CHAPTER VI

SUMMARY AND CONCLUSIONS

Rubber has always been an important commercial crop in India's agricultural history. India is the fourth largest producer of natural rubber in the world. India also ranks fourth in the case of NR consumption and first in the case of productivity as such an analysis of factors affecting NR supply and prices is highly relevant especially in the wake of liberalization and changing global economic scenario.

The first objective of the study was to estimate the short term and long term supply response of NR in India. In the study two types of multiple regressions were run for estimating the short term response of output of rubber to the price for the period 1976-77 to 2001-2002. The first one includes the trend variable and the second one excludes it.

In the simple regression of production of rubber as a percentage of tappable area or yield per hectare of tappable area in year t on the actual price of natural rubber in year t, both the price coefficient and trend variable are significant at 5 percent level of significance. The F ratio which shows the overall significance of the regression model is 86.56 which are significant at 1 percent level. The price elasticity is estimated to be 0.25.

When production of rubber as a percentage of tappable area is regressed on trend variable, $R^2$ and F ratio (0.877 and 156.96) are highly significant and it shows that short run production is greatly influenced by time variable.

In the third equation, production in metric tonnes was regressed on pt along with two more new variable i.e. newly planted area and tappable area. All the variables are significant at 0.05 level of significance. The price coefficients and the coefficient of $T_t$ are positive revealing positive response of $O_t$ to $N_t$ and $T_t$.

But the presence of the additional variable $N_t$ and $T_t$ leads to negativity (-19983.63) of the intercept term. The negative sign of $N_t$ shows that output in the short run is negatively related to the newly planted area. This is expected as tapping of these plants planted now can only be undertaken after 5-7 years. The price elasticity in this case is 0.39, $R^2$ and F ratio in this case is 0.969 and 234.43 respectively.
The fourth regression is run to estimate the short term supply response of holdings.

Though adjusted $R^2$ is high (0.917) price coefficient (26.47) is relatively less significant. The price elasticity is 0.12 and the F ratio is 122.35. This means that output of holdings in the short run is relatively inelastic. The trend variable shows high significance (6.16).

When trend is eliminated intercept term became positive and price coefficient showed greater significance. The price elasticity in this case is 1.38. But the adjusted $R^2$ is lower at 0.771.

In the fifth regression, when $Q_0$, i.e. Output of estates is regressed on both $P_1$ or market price of rubber and $T_1$, or time variable showed greater significance in the short run. Adjusted $R^2$ is 0.953 and F ratio is 222.882 in this case. As the price elasticity is -0.28, output of estates does not seem to be responsive to current price.

Eliminating the time variable the price elasticity (0.40) becomes positive and price coefficient becomes more significant. But adjusted $R^2$ (0.779) and F ratio is (78.91) is comparatively lower.

For estimating long term response, both Nerlovian and Fisherian types of regressions were tried which involve lagged independent variables and in the case of Nerlovian model even lagged dependent variables.

In the case of declining weighted specification, in the Fisherian equation (1) with the time variable included when the price variable is $PW2$ both the long run and short run elasticity estimates (-0.17, -0.07) The intercept terms ($1597.85$) is positive and the price coefficient is significant 0.05 level of significance in the case of variables $PW2$. For the price variable $PW3$ also both the long run and short run elasticity estimates are negative (-0.22, -0.09). Price coefficient (-0.004) attains significance at 0.05 level. This is in confirmation with expectations as the price variable takes into consideration of a lag up to two years. When the price variable is $PW5$ and $PW7$, elasticity estimates (0.07, 0.099) turned positive due to the increase in lags. Similarly in Fisher II the weighted sum of the logarithms of these prices was taken. Two equations were estimated with $P_1 \times W_3$ and $P_1 \times W_5$ short and long run elasticities are positive. The long run and short run elasticity estimates for $P_1 \times W_3$ are 2.90 and 0.55 respectively and the long run and short run elasticity estimates for $P_1 \times W_5$ are 5.10 and 0.55 respectively. Price coefficients of both equations (66.98, 89.09) were significant at 0.05 level of significance.

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In the case of unweighted specification also the coefficient of the price variable (-0.006) attains significance at 0.05 level. Adjusted R2 (0.386) and Durbin Watson statistic (0.160) are not satisfactory. The long run and short run elasticity estimates are (0.001, -0.003).

A number of equations were estimated starting with regressing the sum of the newly planted area and replanted area \((N_t/T_{t-1})\) on \(P_t\) and \(P_{t-1}\) and so on till we included \(P_{t-16}, P_{t-17}\). We found the coefficients of \(P_{t-4}, P_{t-5}, P_{t-6}, P_{t-7}\), positive while the coefficients of \(P_{t-11}, P_{t-2}, P_{t-3}\) were negative. Choosing the estimated \((N_t/T_{t-1})_{t-1}\) from the equation where terms up to \(P_{t-7}\) were included as explanatory variables, we ran the Second stage of Least Squares regression \((N_t/T_{t-1})\) on \(P_t\) and \((N_t/T_{t-1})_{t-1}\), i.e. the lagged endogenous variable to get our Two stage Least Squares Nerlovian estimates.

Another set of Nerlovian Two Stage Least Squares regressions with six year lag using in the stage 1, terms up to \(P_{t-3}\) as explanatory variables. These two lags were chosen, because the rubber tree matures after 5-7 years.

In the six years lag equations the price coefficient is negative (-0.00977) and the coefficients of lagged dependent variable (0.90829) are positive. Though the price coefficient is not significant, the lagged dependent variable is significant at 0.05 level. The trend coefficient (-0.956) is negative. In the case of eight years lag equations the trend coefficient (0.281) was found to be positive. A comparison of the eight years lag equations and six years lag equations would throw light on the long term decision. It was found that coefficient of elasticity increased from -0.06 to 0.02 in the case of short run and from -2.01 to 0.01 when the number of lags were increased in the price variable. This leads to the conclusion that new planting positively responds to the past prices of rubber.

The results obtained from the Nerlovian model substantiate the findings. The lagged dependent variable is positive and significant at 0.05 level. Price coefficient was found to be positive. While the coefficient of elasticity is positive for an 8 years lag specification, it is found to be negative for the 6 years lag specification.

We may conclude that producers supply responds more to current price in the short run. The estates supply does not seem to be responsive to current price. The long run planting decision is influenced by past 8 years prices. The results also
indicated that the time variable, do significantly influence the decision making on replanting or new planting. It is felt that further exploration on the average response needs to be carried out taking into consideration of factors like Age composition, effects of alternative crop etc, which is beyond the scope of the present study.

The second objective of the study was to analyse the macro economic environment of NR industry and the causative factors of rubber price crash. One can see that between 1985-1990 the prices remained in the 16 to 20 range during early nineties. In the post liberation era the prices were contained with in the band of 20-25. The mid nineties showed a rise to the 35 level and from 1995 on wards it continued its upsurge to reach fantastically high levels like 57 to Rs 60 at a point of time. In the year 1997-98 saw the plummeting of prices to Rs 30 level. Sometimes fluctuating downwards to Rs. 25 after 1998 the downward tendency was reaffirmed. Prices were again with in the 25 to 30 level.

An analysis of the macro economic environment of the rubber industry during the time period between 1995-2000 involves an analysis of the four major sectors of the economy viz the Government sector, the business sector, the foreign sector and the household sector. Each sector was found to have its share in causing and accentuating rubber crisis.

The causative factors of rubber crisis reveal a complex interrelated nexus. But one can say that the setting was provided by the liberalisation of Indian economy. Slashing of duties to the extent of 60 percent changed the whole foreign trade scene. Import duty for poly urethane, a major substitute of latex was cut down to 25 percent. At the same time a 35 percent excise duty was imposed on foam products, a major end using sector of latex. To complicate things, dumping duty provisions of DSAD favoured SR and ignored poly Urethane or its raw materials favouritism was shown to SR at a time when instead of East West compartmentalisation in NR:SR production there was emerging complementarity with India and China in the forefront. Prices touched low levels in mid 97. This accentuated the threat of SR substitution. Lack of restriction on poly urethane imports crashed the above 45 percent price differential between sheets and latex which was a result of the Aids scare and glove boom.

Post liberalisation industry sluggishness led to low effective demand influenced movement of goods and tyre demand. Original equipment demand as well as replacement demand fell sharply. Retreading of tyres became wide spread. Rubber
crisis year was also a year where there was 40 percent power cut in North India. Again it was a year when the regular power cuts are more strictly enforced in Kerala.

The role of state run institutions like STC was very much inhibited in the Post liberalisation scenarios. Ministerial orders for fund procurement were often delayed and there was great uncertainty about the procurement funds. Delayed payment caused procurement by agencies like Rubco and Rubmark impossible at times. The proclaimed procurement had a slow pace with a time limited 200 days. This was made at a time when stocks were piling up daily. STC is alleged to quote below market prices to procuring agencies and giving them minimal time to finalise the deal. STC's insistence on procuring good grades is necessitated by the business sectors insistence on them. An attempt to join the dealers in the procurement chain proved fruitless due to STC payment in installments and rejection of at least 10 percent of the delivery on the grounds of low quality causing loss transport charges to the dealer. STC bought at the market level not at BMP level. As a result there was not much support to the BMP level. Faced with glutted go downs and delayed payment from STC, the procuring agencies released their stock in the market thus crashing prices further. Companies would adopt speculative procurement policies when agencies start their procurement, making further procurement impossible by the fund hungry agencies. Business sector created a situation after a lot of negotiations whereby it became more profitable to buy from domestic market.

Business sector as expected continued with their lobbying, media management; stock management policies like joint buying strategy, joint market invisibility, time management of BMP announcement etc. But Indian business big fishes are facing the threat of MNC whales and have to fight tooth and nail to sustain their market share. Competition is forcing Indian bigwigs to adopt SR orientation.

Exports possibility as a saviour was ticked off due to low quality of Indian rubber. Lack of export culture due to strong domestic demand resulted in lack of basic infrastructural facilities and the lack of a well developed futures market.

While the opening up of China gates and rise in Chinese demand can be cited as a cause for the historic price rise; South East Asian economic crisis can definitely be pointed out as the factor behind the historic price fall. Due to increased global integration the South East Asian waves were reflected everywhere. It slowed down progress in India who was waking up from industrial sluggishness causing further pressure on its already overvalued currency. South East Asian devaluation increased
their competitiveness forcing countries like India and Srilanka to lower prices. International agreement became pointless as INRO DMIP was fixed in terms of Malaysian currencies.

They advocated the availability tyre technologies of NR at international rates while tyre a not available at international rates.

There was not much help from the State government. Though both parties took it up as a political issue. State Revenue orders giving sales tax exemption to natural rubber were short term covering only a few months and served little purpose. State budget were non supportive and no positive measures were taken on a time bound manner for exporting away the surplus. State government’s purchase tax of 11 percent led to the continuance of massive rubber smuggling.

Rubber Board being a developmental data providing agency could do little to save the grower. In post liberalisation era statistics of rubber production is collected from check posts and industry and hence highly unreliable. There is no estimate of rubber smuggling, interstate as well as inter country. In the wake of termination of world bank loan rubber increased the cess by 50 ps which though levied from estates and manufactures is in effect a tax on the growers. Their price realisation would lower by the labour charges which increased proportionately. But rubber prices refused to decline proportionately thus accentuating the crisis. The absence of co-operation between Estates and small holders caused led to absence of common price fall resistance policy. Lack of reinvestment of rubber proceeds in rubber related industry led to heavy dependence on tyre companies whims and fancies.

SWOT Analysis
Strengths
1. Geographical suitability which makes rubber cultivation highly suitable.
2. Indian industrial climate is showing signs of revival. A good crop period and the resultant income effect are expected to increase goods movement leading to increase in original and replacement equipment demand.
3. Government of India has banned import under license against public notice after 1995-96. Import under Special Import License (SIL) is discontinued from April 2001. Also Advance Licensing scheme was banned from February 20,1999. This shows that state role is effective even after liberalisation.
4. Long gestation lag and initial high investment which ensures commitment from growers.

5. New innovations in tapping which would double the productivity of existing trees viz; inclined upward tapping developed by Scientists

6. India exports tyres to 51 countries and they even enjoy a premium status in US market. The market share of US in Indian exports is almost 30 percent. Though tyre export growth fell by 10 percent in 1998, it is fast picking up.

7. Revival of South East Asian economies since globalisation means interdependent fortunes countries like the US is taking keen interest in investing for South East Asian revival.

8. Under GATT developing countries like India enjoy “Green Box Treatment” under which India need to reduce subsidies for values greater than 10 percent only over a period of 10 years. Since India’s share in the world trade is less than 3.25 percent and per capita income is less than $1000, she is exempt from the prohibition of export duties. Bop difficulties can be cited to prolong the time span for tariffication.

9. High level of cooperation and grower awareness in the wake of crisis which led to industrial venture in some areas.

10. Since India is a “Developing Country”, rise in demand for tyres and other end products a sure certainty.

11. High level of literacy and alternative employment among small growers enabling them to bear short term price fluctuations.

12. Strong religious, institutional and political support. Rubber votes being a deciding factor for both parties and hence their causes are actively taken.

13. Rising population trend would add an extra dose of purchasing power each year.

Weaknesses

1. Smallness of 95 percent of growers reduces economies of production. Small holders do not enjoy the advantage of efficient organisation like estates. In the absence of smoke houses, go downs etc they cannot hoard and speculate to get higher incomes. Estates thus become the price maker and the growers the price taker.

2. Absence of a strong and transparent supply chain from grower to dealer and to the producer

3. Linkages between rubber related small industries are weak.

4. Lack of cooperation among estates and small holders make it impossible to adopt production control measures in the wake of price crisis, along the lines of OPEC
model cartel. Since small growers are vulnerable to price fluctuation, they cannot afford to adopt measures like production cut or stock keeping.

5. Since rubber is a perennial crop, capital investment is for long term and it becomes impossible to form rational expectations about future. They can respond with respect to cropping pattern, cropping intensity and productivity. But they are unable to change acreage in the short run, since it would take another 6-7 years and the then price situation is obviously impossible to predict.

6. It is said that rubber cultivation has led to a highly skewed agricultural growth in Kerala. It enjoyed the highest rate of subsidy. As cultivation of subsistence crops were neglected, general cost of living rose. Income proceeds from rubber were frittered away in conspicuous consumption with no productive reinvestment in rubber related industries. Though increase in rubber incomes had shown multiplier effects, it is lesser when compared to the multiplier effects which would have been achieved by general increase in real incomes owing to low cost of living.

7. In countries like Indonesia and Malaysia, rubber cultivation is considered as a means for removing unemployment. So it enjoys 90-95 percent state subsidy. Both India and these countries face equal level of international prices, but different levels of domestic support. As against India, in these countries devaluation would work towards increasing exports as domestic consumption is less than 20 percent.

8. State Trading Corporation (STC) proved to be a "weak player" in the procurement scene. There were delays in ministerial order for fund granted for procurement. Fund granted was also inadequate. There were no supports to Rubmark's efforts through a centrally sponsored scheme. Lack of coordination and cooperation between STC and the procurement agencies viz Rubco and Rubmark. Procurement was for a time span of 100 days in the first phase and 200 days in the second phase. By that time period excess stock accumulated and accentuated the glut. As far as latex was concerned, no procurement was done since ammoniated latex has minimal storage life. State sales tax of 11 percent stood in the way of STC procurement till it was withdrawn in 17-11-1999. STC lost Rs 8 crores in this account. Delay and procedural formalities with STC, fear of rejection of stocks on the basis of quality, delayed payments etc. created frequent frictions between STC procurement agencies, rubber dealers.

9. There is no price support procurement mechanism to ensure that the BMP is maintained at the fixed level. A lot of calculations and government efforts goes into the fixation of BMP. Whenever they are short of money, the growers themselves
would ignore BMP level and sell at levels below it. BMP being partially protectionist in effects. It cannot be relied upon particularly in the WTO era.

10. Breaking up of INRO as a price stabilising agency made international prices weak. As the intervention price was pegged in terms of Malaysian currency, its devaluation resulted in the pegging of intervention price level below the "Must Buy" level. Though, it was later linked to the US dollar, there was lack of cooperation among member countries resulting in fund shortage and breakup of price stabilisation scheme.

11. Since domestic demand had always been sufficient to absorb the excess production until recently, there wasn't any necessity to expand basic infrastructural facilities for export. We are unable to offer a steady supply for longer periods. Quality of our products is not known internationally. We cannot offer forward market rates in the absence of a well developed forward market system. This makes exporting away of surplus production difficult.

Opportunities

1. Crop Substitution is impossible in the present agricultural situation of Kerala as all crops are suffering badly. There is no crop viable enough to substitute rubber. The other option is sale of land. But land prices show a proportionate relationship with rubber prices. Due to the growing disinterest among Gulf based NRI to invest in the real estate sector, registered land deals have come down. So opportunity for rubber cultivation is still alive in Kerala.

2. Green box provision in WTO will boost agricultural exports.

3. GATT provides protection to plant breeders under which new range of seeds, bio-fertilisers, bio-pesticides and successive generations of plant variety are protected. This provides an opportunity for further research in rubber.

4. To reap the benefits of trade liberalisation under WTO, government should take measures like.
   a. Technology upgradation, land reforms, optimal use of fertilisers and irrigation.
   b. Analysis of price formulation of agro products and taking steps to avoid distortion in food production.
   c. Maintaining Export Oriented units in agriculture with further foreign collaboration.
   d. Research on Aggregate Measure of Support (AMS) to quantity protection in Indian agriculture.
c. Formation of Trading Blocs and Common Agricultural Policy among developing countries.

d. Conducting state agricultural projects with foreign collaboration.

5. Central government is taking measures to expand export opportunities in rubber. Rubber Board has set up Export Cells for technological specification and information. A rubber park is proposed to be set up in Airapuram in Perumbavoor. This would set up additional small scale rubber related industries with better linkage.

6. Rising demand for rubber wood

7. Road rubberisation is emerging as a new source of demand supported by state governments.

8. Rubber honey is emerging as a new source of additional income to growers.

9. It was the emergence of new demand sources like opening up of China gate, which had led to the sporadic rise in prices in 1996. Again, the emergence of Economic Union as a contending force against the US will increase competition in the rubber market since both the EU and the US are top NR consumers which might lead to future rise in prices.

10. There is a possibility of signing up of a "third generation agreement" between India and EU which will increase Indo-EU trade and prop up rubber prices.

Threats

1. Though imports through Advance Licensing Scheme were banned since February 1999, imports continued. Since Advance License has a normal validity for 18 months after issue and can be extended twice for duration of six months each, imposition of ban didn't help much.

2. Liberalisation policies have favoured SR imports. Growth in SR production and consumption is showing steady increase since 1995-96. Since SR is petro based fall in oil prices can favour SR at any time. Indian industries are copying SR based foreign technologies to achieve price competitiveness.

3. Under TRIPS, the national treatment clause gives the foreign investor the same right in area and magnitude of investment. MNCs have entered the domestic scene and set up tyre plants. They have the advance licensing facility for making export related imports, while utilising cheap domestic labour. There is a threat of import of NR from African countries where labour is cheaper. TRIPS stipulate no qualitative restrictions on imports and exports and performance obligations like usage of local raw materials and equipments, technology transfer etc.
4. There is also the threat of import of second-hand tyres. Lobbyism has succeeded in suppressing this threat for the present. Import of SR and its raw materials are protected by levying anti-dumping duty. But import of NR does not enjoy the same protection.

5. Lowering of import duty on Poly Urethane from 75 percent to 20 percent lowered the price advantage in latex production by 50 percent. This has prevented reaping the benefits of global aids scare and glove boom.

6. Since Kerala's electricity is hydro based frequent power cuts upset industrial climate.

7. Domestic demand is insufficient for glut removal though it is always on the rise. If we take the per tyre requirements, of the total quantity of all kinds of tyres imported, less than 15,000 tonnes would form additional consumption requirement in the absence of imports.

8. Business lobbying has always been a threat to stable rubber prices. Whenever rubber prices rises, industrialists raise tyre prices more than proportionately. Within months they would agitate for imports and bring down rubber prices while tyre prices would remain at the raised level. Tyre companies like MRF & CEAT which have about 40 percent share in rubber market cite various reasons and jointly appear or disappear from the market to manage prices. Bribery and corruption is used to formulate favourable policies at the government level. If they fail at this, they influence officers to prevent the implementation of such policies. They reject STC's stocks citing low quality as a reason and influence STC officials to make procurement ineffective. Media is influenced to create false panic and lower prices. Due to development of transportational facilities time period of business inventory is reduced two weeks. Business lobbying resulted in imports for in excess of import requirements and is said to have resulted in the loss of revenue of Rs 125 crores.

9. Retreading of tyres have become popular reducing replacement demand for tyres.

10. China's presence in the tyre export market is much larger than ours. India sustains due to quality which makes its exports costlier. Secret of low priced chinese tyres is not known.

11. Bangkok agreement provides 10% duty concession for tyre imports from Korea which makes sustaining of domestic profit margins difficult.

12. Psychological bondage towards white collar jobs has led to voluntary unemployment even though better paid blue collar jobs are available. This has
resulted in artificial labour shortage and rise in labour wages. Trade Unionism prevent proportionate downward movements in rubber prices and rubber wages thereby reducing price competitiveness.

13. From August 1998 rubber can be imported duty free from SAARC countries.

14. Newer HYV could be evolved with sowing patents in other countries and they would avail protection under Plant Breeders Rights.

15. Kerala growers might favour a multicrop model of agriculture if the prices continue to fall.

16. Possible shifting of cultivation to North Eastern region due to rising labour costs as evident from increased interest taken by the Rubber Board in extension and development to North Eastern areas.

The third objective of determining the minimum cost of production of NR is analysed with aid of an all Kerala primary survey covering a total mature area of 16553 ha. having 70056 tappable trees and an immature area of about 22 ha. The time period spans from November 1999 to February 2001.

In the primary survey of immature area, about 60 percent of the cost is shared by the labour component. Almost 90 percent of the surveyed units had no immaturity costs in which labour cost share is very high. The remaining 10 percent is found to follow the recommended cultivation norms of the Rubber Board.

Rubber Board estimates of labour requirements was found to be higher for the years of immaturity period. Though the no: of surveyed immature sample units are few, the results are in tandem with the general practice, since the sample is a representative one. Also, cultivation practices are more or less similar area wise especially in the case of immaturity period wherein growers are keen to follow the Board instructions implicitly.

Variation in wage rates across different geographical regions was also found. Shortage of labourers both male and female was acutely felt in all the geographic regions. Northern and Southern Kerala were identified as low wage regions. This should be due to the influence of the availability of immigrant labourers from the neighbouring Tamil Nadu state at a cheaper rate. Central Kerala showed comparatively higher wage rates. The area form an industrial belt of the state and therefore high wage rates reflect the opportunity cost component in the industrial and construction sector. Compared to estate where wages are uniform and is fixed based on a tripartite agreement between the employee, employee and the government, the
wages prevailing in the small holding sector are heterogeneous and is fixed on the basis is of supply and demand. As a result high level of wage rate prevails in the small holding sector.

Most of the cultivation works were carried out on a daily wage system. Same wage rate prevailed for all the works associated with rubber in same areas pitting and refilling was undertaken on a contract basis. Wage rates for pitting depended on the type of soil. Greater effort is required for pitting hard rocky areas. Higher pitting wage means higher refilling wage as while refilling is done stones are to be removed from the soil.

Gender inequality in wage rates was observed. Female wage rate comes to only 66 percent of the male rate (Rs. 80.3 as against Rs. 120.1 for male on an average). This is justified on the ground that the type of works undertaken by women involves less physical exertion than that of men. Female work participation rate during immaturity period was 58 percent. 94 percent of the female labourers are employed for weeding and mulching.

Work participation of family labour is negligent in the immaturity period. During maturity period also, less than 5 percent were engaged in tapping and other plant protection measures. This is in tandem with the sample survey results of the Rubber Board which reveal the sole income dependency of sample units as only 40.5 percent. Out of this 95 percent don’t engage in cultivation activities. It was found that in practice watchmen were not kept by small holders for supervision. Supervision is under taken by family liability. Perhaps the cost of supervision is included in Board estimates to incorporate the opportunity costs of family labour.

It was found that protection measures like construction of wind belt and fire belt was net practiced widely. Manurial recommendations of the Rubber Board for immaturity period were strictly followed by the growers. During tapping stage, however discriminatory fertilizer application was practiced on the basis of price realisation. 90 percent of the surveyed units made their own fertilizer mixture. Only those who are members of the co-operative society or those who live in remotest areas bought fertilizers at market price. However for estimating material costs market price of fertilizers was made use of.

Though chemical weeding is more profitable than manual weeding when considering the labour cost component, it was found that majority practiced manual
weeding. This could be on account of ignorance or due to slow rate of change of habitual cultivation practices.

Micron spraying is more cost efficient. Spraying costs are 48 percent less than that of Bordeaux spraying. This is due to the fact that labour cost component under micron spraying is only 42 percent whereas under Bordeaux spraying it is 75 percent. Here again, a slow change of habit was found. Mulching is a widely prevalent cultivation practice. Mulching using African Payal is also found to be widely practiced.

Mulching is a widely prevalent cultivation practice. Mulching using African Payal is also found to be widely practiced. Variation in wage rates across different geographical regions was also found. Shortage of labourers both male and female was acutely felt in all the geographic regions. Northern and Southern Kerala were identified as low wage regions. This should be due to the influence of the availability of immigrant labourers from the neighbouring Tamil Nadu state at a cheaper rate. Central Kerala showed comparatively higher wage rates. The area form an industrial belt of the state and therefore high wage rates reflect the opportunity cost component in the industrial and construction sector. Compared to estate where wages are uniform and is fixed based on a tripartite agreement between the employee, employee and the government, the wages prevailing in the small holding sector are heterogeneous and is fixed on the basis is of supply and demand. As a result high level of wage rate prevails in the small holding sector.

The survey covered on an average to a total nursery area of 16553 ha. with about 70056 tappable trees. Average all Kerala level of production was found to be 16003.68. Sheet production was 88 percent of total production. On an average 12 percent of total production was lost as scrap. There is a 20 percent lose of income from sale of scrap when compared to the sale of sheet.

On an average the all Kerala price level for the sample period was recorded at Rs 30 for sheet and Rs 18 for scrap. Average yearly output per tree was found to be about 210kgs.

All Kerala Average total cost of production is found to be Rs. 183205.3. Wage costs had an 87 percent share is the total cost of production. Tapper wages alone had a 69 percent share in the total cost of production and a 79 percent share in total wage costs.
Overheads and depreciation had a share in the gross cost figure while the remaining is accounted for by materials cost. Per hectare average cost of production of NR per hectare is recorded as Rs. 61.7115 recorded to Rs. 62. per hectare average total production is 1820.069 per hectare sheet production is 1617.578 and per hectare scrap production is 202.4695. Average percentage of scrap of total production is 61.7.

Average total sales are Rs. 4706529. Average total sales of sheet alone in 93% of this gross figure. Average gross margin at the all Kerala level is 4507254.

Average equivalent total production is 16229.17 tonnes. Average total cost of production up to latex stage is 184854.4 costs per kg up to latex stage are about Rs. 12. Average total cost of production of sheet is Rs. 188385.8. Taking into consideration the equivalent production cost/ kg works out to be 13.912 rounded to Rs. 14. This is the basic per kg cost of production.

Basic cost of production of sheet is adjusted by adding the land rent; amortization of deflated development cost Interest on loan, interest on working capital Adjustment of loss on scrap, grade difference, managerial expenses and return as capital risk to arrive at actual cost of production. Actual average cost of production worked out to be Rs. 360688.82. On a per kg basic it works out to Rs. 22 i.e., Rs. 12 below BMP level.

This cost figure is worked and without taking into account opportunity cost explicitly interest rate is considered as the opportunity cost for finance. Opportunity cost of land is not taken into consideration as it is a highly complicated and widely debated issue.

In the first place opportunity cost or cost of next best alternative does not exist in the case of rubber. In the agricultural field no other crop yields better than rubber even when rubber prices are crashing. Annual crops are subject to violent seasonal fluctuations. Kerala's overall economic climate is slowly rooting out paddy and coconut cultivation.

Therefore no other crop has been officially identified as a substitute so far and data are not available for comparison. Thus we see that the aspects of rubber scenario outlined in the SWOT analysis are quantitatively verified in the present chapter.

The characteristic industrial sluggishness of Kerala, though showing signs of improvement in various corners does not have enough force to drive people from agriculture to industry in the Lewis fashion to raise prices and costs in the agricultural sector.
Rubber Board sample survey reveals that only 40 percent of the growers depend solely on rubber as a main source of income.

As per Board's questionnaire for sample survey, a grower is solely dependent on rubber as main source of income when his income from rubber is greater than all the other alternative sources of income. This means that even the 40 percent does not stand for a true estimate of the sole dependents on rubber for income among 9.5 lakh small growers. So rubber cultivation itself has become a next best alternative for a tertiary sector dominated state like Kerala. When majority is engaged in alternative occupations rubber cultivation requiring only supervision once the plant reaches maturity is the most viable alternative.

Land was converted into rubber plantations to come under the exemption enjoyed by rubber plantation under the land ceiling Act. Most of the plantation was purchased years back and data on the land prices is not available for calculating its imputed value. In Kerala the concept of mortgage land is outdated as all such lands have been given to the users. Leased land (after 10-12 years) is also given out. So for rubber opportunity cost concept on such lands are irrelevant. So there remains only owned and inherited land.

In the cost of production study under Ministry of Agriculture imputed value of land is not taken. This is because continuation of the use of land for the same crop is considered itself as an indicator that there is no next best alternative use.

The methodology adopted by United Farmers Front takes cost of production of the first stage and adds opportunity cost at the rate of 12 percent per annum for the next seven years up to the start of yielding to get total cost of first stage. For second stage total cost is also got by adding up opportunity cost. Then a minimum of Rs. 5000 per year net of all expenses is taken as opportunity cost of the land if, it is least out at 12 percent interest rate for each of the seven years is taken. Cost up to yielding stage is the sum of costs of stages I and II plus total opportunity cost for land. Again interest rate of the cost up to yielding stage is taken and is added to yearly maintenance cost of production. Thus there are a lot of opportunity cost calculations in a situation where there are a lot more controversies regarding the calculation of opportunity cost for rubber.

In the wake of global price competitiveness, the adjusted basic average cost is an efficient one. But the condition is that Bench Mark level of Rs 34/kg is above the calculated level and so stands for a “fair” return for the growers. Or in other words
what the grower is justified to get so that he remain in the cultivation of rubber. The peak level attained in mid 1997 can be explained away as seasonal fluctuation's or in other words wind fall gains. It may recur depending on the post WTO global changes. But to use the peak prices as a base for price calculations amounts subscribing to "ratchet effect" phenomenon of Duesenberry.

The concept of normal price is fixed on the theory that the investor should get a return which is enough to cover the cost of production and yield a normal level of profit such that he is not tempted to shut down. There is a normal level of exit and entry. The price level of Rs 18 worked out by the ICWAI methodology can be classified as a normal price under a perfectly competitive situation. Theoretical price levels are not enough for boosting the growth of any industry. Sample survey results based on this methodology (Rs 26) can be considered as the range above shutdown point.

Peaks and troughs in price level are common phenomena whether it is an agricultural or industrial good. It is the result of wind fall gains or losses. But having attained a high level once there is a psychological fixity to that level. The price level between Rs 55-60 can be classified as a peak price level. Using peak prices as a base for price calculations amounts subscribing to "Ratchet effect" of Duesenberry.

The midway level worked out using the second methodology is Rs 38.5 and is higher than the BMP level. At present it is unattainable since international price hovers around Rs 32. We may conclude that the question of how fair is the fair price is a matter of growers view point. Opting for the economically feasible level is the best option for growers.

Though a major share of rubber returns leaked out as conspicuous consumption, changes in business scene and attitude will definitely bring forth positive reinvestment of the surplus. As it is most suited for Kerala's peculiar industrial climate and as there are no viable alternative, rubber cultivation should be shown green flag. For this the grower should at least get the BMP level in the present situation or else exit would be the most viable alternative.

The improved technology in rubber cultivation has improved the potential for greater output and the prospects for sustained growth of the industry in the face of both fluctuating prices and increasing cost of inputs. Therefore, the fourth objective is to forecast the future potential production and demand of NR. Since the majority of
rubber suppliers are small holders and therefore economically backward than the rubber consumers, it is relevant to determine the future potential so as to verify whether encouragement of productivity is a viable option or not.

The proportion of NR in the global elastomer usage is forecasted to decrease from the present level of 40 percent to 37.5 percent in 2010. Due to relatively higher price of NR and progress in SR industry it may still reduce to 35 percent by 2020. World consumption of NR which was 66.8 lakhs during 1999 is forecasted by the International Natural Rubber Organisation to reach 100 lakh tones by 2010.

The World Bank forecasts NR price to recover. NR prices rose by 9.1 percent in 1999 and by 8.3 percent in 2000. The growth rate is expected to slow to an annual rate of 4.8 percent during 2001 – 2005 and 1.8 percent during 2006 – 2010.

The outlook on rubber supply also shows increasing prospects. Most of the major rubber producing countries is getting rapidly industrialized and there is still untapped rubber potential. Small producing countries like Vietnam, Cambodia, and Brazil etc. are showing signs of increasing their NR production in the future. The global output of NR which is 66.0 lakh tones during 1999 is likely to increase to 77.2 lakh tones by 2005 and 85.4 lakh tonnes by 2010.

Considering the time series data from 1984–1985 to 2001–2002, the correlation between the world NR production and Indian NR production worked out to be 0.9778. The corresponding correlation for consumption worked out to be 0.851. For the same time period, domestically the correlation between consumption and production is in tandem with the global results i.e. somewhere in the range of 0.98 to 0.99. Correlation between domestic consumption and price also show close association with the global correlation of the two i.e. between 0.73 to 0.75. Forecasts of world production and consumption reassert the concept of consumption production gap in the future.

Three approaches were employed for the purpose of forecasting future production. In the first approach, time series regressions were estimated for both production and consumption for the 15 year period from 1987 to 2002 for understanding the trend. Box Jenkins method was applied to correct autocorrelation. Both the regressions on production and consumption have high $R^2$ (0.997, 0.991) showing high significance of the trend variable. It proves that behavioral variables do depend on time variable in their adjustment process.
Estimation results using the first approach are revealed that estimated consumption for the year 2003 is 717569.4 Lakhs and estimated production is 742458.1 Lakhs. By 2011 these figures are estimated to be 950844.8 Lakhs and 1015688.0 Lakhs respectively.

Using the second approach, forecasts for new planting is 88203 lakhs tones for the year 2005 and replanting is 9983 ha for the same year. Production is forecasted to reach 6777201 lakhs tones by 2010. The results show that moving average of price (MOP) is the most crucial factor for determining the new planting followed by government subsidy. As against the regression result of new planting, in the case of replanting, it was found that MOP is not significant. Most significant is the trend variable.

Based on normal production function method, the supply forecast of 2002 is 66048 Lakhs and 2003 is 676164 Lakhs. Estimated NR supply is 702272 Lakhs by 2005. In 2011, the supply would be 750178 tonnes. At the terminal point of the analysis i.e. 2020 AD, the estimated production is 899376 tonnes. Of the three approaches, results of the third approach are thought to be reliable as it is more in tandem with the actual figures.

In the case of NR, an analysis of macro economic environment of the rubber industry throws light on the causative factors and areas where remedial measures can be applied. Here a microscopic view of the past is made available. Past experience can be made use of to improve the situation and if measures suggested under SWOT analysis is an optimistic way out subject to the condition of observance. Analysis of the cost of production of NR shows that grower got the subsistence price level even at the trough level. It also revealed that at present there is no viable alternative to rubber cultivation. Higher price level of Rs.65 and lower price level of Rs.24 are just cyclical fluctuations due to global factors a rational rubber must be realistic and accept global influences in the post liberalization era. Supply response analysis reveals positive long term responses and as there is price recovery at present, there is the possibility of positive rubber supply in the future. Forecasting exercise also promises both production and consumption increases and positive demand supply gap.

In short supply response and analysis, forecasting, macro economic environment as well as sort analysis and cost of production study all combine to show that rubber cultivation will not only be sustain but will flourish in the future.