour accounts for 27012 (96%) mandays and female labour accounts 1044 (4%) mandays. The average employment per household from 1-34 Years is 9352 where male labours accounts for 9004 and female labours accounts for 348.

vi. *Income Group of Rs.30000-Above.* The total employment generated from rubber plantation for the income group of Rs.30000-Above in the state from 1-34 Years is 63491 man days labour where male labour accounts for 61661 (97%) mandays and female labour accounts 1830 (3%)

mandays. The average employment per household from 1-34 Years is 21163.67 where male labours accounts for 20553.66 and female labours accounts for 610.

Among the income group for the state, it was found that the income group of Rs.5000-10000 has the highest number of employment with 48.47 percent.

5.12. Rubber Plantation and Employment: Wokha.

The total employment generated from rubber plantation for the district from 1-34 Years is 286144 man days labour, where male labour accounts for 276538 (97%) man days and female labour accounts for 9606 (3%) mandays. The average employment per hectare from 1-34 Years is 3179.38 man days, where the average employment per hectare for male and female labour is 3072.64 man days and 106.73 man days respectively.

The overall correlation between farm size and employment for the state shows a positive relationship with r=0.97. Since the value of r is more than six times the probable error (P.Er=0.1163), the co-efficient of correlation between farm size and employment is significant which shows that as the farm size increases, the employment also increases. The co-efficient of determinants on r^2 value shows that 94% of the variation in employment is explained by the farm size X , the regression values of Employment(Y) on farm size(X) gave us.

$$Y= a+bx, \qquad Y= 1944.703+2531.144X$$

The result shows that the regression co-efficient byx is 2531.144. This explains that a unit change in Farm Size will lead to a change in employment by 2531.144. The p-value of 'byx' is 1.26E-19 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

ii. In the first year, a total of 10378 mandays labours were employed, out of which 7584 (73%) mandays were male labours and 2794 (27%) mandays were female labours.

In the 1st stage of jungle cutting, mulching and burning, a total of 3430 mandays labours were employed, out of which 2330 (68%) mandays were male labours and 1100 (32%) mandays were female labours.

In the 2nd stage of Digging of hole for rubber plantation, a total of 1387 mandays labours were employed, Out of which male labours accounts for 1258 (91%) mandays and 129 (9%) mandays were female labour.

In the 3rd stage for plantation work, a total of 851 mandays labours were employed, out of which 752 (88%) mandays were male labours and 99 (12%) mandays were female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, For which 4710 mandays labours were employed, where male labours accounts for 3244 (69%) mandays and female labours accounts for 1466 (31%) man days

iii. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 11550 mandays labours were employed, out of which 8058 (70%) man days were male labours and 3492 (30%) mandays of female labours were employed.

iv. From 4th to 7 years, a total of 9764 mandays labours were employed, where 6444 (66%) mandays male labours and 3320 (34%) man days of female labours were employed.

v. The total labours employed for tapping purpose for the period 8-31 Years is 241008 mandays labour where male labours accounts for 100 per cent.

vi. The total employment for clearing and tapping from 32-34 Years is 13444 man days labour where male labours accounts for 100 per cent.

5.13. Rubber Plantation and Employment (Hectare-Wise): Wokha.

i. *Small Farm Size.*

The total employment generated from rubber plantation for the small farm size in the district from 1-34 Years is 69574 mandays labour where male labour accounts for 67763 (97%) mandays and female labour accounts 1811(3%) mandays. It was also found that the average employment per hectare from 1-34 Years is 4638.27 man days, where the average employment per hectare for male and female labour accounts for 4517.53 and 120.73 respectively.

The correlation between farm size and Employment for Small farm Size in the state shows a positive relationship with r=0.94. Since the value of r is more than six times the probable error (P.Er=0.0234), the co-efficient of correlation between farm size and employment is significant which shows that as the farm size increases, the employment also increases. The co-efficient of determinants on r^2 value shows that 88% of the variation in employment is explained by the farm size. The regression values byx is found to be is 1732.5 which is significant at 5%.

ii. *Medium Farm Size.*

The total of employment generated from rubber plantation for the Medium farm Size in the District from 1-34 Years is 104150 mandays labour where male labour accounts for 100164 (96.17%) mandays and female labour accounts 3986 (23.83%) mandays. It was also found that the average employment per hectare from 1-34 Years is 2853.42 man days, where the average employment per hectare for male and female labour accounts for 2744.21 and 109.205 respectively.

The correlation between farm size and employment for medium farm size in the State shows a positive relationship with r=0.97. Since the value of r is more than six times the probable error (P.Er=0.0102), the co-efficient of correlation between farm size and employment is significant which shows that as the farm size increases, the employment also increases. The co-efficient of determinants on r^2 value shows that 95% of the variation in employment is explained by the farm size. The regression co-efficient byx is 562.188 which is significant at 5%.

iii. *Large Farm Size.*

The total employment generated from rubber plantation for the large farm size in the district from 1-34 Years is 112420 mandays labour where male labour accounts for 108611 (97%) mandays and female labour accounts 3809 (3%) mandays. It was also found that the average employment per hectare from 1-34 Years is 2920 man days, where the average employment per hectare for male and female labour is 2821.06 man days, and 98.94 man days respectively.

The correlation between farm size and employment for Large farm Size in the District shows a positive relationship with r=0.98. Since the value of r is more than six times the probable error (P.Er=0.0110), the co-efficient of correlation between farm size and employment is significant which shows that as the farm size increases, the employment also increases. The co-efficient of determinants on r^2 value shows that 96% of the variation in employment is explained by the farm size. The regression coefficient byx is 2583.937 which is significant at 5%.

On comparison among farm size of the district, it was found that the large farm size has the highest number of employment with 39.28 percent and the least was found in the small farm size with 24.31 percent.

5.14. Rubber Plantation and Employment (Income Wise): Wokha.

i. *Income Group of Rs.5000-10000.* The total employment generated from rubber plantation for the income group of Rs.5000-10000 in the District from 1-34 Years is 134120 mandays labour where male labour accounts for 130004 (97%) mandays and female labour accounts for 4116 (3%) mandays. The average employment per household from 1-34 Years is 7889.41 where male labours accounts for 7647.29 and female labours accounts for 241.12.

ii. *Income Group of Rs.10000-15000.* The total employment generated from rubber plantation for the income group of Rs.10000-15000 in the District from 1-34 Years is 29238 mandays labour where male labour accounts for 28182 (96%) mandays and female labour accounts for 1056 (4%) mandays. The average employment per household from 1-34 Years is 5790.28 where male labours accounts for 7045.5 and female labours accounts for 264.

iii. *Income Group of Rs.15000-20000.* The total employment generated from rubber plantation for the income group of Rs.15000-20000 in the District from 1-34 Years is 35650 mandays labour where male labour accounts for 34256 (96%) mandays and female labour accounts for 1394 (4%) mandays. The average employment per household from 1-34 Years for the District is 11883.33 where male labours accounts for 11418.66 and female labours accounts for 464.67.

iv. *Income Group of Rs.20000-25000.* The total employment generated from rubber plantation for the income group of Rs.20000-25000 in the District from 1-34 Years is 14345 mandays

labour where male labour accounts for 13912 (97%) mandays and female labour accounts 433 (3%) mandays. The average employment per household from 1-34 Years is 7172.50 where male labours accounts for 6956 and female labours accounts for 216.50.

v. *Income Group of Rs.25000-30000.* The total employment generated from rubber plantation for the income group of Rs.25000-30000 in the District from 1-34 Years is 23186 mandays labour where male labour accounts for 22295 (96%) mandays and female labour accounts 891 (4%) mandays. The average employment per household from 1-34 Years is 11593 where male labours accounts for 111475 and female labours accounts for 445.50.

vi. *Income Group of Rs.30000-Above.* The total employment generated from rubber plantation for the income group of Rs.30000-Above in the District from 1-34 Years is 49605 man days labour where male labour accounts for 47889 (97%) mandays and female labour accounts 1716 (3%) mandays. The average employment per household in the district from 1-34 Years is 24802.50 where male labours accounts for 23944.5 and female labours accounts for 858.

On comparison amongst income group of the district, it was found that the income group of Rs.5000-10000 has the highest number of employment with 46.87 percent and the least was found in the income group of Rs.20000-25000 with 5 percent.

5.15. Rubber Plantation and Employment: Mokokchung.

i. The total employment generated from rubber plantation for the District from 1-34 Years is 144257 mandays where male labour accounts for 141317 (98%) mandays and female labour accounts for 3040 (2%) mandays. It was also found that the average employment per hectare from 1-34 Years is 2646.92 man days labour, where the average employment per hectare for male and female labours is 2592.97 and 55.78 respectively.

The overall correlation between farm size and employment for the district shows a positive relationship with r=0.97. Since the value of r is more than six times the probable error (P.Er=0.00615), the co-efficient of correlation between farm size and employment is significant which shows that as the farm size increases, the employment also increases. The co-efficient of

determinants on r^2 value shows that 95% of the variation in employment is explained by the farm size X , the regression values of Employment(Y) on farm size(X) gave us.

$Y= a+bx,$ $Y= 1177.149+1998.946X$

The result shows that the regression co-efficient byx is 1998.946. This explains that a unit change in farm size will lead a change in employment by 1998.946. The p-value of 'byx' is 1.05E-20 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

ii. In the first year, a total of 4451 mandays labours were employed, out of which 3341 (75.06%) mandays were male labours and 1110 (24.93%) mandays were female labours.

In the 1st stage of jungle cutting, mulching and burning, a total of 1418 man days labours were employed, out of which 1037 (73.13%) mandays were male labours and 381 (26.86%) man days were female labours.

In the 2nd stage of Digging of hole for rubber plantation, a total of 490 mandays labours were employed, Out of which male labours accounts for 414 (84.49%) mandays and 76 (15.51%) mandays were female labours.

In the 3rd stage for plantation work, a total of 493 mandays labours were employed, out of which 414 (83.97%) mandays were male labours and 79 (16.02%) man days were Female labours. The field is also cleaned 2 times in the first year after all the above mentioned works are completed, For which 2050 mandays labours were employed, where male labours accounts for 1476 (72%) mandays and female labour accounts for 574 (28%) man days.

iii. In the 2nd and 3rd year, the rubber field is cleaned 3 times in a year. Altogether 6150 man days Labours were employed, out of which 4428 (72%) mandays were male labours and 1722 (28%) mandays of female labours were employed.

iv. From 4th to 7 years, a total of 1872 man days labours were employed where 1664 (94.23%) mandays' male labours and 208 (11.11%) mandays of female labours were employed.

v. The total labours employed for tapping purpose from 8-31 Years is 8640 mandays labours where male labours accounts for 100 per cent.

vi. From 32-34 Years, the field is cleaned only one time in a year for which a total of 504 mandays labours were employed where male labours accounts for 100 per cent. The total labours employed for tapping purpose for the period 32-34 Years is 11040 mandays labour where male labours accounts for 100 per cent. Therefore the total employment for this tapping period from 32-34 Years is 11544 man days labour where male labours accounts for 100 per cent.

5.16.Rubber Plantation and Employment (Hectare Wise): Mokokchung.

i. *Small Farm Size.*

The total employment generated from rubber plantation for the Small farm Size in the District from 1-34 Years is 75310 mandays labour where male labour accounts for 73822 (98%) mandays and female labour accounts for 1488 (2%) mandays. It was also found that the average employment per hectare from 1-34 Years is 3012.40 man days labour, where the average employment per hectare for male and female labour accounts for 2952.88 and 59.52 respectively.

The correlation between farm size and Employment for the Small farm size in the District shows a positive relationship with r=0.98. Since the value of r is more than six times the probable error (P.Er=0.0045), the co-efficient of correlation between farm size and employment is significant which shows that as the farm size increases, the employment also increases. The co-efficient of determinants on r^2 value shows that 97% of the variation in employment is explained by the farm size X , the regression values of Employment(Y) on farm size(X) gave us.

$Y= a+bx, \qquad Y= 3060+564.4X$

The result shows that the regression co-efficient byx is 564.4. This explains that a unit change in Farm Size will lead a change in employment by 564.4. The p-value of 'byx' is 2.43E-15 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

ii. *Medium Farm Size.*

The total employment generated from rubber plantation for the medium farm size in the district from 1-34 Years is 44877 mandays labour where male labour accounts for 43620 (97%) mandays and female labour accounts for 1257 (3%) mandays. It was also found that the average employment per hectare from 1-34 Years is 2361.95 man days labour, where the average employment per hectare for male and female labours is 2295.78 and 66.16 respectively.

The correlation between farm size and Employment for the medium farm size in the district shows a positive relationship with r=0.98. Since the value of r is more than six times the probable error (P.Er=3.694), the co-efficient of correlation between farm size and employment is significant which shows that as the farm size increases, the employment also increases. The co-efficient of determinants on r^2 value shows that 97% of the variation in employment is explained by the farm size X, the regression values of Employment(Y) on farm size(X) gave us.

$Y= a+bx,$ $Y= 89.467+2306.85X$

The result shows that the regression co-efficient byx is 2306.85. This explains that a unit change in Farm Size will lead a change in employment by 2306.85. The p-value of 'byx' is 6.89E-08 which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

iii. Large Farm Size.

The total employment generated from rubber plantation for the Large Farm Size in the District from 1-34 Years is 24070 mandays labour where male labour accounts for 23775 (99%) mandays and female labour accounts 295 (1%) mandays. It was also found that the average employment per hectare from 1-34 Years is 2292.38 where the average employment per hectare for male and female labours is 2264.28 and 28.10 respectively.

The correlation between farm size and Employment for both Small farm Size and Large farm in the State is combined and calculated because their total size of holding is very small. The result shows a positive relationship with r=0.98. Since the value of r is more than six times the probable error (P.Er=0.0063), the co-efficient of correlation between farm size and employment is significant which shows that as the size of farm increases, the employment of

rubber also increases. The co-efficient of determinants on r2 value shows that 97% of the variation in employment is explained by the farm size X, the regression values of Employment(Y) on farm size(X) gave us.

$$Y = a+bx, \qquad Y = 89.46741+2306.859X$$

The result shows that the regression co-efficient byx is 2306.859. This explains that a unit change in Farm Size will lead a change in employment by 2306.859. The p-value of 'byx' is 6.89E-08, which is less than 0.05. Therefore, the regression co-efficient is significant at 5%.

On comparison amongst farm size of the district, it was found that the small farm size has the highest number of employment with 52.20 percent and the least was found in the large farm size with 16.68 percent.

5.17. **Rubber Plantation and Employment (Income Wise): Mokokchung.**

i. The total employment generated from rubber plantation for the income group of Rs.5000-10000 in the District from 1-34 Years is 74516 mandays labour where male labour accounts for 72883 (98%) mandays and female labour accounts for 1633 (2%) mandays. The average employment per household from 1-34 Years is 4657.25 where male labours accounts for 4555.18 and female labours accounts for 102.06.

ii. The employment generated from rubber plantation for the income group of Rs.10000-15000 in the District from 1-34 Years is 11294 man days labour where male labour accounts for 11086 (98%) mandays and female labour accounts for 208 (2%) mandays. The average employment per household from 1-34 Years is 3764.67 where for male labours accounts for 3695.33 and female labours accounts for 69.33.

iii. The total employment generated from rubber plantation for the income group of Rs.15000-20000 in the District from 1-34 Years is 15410 mandays labour where male labour accounts for 15036 (98%) mandays and female labour accounts for 374 (2%) mandays. The average employment per household from 1-34 Years is 3852.50 where male labour accounts for 3759 and female labour accounts for 93.50.

iv. The total employment generated from rubber plantation for the income group of Rs.20000-25000 in the District from 1-34 Years is 24281 mandays labour where male labour accounts for 23723 (98%) mandays and female labour accounts for 558 (2%) mandays. The average employment per household from 1-34 Years is 4856.20 for male labours accounts for 4744.6 and female labours accounts for 111.60.

v. The total employment generated from rubber plantation for the income group of Rs.25000-30000 in the District from 1-34 Years is 4870 mandays labour where male labour accounts for 4717 (97%) mandays and female labour accounts for 153 (3%) mandays. The average employment per household from 1-34 Years is 4870 where male labours accounts for 4717 and female labours accounts for 153.

vi. The total employment generated from rubber plantation for the income group of Rs.30000-Above in the District from 1-34 Years is 13886 mandays labour where male labour accounts for 13772 (99%) mandays and female labour accounts for 114(1%) mandays. The average employment per household from 1-34 Years is 13886 where male labours accounts for 13772 and female labours accounts for 114.

On comparison among income group of the district, it was found that the income group of Rs.5000-10000 has the highest number of employment with 51.65 percent and the least was found in the income group of Rs. 25000 – 30000 with 3.37 percent.

5.18. Cost: Nagaland. The total cost incurred by the rubber farmers in the state from 1-34 years is Rs.146701250 which includes both fixed cost and variable cost. The average cost for the whole farming period is Rs.4314742.647 per annum for the state.

i. The total cost for the rubber farmers in the first year for the state is Rs.6502010, which includes expenditures like jungle cutting, jungle burning, clearing of the field for three times, rubber stem, toilet, digging, plantation, pruning, weeding and mulching, farm house, lunch and wage of labour. The percentage of cost incurred in the 1st Year is 4.43%

ii. In the second and third year, a total of Rs.5739700 was spent which includes expenditure on farm house, toilet, wages of labour and lunch for cleaning the whole field for three times per year. The percentage of cost incurred in the 1st Year is 3.91%.

iii. From 4-7th years, the cost includes expenses on lunch and wages of labour for cleaning the field two times per year, and the total expenditure came out be Rs.3821500. The percentage of cost incurred in the 1st Year is 2.60%.

iv. The total cost incurred from 8-34 years includes expenditures like wages on labour and lunch for cleaning the field for one time per year, smoke house, tapping materials, roller machine, firewood, formid acid and wages for the tappers, where the total expenditure came out to be Rs. 130638040. The percentage of cost incurred from 8-34 Years is 89.05%.The highest cost incurred by the rubber farmers is on wages for labour with 72.92% of the total cost.

5.19. Revenue: Nagaland. From 8-34 years, the total number of rubber trees tapped for this period is 55220 which produces 9939600 Kgs of smoked rubber per annum and the total revenue earned from the sale of this produce is Rs.1060224000 on an average of Rs.39267.55 per annum for the period.

i. From 8-10 years, a total of 37010 rubber trees were tapped annually which produces 832725 Kgs of natural rubber sheet ready for sale in the market for the period. And the revenue earned from this produce for the period is Rs.87436125 on an average revenue of Rs.29145375 per annum.

ii. From 11-31st Years, all the rubber trees are tapped and a total of 55220 rubber trees are tapped annually, which produces 8697150 Kgs. of rubber sheets for the period and the total revenue earned from the sale of the produce for the period is Rs.913200750 on an average of Rs.43485750 per annum.

iii. From 32-34 years only the rubber trees which was planted as an extension are tapped for a period of three years. The total number of rubber trees tapped for this period is 18210 which produces 409725 Kgs. of rubber sheets per year and the total revenue earned from the sale of this produce is Rs.43021125 on an average of Rs.14340375 per annum for the period.

5.20. Benefit –Cost Analysis: Nagaland.

i. As there was no revenue generation for 1-7 years, the result of the net present value came out to be negative (Rs.-16063210) for the same period.

ii. The present value for the entire farming period from 1-34th year is Rs.248154491 and the average present value for the same period is Rs.7298661.5. The highest present value is in the 11th year with Rs. 18434532 and the least in the 8th year with Rs. -6085175.

iii. Since the Net Present Value (Rs.248154991) for the state is higher than the cost incurred (Rs.146701250) which is worked out at a discount rate of Rs.6.85, there is profitability in this investment.

iv. The Benefit-Cost Ratio came out to be 5.71 which is more than unity. Thus the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable in the state.

5.21. Hectare-Wise Cost and Revenue: Nagaland:

i. Under Small farm size for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.47133320 and the average cost for the same period is Rs.1386274.11. The total revenue earned was Rs.283776000 with an average of Rs.8346352.94. The net present value for the entire farming period from 1-34th year is Rs. 64677953.43 which is higher than the cost worked out at a discount rate of 6.85%. The positive Benefit –Cost Ratio (4.99) along with high net present value shows that investing in rubber farming or plantation is profitable under small farm size for the state.

ii. Under medium farm size for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.53012390 and the average cost for the same period is Rs.1559187.94. The total revenue earned by the rubber farmers during the entire farming period was Rs.414912000 with an average of Rs.1220329411.The net present value was Rs. 98127887 while the Benefit –Cost Ratio was 6.04 which indicates viability of rubber farming.

iii. Under large farm size for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.46555540 and the average cost for the same period is Rs. 1369280.588. The total revenue earned by the rubber farmers during the same period was Rs. 361536000 with an average of Rs.10633411.76. The net present value was Rs.85348651 and the Benefit –Cost Ratio came out to be 4.99 which is more than unity. Thus, the net present value and the benefit-cost ratio indicate that investing in rubber farming or plantation is profitable under large size of farming for the state.

iv. In comparison amongst the different farm size in the district, we found out that medium farm size has the highest benefit coast ratio.

5.22. Income-Wise Cost and Revenue: Nagaland.

i. Under income size of Rs. 5000-10000 for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.69794450 and the average cost for the same period is Rs.2052777.94. The total revenue earned was Rs.477120000 with an average of Rs.14032941.17. The Net Present Value for the entire farming period from 1-34th year is Rs.111001571 which is higher than the cost worked out at a discount rate of 6.85% .The positive Benefit –Cost Ratio (5.49) along with high Net Present Value shows that investing in rubber farming or plantation is profitable under income group of Rs 5000-10000 for the state.

ii. Under income size of Rs. 10000-15000 for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.14018290 and the average cost for the same period is Rs.412302.64. The total revenue earned was Rs.97536000 with an average of Rs.2868705.88. The Net present value for the entire farming period from 1-34th year is Rs.22525557 which is higher than the cost worked out at a discount rate of 6.85. The positive Benefit –Cost Ratio (5.42) along with the high Net Present Value shows investing in rubber farming or plantation is profitable under income group of Rs 10000-15000 for the state.

iii. Under income size of Rs.15000-20000 for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.17704030 and the average cost for the period is Rs.520706.76. The total revenue earned was Rs131904000 with an average of Rs.3879529.41. The Net Present

Value for the entire farming period from 1-34th year is Rs.30826684 which is higher than the cost worked out at a discount rate of 6.85%. The positive Benefit –Cost Ratio (5.78) along with high Net Present Value shows that investing in rubber farming or plantation is profitable under income group of Rs.15000-20000 for the state.

iv. Under income size of Rs.20000-25000 for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.13436630 and the average cost for the same period is Rs.395195. The total revenue earned by the rubber farmers from 1-34 years is Rs.94272000 with an average of Rs.2772705.88. The Net Present Value for the entire farming period from 1-34th year is Rs.21971162 which is higher than the cost worked out at a discount rate of 6.85%. The positive Benefit –Cost Ratio (5.59) along with the high Net Present Value shows that investing in rubber farming or plantation is profitable under income group Rs.20000-25000 for the state.

v. Under income size of Rs.25000-30000 for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.10004840 the average cost for the same period is Rs.294260. The total revenue earned was Rs.86592000 with an average of Rs.2546823.52. **T**he Net Present Value for the entire farming period from 1-34th year is Rs.20552013 which is higher than the cost worked out at a discount rate of 6.85%. The positive Benefit –Cost Ratio (6.58) along with the Net Present Value shows that investing in rubber farming or plantation is profitable under income group Rs.25000-30000 for the state.

vi. Under income size of Rs.30000-Above for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.21743010 and the average cost for the period is Rs.639500.29. The total revenue earned by the rubber farmers from 1-34 years is Rs.172800000 with an average of Rs.5082352.94. The Net Present Value for the entire farming period from 1-34th year is Rs.41277504 which is higher than the cost worked out at a discount rate of 6.85%. The positive Benefit–Cost Ratio (6.2) along with high Net Present Value shows that investing in rubber farming or plantation is profitable under income group Rs.30000-Above for the state.

vii. In comparison among the different income group of the state, it was found that the income group of Rs.25000-30000 has the highest Benefit Cost Ratio.

5.23. Cost: Wokha. The total cost incurred by the rubber farmers in the district from 1-34 years is Rs.95523990 which includes both fixed and variable cost. The average cost for the whole farming period from 1-34 Years is 2809.52 per annum for the district.

i. The total cost for the rubber farmers in the first year for the District is Rs.4495310, which includes expenditures like jungle cutting, jungle burning, clearing of the field for three times, rubber stem, toilet, digging, plantation, pruning, weeding and mulching, farm house, lunch and wage of labour. The percentage of cost incurred in the 1st Year is 4.70%.

ii. In the second and third year, a total of Rs.370930 was spent which includes expenditure on farm house, toilet, wages of labour and lunch for cleaning the whole field for three times per year. The percentage of cost incurred in the 2nd and 3rd Year is 0.38%:

iii. From 4-7th years, the cost includes expenses on lunch and wages of labour for cleaning the field two times per year, and the total expenditure came out be Rs.2967700. The percentage of cost incurred From 4-7th years Year is 3.10%:

iv. The total cost incurred from 8-34 years includes expenditures like wages on labour and lunch for cleaning the field for one time per year, smoke house, tapping materials, roller machine, firewood, formid acid and wages for the tappers, where the total expenditure came out to be Rs.84351680. The percentage of cost incurred From 8-34 years Year is 88.05%:

The highest cost incurred by the rubber farmers is on wages for labour with 74% of the total cost.

5.24. Revenue: Wokha. The total revenue earned by the rubber farmers from 1-34th years is Rs.676608000 with an average earning of Rs.19900235.29 annually for the period.

i. The total number of rubber trees tapped on the 8^{th-} -10 years is 23510 which produces 528975 Kgs. of rubber sheets for the period as a final output ready for sale in the market and

the total revenue earned from the sale of this produce for the period is Rs.55542375 on an average of 18514.125 per annum.

ii: The total number of rubber trees tapped on the 11^{th} -31^{st} year is 35240 which produces 5550300 Kgs. of rubber sheets as a final output ready for sale in the market and the total revenue earned from the sale of this produce is Rs.582781500 on an average of Rs.27751.500 for the period.

iii. The total number of rubber trees tapped on the 32^{nd} -34^{th} years is 11730 which produces 263925 Kgs. of smoked rubber sheets as a final output ready for sale in the market and the total revenue earned from the sale of this product is Rs.38284125 with an average of Rs.12761.37 for the period.

5.25. Cost-Benefit Analysis: Wokha.

i. As there was no revenue generation for the bearing period from 1-7 years, the result of the net present value came out to be negative (-11172310) for the same period.

ii. The present value for the entire farming period from 1-34^{th} year is Rs.157245450 and the average present value for the same period is Rs.4624866.17 per annum. The highest present value is in the 11^{th} year with Rs. 11727511 and the least is in the 1^{th} year with Rs. -4207122.

iii. Since the total Net Present Value (Rs.157245450) for the district is higher than the cost incurred (Rs.95523990) which is worked out at a discount rate of Rs.6.85, there is profitably in this investment.

iv. The Benefit–Cost Ratio came out to be 5.54 which is more than unity. Thus the Net Present Value and the Benefit-Cost Ratio indicates that investing in rubber farming or plantation is profitable for the district.

5.26: Cost and Revenue (Hectare Wise): Wokha

i. Under Small farm size for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.21322510 and the average cost for the same period is Rs.627132.64. The total revenue earned was Rs.107904000, with an average of Rs.3173647.05. The Net Present Value for the entire farming period from 1-34 years is Rs.23659089 which is higher than the cost worked out at a discount rate of 6.85. The positive Benefit –Cost Ratio (4.21) along with high Net Present Value shows that investing in rubber farming or plantation is profitable under small size of farming for the district.

ii. Under medium farm size for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.36173400 and the average cost for the same period is Rs.1063923.52. The total revenue earned by the rubber farmers from the entire farming period i.e 1-34 years is Rs.278208000 with an average of Rs.8182588.23. The Net Present Value for the entire farming period from 1-34th year is Rs.65610290 which is higher than the cost worked out at a discount rate of 6.85%. The positive Benefit-Cost Ratio shows that investing in rubber farming or plantation is profitable under medium size of farming for the district.

iii. Under large farm size for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.38028080 and the average cost for the same period is Rs.1118472.94. The total revenue earned was Rs.290496000 with an average of Rs.8544000. The Net Present Value for the entire farming period from 1-34th year is Rs.67976072 which is higher than the cost incurred worked at a discount rate of 6.85%. The positive Benefit –Cost Ratio (5.86) along with high Net Present Value shows that investing in rubber farming or plantation is profitable under large size of farming for the district.

iv. In comparison among the different farm size in the district, it was found that the large farm size has the highest cost-benefit ratio.

5.27. Cost and Revenue (Income-Wise): Wokha.

i. Under income size of Rs. 5000-10000 for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.43322640 and the average cost for the same period is Rs.1274195.29. The total revenue earned by the rubber farmers from 1-34 years is

Rs.277056000 With an average Rs.8148705.88. The present value for the entire farming period from 1-34th year is Rs.63682884 which is higher than the cost worked out at a discount rate of 6.85. The positive Benefit –Cost Ratio (5.12) along with the Net Present Value shows that investing in rubber farming or plantation is profitable under income group of Rs 5000-10000 for the district.

ii. Under income size of Rs. 10000-15000 for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs.10286540 and the average cost for the same period is Rs.302545.29. The total revenue incurred by the rubber farmers from 1-34 years is Rs.74880000 with an average of Rs.2202352.94. The present value for the entire farming period from 1-34th year is Rs.17370340 which is higher than the cost worked out at a discount rate of 6.85%. The positive Benefit –Cost Ratio (5.56) along with the Net Present Value shows that investing in rubber farming or plantation is profitable under income group of Rs 10000-15000 for the district.

iii. Under income size of Rs.15000-20000 for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs.12187340 and the average cost for the same period is Rs.358451.17. The total revenue incurred by the rubber farmers from 1-34 years is Rs.88320000 with an average of Rs.2597647.05. The net Present value for the entire farming period from 1-34th year is Rs.15000-20000 which is higher than the cost worked out at a discount rate of 6.85%. The positive Benefit –Cost Ratio (5.52) along with the Net Present Value shows that investing in rubber farming or plantation is profitable under income group of Rs.15000-20000 for the district.

iv. Under income size of Rs.20000-25000 for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs.4629300 and the average cost for the same period is Rs.136155.88. The total revenue earned by the rubber farmers from 1-34 years is Rs.29760000 with an average Rs.875294.11. The present value for the entire farming period from 1-34th year is Rs.6771751 is higher than the cost worked out at a discount rate 6.85%. The positive Benefit –Cost Ratio (5.15) along with the Net Present Value shows that investing in rubber farming or plantation is profitable under income group of Rs.20000-25000 for the district.

v. Under income size of Rs.25000-30000 for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs.8227970 and the average cost for the same period is Rs.241999.11. The net Present Value for the entire farming period from 1-34th year is Rs.17101700 which is higher than the cost worked out at a discount rate of 6.85. The positive Benefit –Cost Ratio (6.61) along with the Net Present Value shows that investing in rubber farming or plantation is profitable under income group of Rs.25000-30000 for the district.

vi. Under income size of Rs.30000-Above for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs16870200 and the average cost for the same period is Rs.496182.35 per annum for the district. The total revenue earned by the rubber farmers from 1-34 years is Rs.134400000 with an average of Rs.3952941.17. The Net Present Value for the entire farming period from 1-34th year is Rs.31957564 which is higher than the cost worked out a discount rate of 6.85%. The positive Benefit –Cost Ratio (6.17) along with the Net Present Value shows that investing in rubber farming or plantation is profitable under income group of Rs.30000-Above for the district.

vi. In comparison among the different income group in the district, it was found that the income group of Rs.25000-30000 has the highest cost-benefit ratio.

5.28. Cost: Mokokchung. The total cost incurred by the rubber farmers in the state from 1-34 years is Rs.51177260 which includes both fixed and variable cost. The average cost for the whole farming period is 1505213.52 per annum for the district.

i. The total cost for the rubber farmers in the first year for the District is Rs.2006700, which includes expenditures like jungle cutting, jungle burning, clearing of the field for three times, rubber stem, toilet, digging, plantation, pruning, weeding and mulching, farm house, lunch and wage of labour. The percentage of cost incurred in the 1st Year is 3.92% of the total cost in the district.

iii. In the second and third year, a total of Rs.2030400 was spent which includes expenditure on farm house, toilet, wages of labour and lunch for cleaning the whole field for three times per year. The percentage of cost incurred in the 2nd Year is 3.96% of the total cost in the district.

iv. From 4-7th years, the cost includes expenses on lunch and wages of labour for cleaning the field two times per year, and the total expenditure came out be Rs.853800. The percentage of cost incurred in the 1st Year is 1.66% of the total cost in the district.

v. The total cost incurred from 8-34 years includes expenditures like wages on labour and lunch for cleaning the field for one time per year, smoke house, tapping materials, roller machine, firewood, formid acid and wages for the tappers, where the total expenditure came out to be Rs.46286360. The percentage of cost incurred in the 1st Year is 90.44% of the total cost in the district.

The highest cost incurred by the rubber farmers is on wages for labour with 70.17% of the total cost.

5.29. Revenue:Mokokchung. The total revenue earned by the rubber farmers from 1-34th years is Rs.383616000 with an average earning of Rs.11282823.53 annually for the period.

i. The total number of rubber trees tapped on the 8th- -10 years is 13500 which produces 303750 Kgs. of smoked rubber sheets as a final output ready for sale in the market and the total revenue earned from the sale of this produce is Rs.31893750 on an average of Rs.10631250 per annum.

ii. The total number of rubber trees tapped on the 11th -31st year is 19980 which produces 3146850 Kgs. of smoked rubber sheets as a final output ready for sale in the market and the total revenue earned from the sale of this product is Rs. 330419250 on an average revenue of Rs.15734250 per annum.

iii. The total number of rubber trees tapped on the 32nd -34th years is 6480 which produces 145800 Kgs. of smoked rubber sheets as a final output ready for sale in the market and the total revenue earned from the sale of this product is Rs.21303000 for the period on an average of Rs.7101000 per annum.

5.30. Benefit –Cost Analysis: Mokokchung. As there was no revenue generation for 1-7 years, the result of the net present value came out to be negative (-4890900) for the same period.

i. The present value for the entire farming period from 1-34th year is Rs.90909041 and the average present value for the same period is Rs.2673795.32 per annum for the district.The highest present value is in the 11th year with Rs.6707021 and the least is in the 1th year with Rs. -1878053.

ii. Therefore it can be seen that the total Net Present Value (Rs.90909041.) for the district is higher than the cost incurred (Rs.51177260) which is worked out at a discount rate of Rs.Rs.6.85, there is profitability in this investment.

iii. The Benefit –Cost Ratio came out to be 6.04 which is more than unity. Thus the net present value and the benefit-cost ratio indicates that investing in rubber farming or plantation is profitable for the district.

5.31. Cost and Revenue (Hectare -Wise): Mokokchung.

i. Under Small farm size for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.25810810 and the average cost for the same period is Rs.759141.47. The total revenue earned was Rs.175872000 with an average of Rs.5172705.88. The Net Present Value for the entire farming period from 1-34th year is Rs.41018865 which is higher than the cost worked out at a discount rate of 6.85%. The positive Benefit –Cost Ratio (5.64) along with high Net Present Value shows that investing in rubber farming or plantation is profitable under small size of farming for the district.

ii: Under medium farm size for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.16838990 and the average cost for the same period is Rs.495264.41. The Net Present Value for the entire farming period from 1-34th year is Rs.32517597 which is higher than the cost worked out at a discount rate of 6.85%. The positive Benefit –Cost Ratio (6.25) along with the Net Present Value shows that investing in rubber farming or plantation is profitable under medium size of farming for the district.

iii. Under large farm size for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.8527460 and the average cost for the same period is Rs. 250807.64.The total revenue earned was Rs.71040000 with an average of Rs.2089411.76. The Net Present Value for

the entire farming period from 1-34th year is Rs.17372579 which is higher than the cost worked out at a discount rate of 6.85%. The positive Benefit –Cost Ratio (6.76) along with the Net Present Value shows that investing in rubber farming or plantation is profitable under large size of farming for the district.

iv. In comparison among the different farm size in the district, it was found that the large farm size has the highest cost-benefit ratio.

5.32. Cost and Revenue (Income-Wise): Mokokchung:

i. Under income size of Rs. 5000-10000 for the state, the total cost incurred by the rubber farmers from 1-34 years is Rs.26471810. and the average cost for the same period is Rs.778582.64. The total revenue earned was Rs.200064000 with an average of Rs.5884235.29. The Net Present Value for the entire farming period from 1-34th year is Rs.47318687 which is higher than the cost worked out at a discount rate of 6.85%. The positive Benefit –Cost Ratio (6.09) along with high Net Present Value shows that investing in rubber farming or plantation is profitable under income group of Rs 5000-10000 for the district.

ii. Under income size of Rs. 10000-15000 for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs.3731750 and the average cost for the same period is Rs.109757.35. The total revenue earned was Rs.22656000 with an average of Rs.666352.94. The present value for the entire farming period from 1-34th year is Rs.5155217 which is higher than the cost worked out at a discount rate of 6.85%. The positive Benefit –Cost Ratio (5.02) along with Net Present Value shows that investing in rubber farming or plantation is profitable under income group Rs 10000-15000.

iii. Under income size of Rs.15000-20000 for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs.5516690 and the average cost for the same period is Rs.162255.58. The total revenue earned was Rs.43584000 with a average of Rs.1281882.35. The Net Present Value for the entire farming period from 1-34th year is Rs.10465473 which is higher than the cost worked out at a discount rate of 6.85%. The positive Benefit –Cost Ratio

(6.42) along with the Net Present Value shows that investing in rubber farming or plantation is profitable under income group of Rs.15000-20000.

iv. Under income size of Rs.20000-25000 for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs.8807330 and the average cost for the same period is Rs.259039.11. The total revenue earned was Rs.64512000 with an average of Rs.1897411.76. The Present Value for the entire farming period from 1-34th year is Rs.15199411 and the average present value for the same period is Rs.447041.5 which is higher than the cost which is higher than the cost worked out at a discount rate of 6.85%. The positive Benefit –Cost Ratio (5.82) along with the Net Present Value shows that investing in rubber farming or plantation is profitable under income group of Rs.20000-25000.

v. Under income size of Rs.25000-30000 for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs.1776870 and the average cost for the same period is Rs.52260.88. The total revenue earned by the rubber farmers from 1-34 years is Rs.14400000 with an average of Rs.423529.41. The Present Value for the entire farming period from 1-34th year is Rs.3450313 which is higher than the cost worked out at a discount rate of 6.85%. The positive Benefit –Cost (6.45) along with the Net Present Value and the benefit-cost ratio indicates that investing in rubber farming or plantation is profitable under income group of Rs.25000-30000.

vi. Under income size of Rs.30000-Above for the district, the total cost incurred by the rubber farmers from 1-34 years is Rs.4872810 and the average cost for the same period is Rs.143317.94. The total revenue earned was Rs.38400000 with an average of Rs.1129411.76 . The Net Present Value for the entire farming period from 1-34th year is Rs.9319940 which is higher than the cost worked out at a discount rate of 6.85%. The positive Benefit –Cost (6.35) along with the Net Present Value shows that investing in rubber farming or plantation is profitable under income group of Rs.30000-Above.

vii. In comparison among the different income group in the district, it was found that the income group of Rs.25000-30000 has the highest cost-benefit ratio.

Conclusion and Suggestion:

From the study, it was found that rubber cultivation is profitable and viable for the farmers in the state. However, the farmers are ignorant about the prices, marketing and other logistic services. Moreover, rubber processing units and industries are absent in the state. Thus, few suggestions are put forward here for better rubber production in the state.

i. The Rubber Board/Government should give effective extension service by organising training for proper management of rubber plantation in the state. It is also suggested that a separate training for post-harvest technology be organised from time to time in the state.

ii. Awareness programme for market intelligence of the rubber farmers is essential in the state, so that they get at least remunerative price.

iii. Most of the rubber farmers in the state employ/hire untrained labourer based on profit sharing basis or on high monthly salary basis, which is effecting the production. Therefore it is suggested that the rubber farmers should be sensitise on this issue and should employ trained labourer.

iv. With ever increasing rubber plantation in the state, it is suggested that rubber–based industries should be established in the state which will lead to employment and income generation in the state.

v. The Government should introduce minimum support price for rubber farmers in the state in order to offset the loss incurred during fall in price of rubber products in the market.

vi. Proper markets should be set up in all rubber growing districts of the state in order to facilitate the farmers to dispose their products.

vii. The State Government should introduce Insurance schemes to the rubber farmers.

viii. Proper assessment on the area under rubber cultivation, production and total standing trees in the state needs to be taken periodically by the Government so that the statistical data will be available for reference.

ix. All weather roads connectivity should be prioritised by the Government for easy accessibility of the farmers in different forms.

x. Due to population pressure, jhum cycle is drastically reduced leading to low productivity and low farm income. As a result, farmers are discouraged and starts migrating to the urban areas seeking for better opportunities. Thus rubber cultivation can provide a viable alternative in comparison to other farming activities which may even reduce migration from rural to urban areas in the state. As such the policy makers must encourage rubber plantation in the state.

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