# CHANGING DIMENSIONS OF THE WORLD NR PRODUCTION SECTOR

by

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The recent vigorous expansions of many Asian economies have key implications for NR supply. Rises in wages and prices of land have major significance for a labour- and land-intensive crop like natural rubber, and beyond a certain stage make its production uneconomic.

This paper examines NR supply and its relation to economic growth. What are the current levels and directions of NR supply, and what are the basic underlying factors involved? How do governments impact on NR production, and how in particular can they facilitate the economic adjustment of the dominant smallholding sector? What are the NR supply conditions and potentials of main producing countries, and what forecasts can be made for the next 25 years? How will such forecasts match expected demand, and how will prices react to such changes? These crucial questions are now addressed.

## Supply Levels and Directions

It is pertinent first to review current country supply situations, for these establish the scenario from which predictions can be made. The situations are outlined in Table 1.

Thailand is seen as number 1 producer in 1995, having come up rapidly to this position and built on its major progress in planting improved rubber. That progress is reflect in its high average annual yield of 847kgs per mature hectare in 1990. Indonesia appears as number 2, albeit with the largest extent of planted NR and having advanced through extending mainly unselected seedlings with smaller average yields. Then Malaysia ranks as number 3 in 1995, having fallen quickly to this place, and indeed having dropped dramatically by over 500,000 tonnes per year since 1988. While these

[a] All values are converted to US dollars at concurrent exchange rates.

three main producers each contributed 25 per cent of global NR production in 1990, Malaysia had declined to 19 per cent, and Thailand had risen to 30 per cent, by 1995 (Table 1).

India as a considerable although much smaller producer had also rapidly expanded its output from a largely high-yielding area, whose average yield of 1,057kg per mature ha in 1990 was very high for such a wide extent of rubber. China too was advancing its crop quite speedily on the basis of a seemingly low average yield, while Sri Lanka, Nigeria and Viet Nam were reducing their production. The Philippines and Ivory Coast both had a small but steady production, with the latter again having apparently high yields per mature hectare. Cameroon and Kampuchea were once more extending relatively small outputs, and there was finally a substantial planted rubber distributed amongst smaller producers. These notably comprised Liberia, Brazil, and Guatamala, and had low average yields per planted hectare.

It should also be noted from Table 1 that smallholdings occupy a high proportion of planted NR in most countries, averaging 83 per cent of the total estimated global area of over 9 million hectares in 1990 (Table 1). The exceptions with a majority of estates are Sri Lanka, the Ivory Coast, and Cameroon, while China and especially Viet Nam also have most NR area in state farms. The scope of estates has been progressively falling, however, seeming likely to continue doing so under economic pressures outlined below.

**Basic Factors Influencing Supply**

Climate is all-important, especially in relation to plans for planting natural rubber in new sites where such aspects as overlong dry seasons or otherwise unsuitable weather conditions reduce yields and put up costs of production. NR can manage a wide range of soils so long as they are well drained, but really needs temperatures of 24-28°C and a well distributed high rainfall of 1800-2000 mm. Like other basic factors about to be detailed, climate is often inadequately considered, sometimes for political reasons but also because assessments are frequently made from a narrow and over-optimistic technical perspective.

Political stability is likewise vital, and needs little amplification. This is a function of good government, whose other desirable policies are explored below. The adverse effects without such stability have been demonstrated in many situations, including for example Indonesia before its New Order government from the late 1960s or Liberia at the present time.

The economic level of a society is a basic factor particularly highlighted in this paper, being usefully characterised through distinguishing the extremes of 'backward' and 'advanced' economies. Each extreme actually covers a complex set of circumstances, with positive and negative influences so far as NR supply is concerned. Yet what fundamentally happens in moving from one position to the other is transition from a poor mainly rural society characterised by badly functioning markets and inferior infrastructures to more prosperous conditions with integrated markets, better services and growing urban centres and industries. This transition raises costs of labour and land, both of which are bad for NR production. The range of economic opportunities other than rubber increases, often embracing employment possibilities in industrial locations far from rural districts. The national currency exchange rate against other denominations frequently appreciates, putting export items like rubber at a disadvantage. But countering these disadvantages markets became more competitive with economic advance, having lower capital and transportation costs and providing better information for rural dwellers; these changes are all good for NR. There is too the emergence of demand for rubber wood, which adds greatly to the value of felled old rubber trees.

Some major implications of such economic transition for NR are illustrated in Table 2, which budgets costs of high-yielding production per kg under altering labour, land and transportation charges accompanying the changes outlined. Although the exercise is hypothetical, the costs are judged realistic and taken from studies of national production sectors. Thus the wage of $2 per day and land price of $250/ha in the 'backward' position characterise countries like Indonesia and the Philippines, while the wage of $10 and land price of $12,000 in the 'advanced' position is the level almost reached by Malaysia. Table 2 also presumes improvements in labour use efficiency and lowerings of transport and forwarding changes with moves to an advanced economy, but does not surmise either changed real interest rates or substitutions of material for labour inputs. This is despite the fact that interest rates may well fall and material inputs be substituted, accordingly reducing total costs. Available evidence does not clearly indicate that this occurs, however.

Table 2 shows that assuming a common border price range of 75-150cts per kg, which was that obtaining in 1990-1995, only the 'backward' position consistently earns profits over grand total estimated costs. The 'medium' position only earns profit at the highest price level, while the 'advanced' position always incurs a loss. Circumstances look better when only direct production costs are considered, which would be the outlook in the short-term; even the 'advanced' position

then earns some profit at this highest price . These comparisons serve to exhibit huge disincentives to NR production imposed by labour and land price rises.

The institutional structure of NR production is another very basic factor, and essentially involves whether supply is generated through smallholdings or estates. It especially concerns producers' abilities to move to higher production planes grounded on improved planting materials and associated cultural practices. While NR smallholdings have demonstrated responses to greater (or lesser) prices through short run tapping adjustments (Jumpasut, 1987), they have rarely been able to undertake longer run replanting with better trees without special government help. These circumstances contrast dramatically with those of most NR estates, which with much superior capital and technical resources took quick advantage of high-yielding trees when they became available, making appropriate economic adjustments without official interventions. This smallholder sluggishness with high-yielding rubber varieties is a very different aspect to the original rapid adoption by the subsector of unselected seedlings (Bauer, 1948). That move early this century essentially required few external inputs and little skill, being easily open to millions of small farmers who took up NR cultivation so enthusiastically.

Government support much affects NR supply like other productive activities, and this has been notable in smallholder replanting. Hence the generally well organised government provisions of credit and advice for establishing improved rubbers in Thailand, Malaysia, India, and Sri Lanka enabled smallholders to successfully undertake investments not possible under purely private conditions without official intervention. They underpinned the relatively higher yields (and returns) per mature hectare recorded for those countries in Table 1. They compared strikingly with other situations - notably those in Indonesia and Nigeria - where such comprehensive programs were not followed and most NR areas still remain under low-yielding unselected seedlings. The one exception to this distinction is the Philippines, where smallholders appear to have adopted high yielding materials with limited technical help from official sources.

The big state farms in China and Vietnam have as parts of government had much support in moving to high production levels, while public estates in Indonesia, Sri Lanka, the Ivory Coast, and Cameroon have also been assisted in this way. Yet full government control is not really the best means of arranging production, and recent privatisations of government estates in Sri Lanka, and the Ivory Coast appear to have stimulated productivity through raising organisational efficiencies.

Further government policies of offering domestic NR producers with big internal rubber markets much higher prices through tariffs and quotas on NR imports have characterised both India and China for many years. These too have been vital in encouraging the big supply increments observed in Table 1.

Lastly among basic factors, NR market price levels have crucially determined the profitability of NR supply, accordingly influencing both short-run production behaviour and long-run investments in the crop. Manifestly the NR price of the early 1990s was very low, as shown by the index numbers of Figure 1; excepting the early 1930s, this period was amongst the lowest points ever reached by real NR (and most other commodity) prices adjusted for inflation (Barlow, Jayasuriya and Tan, 1994). As noted, the NR border price of 75cts per kg in 1990 and 1991 renders only the 'backward' position of Table 2 profitable. It is also noteworthy to see from Figure 1 that NR prices, and even more so those of SR, have quite closely tracked the index level of 33 non-fuel commodities; these unlike NR have shown little upturn since 1990, and are not forecast to do so at predicted global economic condition in the next decade (World Bank, 1996). The importance of the price factor has been further explored by Ng (1996).

**NR Supply Conditions and Potentials**

It is opportune in checking supply conditions of main NR producers to review key economic indicators, and some of the limited data uniformly available for all countries are presented in Table 3. Predictions of future NR supplies in light of these indicators and of current and expected country conditions are presented under two headings in Table 4. The 'Barlow' forecasts are grounded on the foregoing discussion as well as circumstances elaborated below, while the careful estimates of 'Burger and Smit' (1994) were made from a 1993 vantage point.

Turning first to Thailand, its recent high GDP growth rate of almost 9 per cent per year, 1993 GNP per head of $2.110 and low share of 12 per cent of GDP for agriculture (Table 3) indicate a country well on the way to an advanced economy. This is reflected in the relatively high and increasing estimated daily agricultural wage of $5.50, as well as in land prices already exceeding $8,000 per hectare in the south where most rubber is grown (Krisanasap, 1994). These costs reflect growing economic opportunities, and are too high to attract long-run NR investment where capital goes to other less labour-intensive and more profitable crops. Thailand's exchange rate has also appreciated against the US dollar, signifying a further disadvantage.

While NR supply can be expected to increase over the next few years on the basis of previous extensive replantings, this is not judged likely to continue with output beginning to fall by 2010 (Table 4). Plans for more NR development in the north-east do not seem to have worked out, largely because of a less favourable climate for NR accompanied by the possibility of other more profitable ventures.

Indonesia has had moderately rapid growth, but its much lower GNP per head of $740 is reflected in a far smaller wage of $1.70 per day which is only rising slowly in real terms. It is also associated with minor albeit gradually ascending land prices of $200-300 per hectare for rubber land away from main centres. There has further been some depreciation in the exchange rate (Table 3). The Thai scenario is yet to eventuate in much of outer-island Indonesia where NR is chiefly grown, although it is doing so to a limited extent around urban centres in Java and elsewhere. Perhaps a gap of 10-20 years can be anticipated before economic growth affects become really widespread.

Yet although Indonesia has apparent comparative advantage in NR production, seeming well placed to exploit this through productivity improvements, that outcome does not look probable. This is because the government credit and technical assistance necessary to increase smallholders' output has proved troublesome to implement through the present bureaucratic structure and culture, and because that structure seems unlikely to change. Hence export tax or 'cess' schemes on the lines of those in Malaysia and Thailand have proved impossible to operate successfully, while agricultural administrations have not been suitably oriented for implementing individual replanting schemes like those pursued elsewhere. The few Indonesian estates cultivating rubber have been moving to less labour-intensive oil palm, and this trend seems set to continue. It thus seems that NR supply from Indonesia will merely continue to rise slowly on the back of planted area extensions under low-yielding rubber (Table 4), and that there will not be major spurts seen in other cases.

In Malaysia with its large 1993 GNP/head of $3,140 and continuing high growth rate, labour and land costs are already far above those of other NR countries, while even current production is only being maintained by huge numbers of immigrant labourers from Indonesia and elsewhere, often working at substantially lower wages than the $8.50 per day in Table 4. There is certainly no incentive to plant new rubber, and NR production is very much a 'sunset' industry. A steady decline in national NR output can accordingly be expected, depending to some extent on NR price levels. It further seems true in the Malaysian case, as Ng (1996) has observed, that the disincentives from

renewed low NR prices like those in 1990 and 1991 could be such that curtailed production would subsequently not recover even at very high price levels.

India is once more a different case with a small GNP/head of $300, relatively low growth rate, and minor agricultural wage (Table 3) which shows little sign of increasing in real value. It also has a massive internal rubber goods market which has always taken all its output. But remaining land climatically suitable for new NR cultivation is restricted in India, while potentials for large supply advances through raising yields above existing high levels (Table 1) seem limited. It is pertinent too that NR in India has long been highly protected by tariffs and quotas, giving producer prices much above international levels and favouring rubber over many other domestic crops. Such protection will undoubtedly have to be removed as the provisions of GATT - of which India is a member - come into force. Some rise in output can be anticipated given persisting low wages, further technical improvements and large expansions in domestic manufacturing demand for local NR which incurs much lower forwarding costs Yet it is not thought likely to be large under the conditions explained (Table 4).

China parallels India in being a vast protected market consuming all its NR crop and giving prices somewhat above world market levels to producers. It too has climatic constraints, with the main production area of Hainan island and adjacent mainland part of Guangdong being subject to severe winds, long dry seasons, and 'cold waves' (Huang and Pan, 1992). The other big production area of southern Yunnan is hilly, with a similar extended dry period and with low night-time temperatures (Chapman, 1991). While such constraints have been cleverly faced by agronomists generating new clones and cultural techniques, yields are still lowered and costs raised by such problems. China further has a higher GNP/head than India (Table 3) and a rapidly expanding economy partly centred in Guangdong not far from many NR plantations. Some continued supply increases are nonetheless anticipated (Table 4), especially flowing from further burgeoning of rubber smallholdings in Yunnan; the latter has occurred since the production responsibility system was introduced in the late 1970s, being much encouraged by an accompanying security of tenure.

Supply conditions in smaller producing countries cannot be treated in such detail. Suffice it to remark that Sri Lanka with its GNP per head of $600 and medium growth of 5.5% (Table 3) still has a low wage of $1.50 and well developed extension services. The recent privatisation of public estates dominating the rubber area should also provide useful fillip to productivity increases, and possible reforms of tax systems adverse to NR would do likewise. This new scenario is expected to

reverse the industry's decline since the 1970s, leading to modest supply advances (Table 4). Again, Nigeria with its huge stocks of old smallholding rubber, difficulties in replanting with improved materials and competition from profitable food crops is only thought likely to expand slowly. That is despite a low wage and substantial exchange rate depreciation in recent years.

In contrast, Viet Nam with its exceedingly low GNP per head of $170, small wage, dominant estate (state and provincial farm) sector, absence of other suitable large scale cash crops in rubber areas , strong government support and recent encouragement to smallholdings can be expected to greatly raise its NR supply. Given probable area and productivity increases, that supply could well be tripled to 270,000 tonnes in 2010 (Table 4). But The Philippines with its excellent rubber growing climate and ample land has until recently at least been limited by political problems, especially in the key locations of Zamboanga and Basilan on Mindanao island. Its future supply increments are still judged likely to be restrained.

The Ivory Coast with its well managed and largely privatised estates and recently expanding area of smallholdings assisted through nucleus estate arrangements seems set to continue steady expansion against the background of a mainly stagnant economy (Table 3). Cameroon with its almost exclusively estate structure appears wont to benefit from forthcoming privatisation, but attempts to stimulate smallholder production have been unsuccessful owning to other alternatives and a simple emphasis to Nigeria on food crop production. Some advance in supply is nevertheless predicted (Table 4). Finally, a large collection of 'other' smaller producers including Kampuchea, Brazil, Guatemala, and Myanmar promise to augment their role to a degree. But many of these other countries face constraints, as with gross political uncertainty in Kampuchea and disease and high labour costs in Brazil whose GNP per head in 1993 was over $3,000. Only limited total increases are accordingly forecast from this last group of suppliers.

These separate Barlow predictions sum to global supplies of 6,322 tonnes in 2000 and 6, 351 tonnes in 2010 (Table 4). They differ from Burger and Smit's estimates in certain cases, notably with Malaysia, India and Vietnam where rather more pessimistic assumptions are made. The Barlow estimate is higher with the Ivory Coast, Cameroon and other countries, however. Barlow's essentially static global output forecast for the years from 2000 compares with Burger and Smit's slow rise to 7,100 tonnes in 2010.

**Price and Substitution Effects**

It focusses discussion to put these NR forecasts in a framework of actual previous and expected future NR and SR supply and consumption, and this is done in Table 5. It seems reasonable as one scenario (labelled (1) in the Table) to set future world rubber consumption rises (SR and NR) at an annual compound rate of 1.5 per cent from the present until 2010. That is faster than increases from 1990-95, but below those from 1980-90. It also matches the small quickening of global economic growth anticipated in years ahead. Taking this rate gives predicted world consumptions of 16,392 tonnes in 2000, and 19,031 tonnes in 2010; it also implies SR supply levels in those years, assuming this elastomer fills the gap, of 10,070 and 12,680 tonnes respectively (Table 5). The share of NR in total rubber consumption remains at its present high of 39 per cent until 2000, but then falls to 33 per cent by 2010. Alternatively, and given a larger assumed world rubber consumption growth of 3.0 per cent per year (labelled (2) in Table 5), the share of NR in 2000 and 2010 becomes 36 and 27 per cent respectively.

Both these relative falls in NR consumption will indicate NR scarcity, and may thus be expected to continue giving NR price premia over SR (Figure 1). But it is not judged that these premia would much exceed those existing today. That is because despite the effects of radials and other factors in raising the NR share in recent years, there seems room for downward adjustment with reverse substitution by SR. Such an outcome would be especially feasible if, as is actually anticipated, NR declines occurred over a long period enabling progressive alterations in SR production capacity and rubber goods manufacturing. After all, even under scenario (2) of quicker future global rubber consumption growth, the share of NR only falls to 27 per cent by 2010; this compares with the previous quite low NR proportion in total rubber consumption of 30 per cent in 1980 (Table 5). It is also against a background where there is a wide apparent scope for NR:SR substitution. That is illustrated in Table 6, which denotes a range of 7-80 per cent in the share of NR in total rubber consumption of major consuming countries.

**Conclusion**

The future pattern of NR supply is still very much a matter for conjecture. But it is true as well that certain definite trends have emerged in the last two decades, assisting those who wish to look ahead.

The widespread effects of economic growth, difficulties of smallholder improvement, and climatic constraints on new NR plantings all combine to indicate that little further NR supply can be anticipated over the next 25 years. It seems probable in fact that supply will eventually begin to decline. Yet the slowness of this change gives room for progressive adjustments by SR producers and rubber goods manufacturers, under circumstances where NR price premia may be maintained but do not seem likely to grow much larger. Actual levels of NR and SR prices will continue to primarily depend on world economic growth.

Although questions of future NR supply are conjectural, they have vital implications for producers and consumers. They accordingly deserve careful continuing study by policy makers in all countries involved.

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**Table 1. Areas, Production, and Yields of NR**

| | Thailand | Indonesia | Malaysia | India | China | Sri Lanka | Nigeria |
|---|---|---|---|---|---|---|---|
| Area, 1990 ('000 ha) | 1,844 | 3,155 | 1,837 | 451 | 603 | 199 | 247[a] |
| Production ('000t) | (95)[b] | (83) | (81) | (83) | (na)[c] | (33) | (81) |
| - 1990 | 1,271 | 1,262 | 1,291 | 324 | 264 | 113 | 152 |
| | (25)[d] | (25) | (25) | (6) | (5) | (2) | (3) |
| - 1995 | 1,784 | 1,457 | 1,089 | 500 | 360 | 106 | 93 |
| | (30)[d] | (25) | (19) | (8) | (6) | (2) | (2) |
| Yield, 1990 | | | | | | | |
| - (kg/mature ha) | 847 | 677 | 800 | 1,057 | na | 772 | na |
| - (kg/planted ha) | 689 | 400 | 599 | 718 | 438 | 568 | 615 |

| | Viet Nam | Philippines | Ivory Coast | Cameroon | Kampuchea | Others[e] | World |
|---|---|---|---|---|---|---|---|
| Area, 1990 ('000 ha) | 250 | 88 | 68[a] | 41[f] | 19[f] | 283 | 9,085[g] |
| | (na)[b] | (75)[h] | (29) | (5) | (na) | (na) | (83) |
| Production ('000t) | | | | | | | |
| - 1990 | 103 | 61 | 69 | 38 | 35 | 136 | 5,120 |
| | (2)[d] | (1) | (1) | (1) | (1) | (3) | (100) |
| - 1995 | 95 | 60 | 77 | 52 | 44 | 153 | 5,870 |
| | (2)[d] | (1) | (1) | (1) | (1) | (2) | (100) |
| Yield, 1990 | | | | | | | |
| - (kg/mature ha) | na | 841 | 1,712 | na | na | na | na |
| - (kg/planted ha) | 352 | 693 | 1,015 | 927 | 1,842 | 481 | 564 |

*Sources*: International Rubber Study Group, 1980-96; (Philippine smallholding area and mature area yield) Philippines. Department of Science and Technology (1993).

*Notes*:
a. Area in 1994.
b. Figures in parentheses along this line are per cents of smallholdings in total planted area of early 1990s.
c. Probably about 30 per cent, with the balance being under state farms.
d. Figures in parentheses along this line are shares of the particular country's NR production in total world production.
e. Especially Liberia, Brazil, and Guatemala.
f. Area in 1984.
g. Estimated by author using the best available information.
h. Per cent of holdings less than 5 ha.

**Table 2. Estimated Returns and Costs from NR Production in Advancing Economies**

| | Costs of (1) Labour ($/day) and (2) Land ($/ha) | | |
|---|---|---|---|
| (1) | 2 | 6 | 10 |
| (2) | 250 | 6,000 | 12,000 |
| | (Backward) | (Medium) | (Advanced) |
| Returns | | | |
| - Yield (kg/ha) | | 900 | |
| - Border price (cts/kg, fob)[a] | | 75-150 | |
| Costs (cts/kg) | | | |
| - Field Production[b] | | | |
| Management and labour[c] | 27.2 | 49.0 | 68.1 |
| Materials[d] | 8.5 | 8.5 | 8.5 |
| Transport[e] | 3.0 | 2.5 | 1.0 |
| | 38.7 | 60.0 | 77.6 |
| - Processing[f] | | | |
| Management and labour[g] | 2.2 | 6.5 | 10.9 |
| Materials[h] | 4.9 | 4.9 | 4.9 |
| | 7.1 | 11.4 | 15.8 |
| - Forwarding | | | |
| Domestic[i] | 4.5 | 3.0 | 1.5 |
| External[j] | 12.0 | 11.0 | 11.0 |
| | 16.5 | 14.0 | 12.5 |
| Total Direct | 62.3 | 85.4 | 105.9 |
| - Capital[k] | | | |
| Planting | 4.4 | 8.9 | 13.3 |
| Processing | 1.2 | 1.2 | 1.2 |
| | 5.6 | 10.1 | 14.5 |
| Land[l] | 1.4 | 33.3 | 66.7 |
| Grand Total | 69.3 | 128.8 | 187.1 |

*Notes:*

a. For TSR 20 as the major international grade.
b. Including first level processing to sheet or slab.
c. Assuming task sizes of 300 trees per tapper (backward), 500 trees (medium) and 600 tree (advanced), with common densities of 350 tapped trees per ha and common tapping days of 10 per year.
d. Including costs of equipment.
e. To point of intermediate processing. This cost is usually incurred by traders.
f. Into intermediate product.
g. Assuming 9.8 days of processing labour per 900 kg in all cases.
h. Assuming the same materials charges in all cases.
i. Assuming progressive falls in domestic forwarding costs with better roads.
j. From national boundaries to rubber goods factories. Assuming a slightly higher extern forwarding cost in the backward case owing to poor port facilities.
k. Principal and 5 per cent real interest charges over 20 years on gross investments in bringin plantings to maturity of $500/ha (at backward $2/day labour cost), $1,000/ha (at mediu $6/day labour cost) and $1,500/ha (at advanced $10/day labour cost).
l. 5 per cent real interest charges on land costs shown.

**Table 3. Economic Indicators of Main NR Producing Countries[a]**

| | Thailand | Indonesia | Malaysia | India | China | Sri Lanka |
|---|---|---|---|---|---|---|
| GNP/head, 1993 ($) | 2,110 | 740 | 3,140 | 300 | 490 | 600 |
| Annual GDP Growth 1990-93 (%) | 8.8 | 6.6 | 8.7 | 3.3 | 10.2 | 5.5 |
| Exchange Rate Change[b], 1980-95 | +1.1 | -1.9 | +1.1 | -2.6 | -2.7 | -1.8 |
| Agriculture as a % of GDP. 1992 | 12 | 19 | 10[c] | 32 | 27 | 26 |
| Daily Agricultural Wage ($)[c] | 5.50 | 1.70 | 8.50 | 1.70 | 2.30 | 1.50 |

| | Nigeria | Viet Nam | Philippines | Ivory Coast | Cameroon | World |
|---|---|---|---|---|---|---|
| GNP/head, 1993 ($) | 300 | 170 | 850 | 630 | 820 | 4,420 |
| Annual GDP Growth 1990-93 (%) | 4.5 | 5.1 | 1.2 | -1.0 | -5.9 | 1.5 |
| Exchange Rate Change[b], 1980-95 | -24.8 | -1,282.1 | -1.5 | +1.6 | +1.8 | - |
| Agriculture as a % of GDP. 1992 | 37 | 29 | 22 | 37 | 22 | na |
| Daily Agricultural Wage ($)[c] | low[d] | low[d] | 2.30 | 2.80 | 2.00 | na |

*Sources*: World Bank (1994 and 1995).

*Notes*:
a. Excluding Kampuchea, for which no data is available.
b. Domestic rate against US $. 1993 rate divided by 1985 rate, where all rates are officially quoted. A positive figure denotes appreciation, and a negative figure depreciation
c. Estimated by the author on the basis of best available information. This is the 1996 wage.
d. Around $1.00 per day.

**Table 4. Predictions of NR Supply ('000t)**

| | Actual | Predictions Barlow (Burger and Smit) | |
|---|---|---|---|
| | 1995 | 2000[a] | 2010[b] |
| Thailand | 1,784 | 1,887<br>(1,887) | 1,600<br>(1,600) |
| Indonesia | 1,457 | 1,633<br>(1.633) | 1,850<br>(1,850) |
| Malaysia | 1,089 | 950<br>(1,108) | 600<br>(1,150) |
| India | 500 | 550<br>(656) | 600<br>(877) |
| China | 360 | 423<br>(423) | 500<br>(500) |
| Sri Lanka | 106 | 110<br>(139) | 120<br>(116) |
| Nigeria | 93 | 100<br>(63) | 120<br>115) |
| Viet Nam | 95 | 150<br>(219) | 270<br>(403) |
| Philippines | 60 | 70<br>(55) | 121<br>(121) |
| Ivory Coast | 77 | 89<br>(89) | 130<br>(110) |
| Cameroon | 52 | 60<br>(60) | 90<br>(60) |
| Others | 197 | 300<br>(207) | 350<br>(198)[c] |
| World | 5,870 | 6,322<br>(6,539) | 6,351<br>(7,100) |

*Source:* (Burger and Smit predictions): Burger and Smit (1994).

*Notes:*
a. Burger and Smit's predictions taken from Table 13.1 of Burger and Smit (1994).
b. Burger and Smit's predictions taken from relevant sections of Burger and Smit (1994). Some figures are not exactly quoted, and are estimated from presented graphs.
c. Difference between Burger and Smit's world and individual country forecasts. The figure for 'others' is not given in the original work.

**Table 5. Past Consumption and Future Supply/Consumption of NR and SR ('000t)**

| | NR | | | SR | | Total | |
|---|---|---|---|---|---|---|---|
| Past Consumption | | | | | | | |
| 1960 | 2,080 | | [47][a] | 2,340 | | 4,420 | |
| 1970 | 3,090 | (4.1)[b] | [36] | 5,610 | (9.1) | 8,700 | (7.0) |
| 1980 | 3,780 | (2.1) | [30] | 8,760 | (4.6) | 12,540 | (3.7) |
| 1990 | 5.280 | (3.4) | [35] | 9,830 | (1.2) | 15,100 | (1.9) |
| 1995 | 5,960 | (2.4) | [39] | 9,240 | (-0.9) | 15,220 | (0.8) |
| Future Supply[c] /Consumption | | | | | | | |
| 2000 (1) | 6,322 | (1.2) | [39] | 10,070 | (1.7) | 16,392 | (1.5) |
| (2) | 6,322 | (1.2) | [36] | 11,318 | (4.2) | 17.640 | (3.0) |
| 2010 (1) | 6,351 | (-) | [33] | 12,680 | (2.3) | 19,031 | (1.5) |
| (2) | 6,351 | (-) | [27] | 17,357 | (4.5) | 23,708 | (3.0) |

*Sources:* (Consumption data): International Rubber Study Group (1980-96); (Future NR supply): Table 4.

*Notes:*

a. Figures in brackets in this column are per cents of NR in total NR and SR consumption/supply.

b. Figures in parentheses in all columns are annual compound growth rates of consumption/supply over the previous 10(5) years.

c. Supply of NR as forecast in Table 4, and supply of SR calculated as the difference between total forecast NR and SR consumption and forecast NR supply. Item (1) is for an assumed total NR and SR annual consumption growth rate of 1.5 per cent, and Item (2) for a total NR and SR annual consumption growth rate of 3.0 per cent.

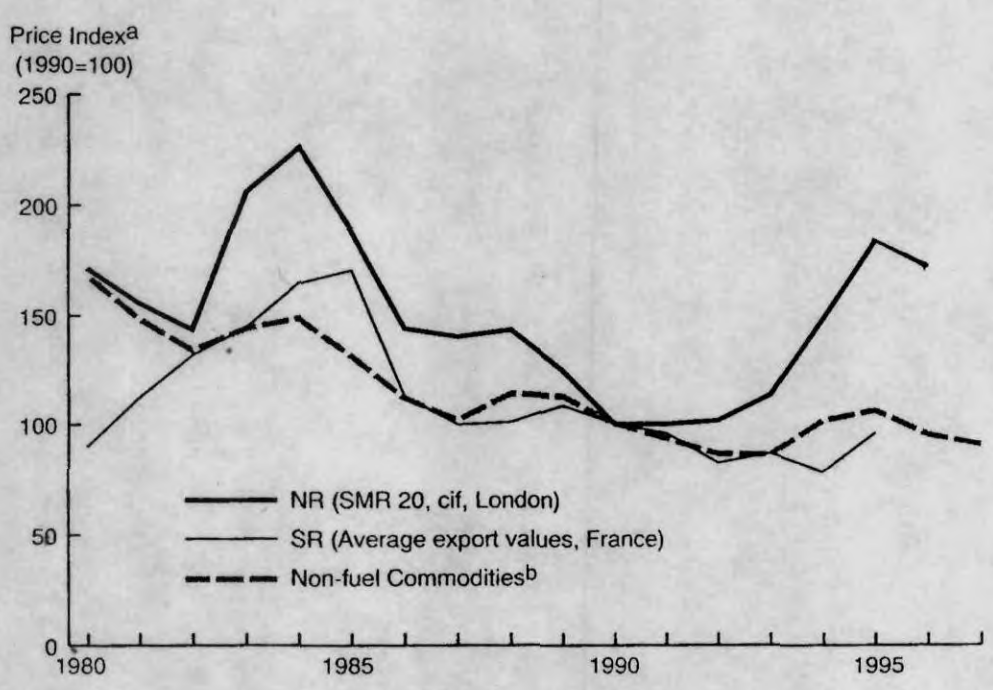
**Table 6. Shares of NR in Total Rubber Consumption[a] of Major Consuming Countries, 1994**

| | USA | Russia[b] | Japan | China |
|---|---|---|---|---|
| Total Consumption ('000t) | 3,119 | 2,228 | 1,666 | 1,425 |
| Share of NR (%) | 32 | 7 | 38 | 51 |
| | Germany | Korea | India | World |
| Total Consumption ('000t) | 713 | 610 | 589 | 14,450 |
| Share of NR (%) | 25 | 48 | 80 | 39 |

*Source:* International Rubber Study Group (1980-96).

*Notes:*
a. NR and SR.
b. Figure for Russia refers to 1990, and to the former USSR. This was prior to the economic collapse, which saw consumption of all rubbers fall to 380,000t in 1994.

**Figure 1. Index Numbers of NR, SR and Non-fuel Commodities Prices, 1980-96**




*Sources*: International Rubber Study Group (1980-96); World Bank (1996).

*Notes*: a All prices adjusted for inflation using the Manufacturing Unit Value Index (1990=100)(World Bank, 1996).
b Figures for 1997 are forecasts.