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Wood Supply and Demand - The Medium Term Prospects for Britain [and Discussion]

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Wood supply and demand – the medium term prospects for Britain

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This paper presents a general review of probable changing trends in demand for wood, with special reference to the interchangability of wood fibre products and sheet materials in competition with solid sawn-goods.

The possible changes upon market demands in view of the high energy content of competitive materials and, in particular, the attractive low energy factors in the production of sawn-goods now that the cheap energy era is phasing out are considered, together with the increased removal potential from European forest resources now that under modern silviculture there is an expanding annual increment.

A brief study of the probable trend of consumption of industrial wood in Europe in the short term future and the expected pattern of sources of supply for the importing countries is made, and the possible pressures of environmental factors upon the harvesting of the forests resources discussed.

Heedless of the needs of tomorrow, man has been consuming the raw materials of the universe – be it the oil or mineral deposits, or just sand and gravel. Like a beacon of light, the general resources of our forests are the one great exception. True, some species of selective hardwoods have become scarce with overcutting, relative to the decades required to reach maturity. Overall, with modern silviculture, fertilization, exploitation of hitherto inaccessible forest areas, transplantation, especially of softwood species in the vast man-made forests now developing in the subtropical lands, the harvest from our forests is matching the ever expanding wood fibre demands. Indeed I predict, that during this century – and that is relatively a medium term in forestry – we shall be seeking new outlets for wood fibre, as our steadily improving growth potential eventually outstrips the expanding world requirement for forest products in today's accepted traditional fields of usage.

The price patterns of many raw materials may well be significantly affected by the sudden world wide awakening, to both the energy crisis and environmental considerations. A decade ago, environmental issues were hardly related to forestry, but from now on they will play a more forceful role in determining forest policies and management practices. In the future, multiple use aspects of forests, in meeting demands other than provision of raw material, will be an established requirement. Recreation, tourism and even landscaping must be incorporated in our planning. Fortunately, a forest well managed according to sound silviculture principles, will embrace the ideal environmental values, even though the consideration of the one be economic and the other aesthetic.

Forestry today has the advantage over all other raw material sources, it can totally meet the new environmental and conservationist demands of society. Of the world raw materials timber alone can claim to be least affected by the era now phasing out, when we were accustomed to cheap energy which favoured products with a high energy content. Wood fibre is a constantly and abundantly available low energy content product, ready to serve the changing world requirements, be it in the field of construction, social reading or educational instruction, packaging, furniture, fuel-wood: name the end product, the forest can provide the material.

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Let us therefore pause and examine what is the trend of these currently known usages, before turning to the potential pattern of supplies.

First, I shall illustrate the changes in European consumption of industrial wood during the past two decades and estimate the trends to the end of this century (table 1). While this does not depict world developments, the trends are almost universal.

TABLE 1. ESTIMATED CONSUMPTION OF INDUSTRIAL WOOD, BY END USE, IN EUROPE 1950–1970 AND PROJECTIONS FOR 1975, 1980 AND 2000 (10^6 m^3)

	1950		1960		1970		1975		1980		2000	
end use sector	WRME*	(%)	WRME	(%)	WRME	(%)	WRME	(%)	WRME	(%)	WRME	(%)
construction	49	29	70	29	98	29	111	28	130	28	191	28
packaging	26	15	45	18	86	25	103	27	121	26	185	27
furniture	11	6	20	8	29	9	34	8	43	9	64	9
mining	19	11	20	8	14	4	15	4	13	3	14	4
sleepers	6	3	5	2	4	1	4	1	3	1	3	—
printing and writing	12	7	23	9	44	13	53	13	69	15	109	16
textiles and other dissolving pulp	4	2	7	3	10	3	11	3	11	3	14	2
other	47	27	56	23	56	16	62	16	70	15	100	15
	174	100	246	100	339	100	393	100	460	100	680	100

* WRME = wood raw material equivalent.

TABLE 2. PRESENT AND ESTIMATED FUTURE REMOVALS OF INDUSTRIAL WOOD (10^6 m^3)

	actual 1970–1972				1985 (estimate)			
region and country	logs	pulp-wood	other	total	logs	pulp-wood	other	total
World	777	312	188	1278	983	667	210	1860
North America	284	144	14	442	300	290	15	605
Europe	147	96	29	272	170	180	20	370
Western	106	83	15	204	125	150	11	286
Eastern	41	13	14	68	45	30	9	84
USSR	165	34	96	295	180	85	100	365
Japan	28	15	2	45	33	35	2	70
Oceania and South Africa	18	7	1	26	30	19	1	50
Other Asia	84	4	34	122	150	30	50	230
Other Africa	16	1	12	29	40	3	17	60
Latin America	35	8	3	46	80	25	5	110

Wood removals and forest resources

In the above table the average annual wood removals of 1970–2, as well as those estimated for 1985, are compared with the growing stock and with the estimated growth of the forests. It should be pointed out that for the developing regions estimates of growth are almost meaningless because of the fact that most wood volume is in the form of unmanaged mixed tropical forests where growth tends to be offset by decay. Here, the ratio of removal to growing stock is a better indication of cutting intensity than is any comparison with estimated growth.

The construction proportion has been constant for half a century, but packaging has increased materially and the diminishing competitiveness of plastics could well exceed the estimated trend for this requirement. The increase in timber for furniture could also be too conservative, as further recognition is accorded to the emphasis now being given by psychologists, sociologists and doctors, to the beneficial value of wood in our homes and working environments; quite apart from the growing desire of society to seek a higher standard of living.

Let us now consider the magnitude of the removal demands imposed upon the forest resources

at the beginning of this decade, and the expectation, if the present trends continue, even for so short a period as to the mid-eighties.

World forest removals, excluding fuel-wood, were annually averaging in 1970–72, 1278×10^6 m^3 and by 1985 the volume is expected to increase by 45 % to 1860×10^6 m^3.

This table indicates that log removals to produce sawn-wood, veneers, plywood, sleepers, etc., are likely to increase by 25 %, whereas pulpwood, about 15 % of which is also used for fibreboard and chipboard production, will probably increase by an average of 6 % annually or 112 % by 1985. This is approximately the same rate of expansion which ruled throughout the 1960s, reinforcing the known trend that sawn-wood is slowly, but steadily, consuming a smaller proportion of the total forest yield.

When considering this projected pattern of expansion, we must not lose sight of the incalculable effect of the unprecedented rise in the price of crude oil, the most important raw material, next to food, in all industrialized countries. This change could well have critical impact upon the overall world level of economic activity. It is clear that many materials which compete with forest products, will have their price structure adversely affected, because of the comparatively low energy factor in the production of sawnwood. Plastics, cement, steel and aluminium are four obvious examples. It may well be that, notwithstanding the recent upsurge in wood fibre costs, markets lost to substitutes will be regained. Sawn-wood could also recover some of the outlets taken over by plywood and especially particleboard, since the major increase in the cost of synthetic binders will make sawn-wood relatively more competitive.

Fuel-wood has been excluded from this table but cannot be ignored. While in Europe and North America there has been a steady pattern of declining fuel-wood consumption, and a transfer of such raw material to pulpwood, in the developing nations fuel-wood requirements have continued to expand. Approximately half of the world's wood harvest is still used for fuel-wood. In the moist tropics it is nearly 80–90 %, where fortunately there is abundant availability. We could well find a trend to substitute fuel-wood for oil for some industrial uses in several emerging countries. Even in developed nations, the possibility of a maximum economic limit to imported oil supplies, and the major problem involved in re-establishing coal mines, could result in fuelwood being used, at least temporarily, for both heating and sundry industrial energy sources.

The solution of our supply problem is not to be found today in absorbing into wood fibre products, the wealth of fuel-wood which is available in our forests.

Nevertheless we must ensure that we increase recovery and utilization of residues, both when harvesting and in the primary industrial operations. The economics of recovery will certainly be eased by the new price structure of all wood fibre products. It is a disturbing thought that at present with branches, stumps, etc., we leave behind in the forests some 20 %, and even with certain species up to 40 %, of the total wood material, while as much as 60 % of residues from primary industrial processing is not recovered. The utilization of residues when harvesting and the rejuvenation of our forests are a prime necessity to protect their role within the living environment.

In the past two decades, modern techniques have completely reappraised the extent of the growing stocks in the world's forests, and established that our earlier calculations had greatly underestimated those forest resources. Albeit, some of the increase had resulted from more detailed statistical inventories, from improved management and silvicultural methods, fertilization and possibly climatic factors in Europe.

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As an example I will illustrate the steadily rising estimates made of Europe's growing stock in the past two decades – now nearly double those of twenty years ago (figure 1). Consequently, removals in the past decade have represented a declining share of both the estimated net growth and the growing stock.

It is also interesting to see the pattern of change in conversion of forest removals, comparing the average annual production in the three years 1959–61 with that of a decade later (table 3).

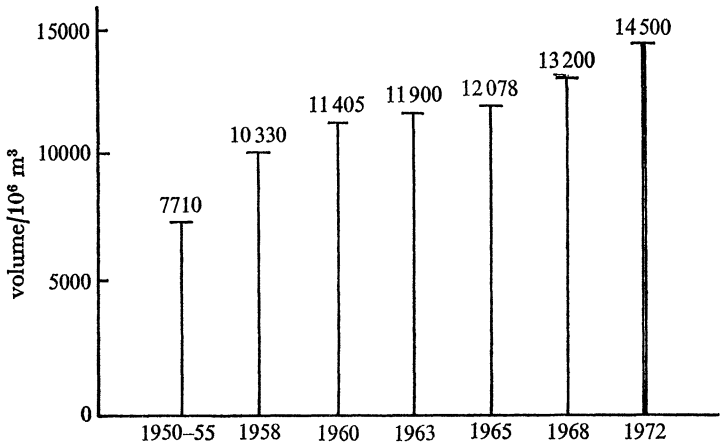

FIGURE 1. Progressive estimates of growing stock in European forests.

TABLE 3. WORLD GROWTH IN OUTPUT OF FOREST PRODUCTS 1969–71 COMPARED WITH 1959–61: INCREASE IN 10 YEARS

log removals...	18%	
main products from logs	26%	
of which increases:		
sawn-wood		21%
plywood		114%
veneers		117%
pulpwood removals	71%	
main products from pulpwood	88%	
of which increases:		
woodpulp		74%
fibreboard		81%
particleboard		602%
poles, pitprops, etc.	−2%	
total industrial removals	24%	
fuelwood	10%	
total removals	17%	

This table also illustrates, very clearly, the greater utilization of raw material, namely an increased production from logs of 8% and from pulpwood of 17% gross. However, much more progress must be achieved in this field.

Let me illustrate the forest potential in relation to the anticipated demands I gave you earlier (table 4). Taking the same projected expansion of removals by 1985, generally speaking there will still be no question of over cutting; even allowing for a very conservative estimate for the developing regions. Here, with the mixed tropical forests, much of the new growth is offset by decay, and cutting is limited by inaccessability, as well as the small proportion of species which have, as yet, been accepted by consumers in the importing countries. Only in Western Europe, Japan, Oceania and South Africa, do removals approach the growth volume.

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They do so as well in the U.S.S.R. west of the Urals, but the relatively low intensity of cutting in the vast reserves of even over mature trees in Siberia, and the North, affect the average.

TABLE 4. PRESENT AND PROSPECTIVE WOOD REMOVALS AND THEIR RELATIONSHIP TO FOREST RESOURCE (10^6 m^3)

region and country	removals (excluding fuel-wood) av. 1970–2	removals (excluding fuel-wood) 1985	estimated growth†	estimated growing stock†	removals as percent of growing stock‡ 1970–2	removals as percent of growing stock‡ 1985
World	1278	1860	(3200)	(306000)	0.5	0.7
North America	442	605	951§	36100	1.3	1.9
Europe	272	370	435	13300	2.2	3.1
Western	204	286	325	9000	2.5	3.5
Eastern	68	84	110	4300	1.8	2.2
USSR	295	365	844§	73200	0.5	0.6
Japan	45	70	77§	1900	2.6	4.1
Oceania and South Africa	26	50	45	1400	2.1	4.0
other Asia	122	230	(400)	(34000)	0.5	0.8
other Africa	29	60	(100)	(22000)	0.1	0.3
Latin America	46	110	(400)	(124000)	0.05	0.1

North America is in an intermediate position in respect to magnitude of removals in relation to growing stock. Here the considerable regional differences are important. The relative situations in coniferous and non-coniferous species are also quite diverse.

A closer look at regional species and log size aspects is necessary to appraise the position of all regions adequately. Lack of data and space preclude a detailed analysis. However, some important highlights are worthy of note.

† With bark. ‡ Growing stock is reduced by 10% as a bark allowance.
§ For Canada, U.S.S.R. and Japan growth is net growth, for other developed countries gross growth.

From European forests, excluding the U.S.S.R., it is anticipated that about 100×10^6 m^3 additional removals will be possible annually by 1985, compared with the 1970–2 average. These increases are largely concentrated upon Finland, Sweden, France, Spain and Turkey.

Finland has an extensive long term programme of land drainage and reafforestation of both woodland and arable land no longer used, which will ultimately increase the woodland area nearly 4.5×10^6 ha or 23%. These measures, together with extensive fertilization, should during this century lead to progressively increased fellings, resulting ultimately in a 20% greater harvest availability.

The situation in Sweden is even more interesting, as, with a quicker growth than in Finland, there is more scope for greater removals even without sophisticated silvicultural methods, such as fertilization. With a shorter rotation of cropping the Swedish forests could produce, should the demand arise, a once and for all additional volume of over 100×10^6 m^3, principally in saw logs. Such a step, which is economically attractive, would in no way be to the detriment of the long term removal volume. Apart from this special situation, it is believed that fellings could be increased by 10^6 m^3 annually until the end of this century, mostly from the southern half, resulting in a yearly volume by say A.D. 2000 of about 100×10^6 m^3 from Sweden alone.

However, the greatest physical base for expanding coniferous removals is undoubtedly the U.S.S.R., which has about 65% of the world coniferous wood volume and produces less than 30%. The total forest area of the U.S.S.R., over 650×10^6 ha, is about 14 times greater than the North European forests, yet less than half are developed. Russian fellings are only 61% of the coniferous and 20% of the non-coniferous growth, even after allowing for the negligible new growth in the vast tracts of virgin forests, much of which contain over mature stands.

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Expansion in European U.S.S.R. forest removals will be confined to the North, which is still heavily forested. Until road and rail links have been further developed, plans for considerably increased wood processing industries there, chiefly pulp and paper, will be delayed by inaccessibility.

The vast potential of the Siberian forests East of the Urals is probably the only unexploited major reserve of high quality coniferous timber in the world today, except for the Canadian interior. The possibilities of establishing forest and wood processing industries in these virgin forest areas is dependent upon development, not only of transport but the incentives such as housing and social conditions, to attract workers in such an inhospitable climate. Nevertheless major timber processing centres are being constructed, such as that at Bratsk, with a capital investment of some 900×10^6 roubles, designed to use annually $6–7 \times 10^6$ m^3. The intended capacity is over 500000 tonnes of sulphate pulp, 250000 tonnes kraftliner, 700000 m^3 sawn softwood, 200000 m^3 plywood and 3.5×10^6 m^2 of fibreboard. This huge complex is thought to be possibly too concentrated and that at Krasnoyarsk, in central Siberia, and future developments are likely to be somewhat smaller.

While much of Siberia's forests resources are inaccessible, such as the swamp land of western Siberia and the mountainous far eastern area, technological transport developments could change their commercial potential. Meanwhile they serve as a vast untapped reserve. Nevertheless, under their current five year planting programme, the U.S.S.R. are planning an additional reafforestation area equivalent to half the size of Great Britain.

Although the heavy cutting of Japanese forests has contained an increase in removals, intensive forest practices, in both new plantations and natural forests, will ensure in the coming decade substantially increased removals, expecially in pulpwood.

More immediate augumentation of world wood fibre supplies is coming from man made forests. Already there are over 80×10^6 ha of these, much of them in quick growing timber species. Here lies the power house of wood fibre supply in the tomorrow, ensuring that we can meet mankind's ever expanding demand for forest products. Securing these supplies is not achieved without heavy capital investment, but as one surveys the orderly row upon orderly row of trees, stretching to the horizon, like some gigantic bulb field at tulip time, it inspires confidence in the future of this proven potential. It is estimated that 16×10^6 ha of intensely cultivated fast growing eucalyptus or *Pinus eliotti* can produce enough wood fibre to satisfy the current annual world demand for pulp, yet the growth from the 240×10^6 ha of Canada's forests today would cover but half – a 30-fold greater yield per hectare. An extreme example but exhilaratingly illustrative of the potential of these forests.

Man made forests also have a secondary advantage over natural forests, in that they can be harvested with a greater degree of mechanization. The problems of finding forest workers is becoming more acute. In the olden days, a natural pool with out of season employment for agricultural workers was readily available. Now with the exodus from some rural areas, the labour force is diminishing. This can be offset by mechanical equipment to a considerable degree, but a prerequisite for maximum mechanization is even-aged stands, under a clear felling system, over flat land. Such an ideal is rarely available in natural forests but can be more easily achieved with new plantations.

The most rapidly developing man made forest scenes are in Brazil, 240000 ha were planted in 1972 and 300000 ha planned for last year, and in the future an annual increase reafforestation of 15%. The total area planted since the start of this programme is roughly 10^6 ha,

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half pine, half eucalyptus. Today from their 600000 ha of eucalyptus already established, there is an annual harvest of 10^7 m^3, with increases from new plantations running at a further million cubic metres annually. The current experiments in growing *Pinus eliotti*, which in ideal conditions can register an increment yield of 38 m^3/ha, is 20 times the normal pine crop from Scandinavia. Brazilian wood fibre exports of a major volume are now assured during this century.

Even the South African non-coniferous plantations, of some 320000 ha acres, yield around 5×10^6 m^3 annually and new areas are being planted with an estimated increased yield of about 250000 m^3 each year. Other significant broad-leaf plantations are in Portugal, providing annually 2×10^6 m^3 with a planned increase of about 240000 ha of eucalyptus, apart from 140000 ha of maritime pine each year. Morocco and Argentine can now produce from man made forests about 10^6 m^3 each annually. These are valuable supplementary supplies to the extensive coniferous plantations of New Zealand, South Africa, Chile and the successfully established new forests in Africa, Malawi, Madagascar, Zambia, Kenya, the Congo and Tanzania, apart from the new Asian developments in Malasia and Fiji.

In reserve, we have the vast volume of mixed tropical broad-leafed timber which, although largely inaccessable today, may well be developed in the future, as new methods of extraction are evolved and as the economic value of wood as a raw material rises.

The industrial wealth of much of this new potential, as well as the mature virgin wooded areas in the humid tropics, has been greatly enhanced by progress in the technology of utilization of non-coniferous short fibre species for pulp. To give a few examples, the U.S.A., who have always been in the forefront with hardwood or broad-leaf pulping, increased the percentage of short fibre pulp from 14 % in the 1950s to nearly 30 % today. In Japan the advance is even greater – they now use approximately 60 % hardwoods, an increase of 35 % in fifteen years. Even in Finland and Sweden, where the forests are predominantly coniferous, hardwood pulpwood removals have risen to 16 % compared with but 3 % twenty years ago.

The marketing of the harvests from the world forests is undergoing vast changes. The current high level of both wood fibre product prices and international interest rates makes large stock holding by either exporter or importer uneconomic. It is therefore reassuring that this should no longer be required, unless the flow of supplies is temporarily dislocated by exceptional climatic conditions or industrial action. The resources from the world's forests are now sufficient to meet the increasing demand by regular all the year round deliveries. This is primarily the result of the new sources of supply from the expanding acreage of man made forests, which yield such a rewardingly rich return and a rapid harvest, by the selected sowing of special species. We can surely still further increase our harvests by application of genetics to improve the form as well as the growth rate of the trees.

As the energy crisis may well modify the pattern of demand for wood goods, so too could production be influenced by energy factors, which place such a burden upon transportation of material, part of which eventually becomes waste. Forest products manufacturers and exporters are facing the same total reappraisal of approach to marketing, as are the importing countries. Less and less shall we see the raw materials imported by the technically mature nations, more and more we shall find technology being exported to the producing areas, particularly where wood fibre resources are available in energy rich countries, such as Venezuela, Nigeria and some of the humid tropics. Thus the imported material will be processed to a far greater degree than at present.

A secondary consideration, especially for pulp and paper production, is that Britain could

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certainly simultaneously either export pollution or import energy, according to one's approach to the current problems, by having a greater degree of process overseas.

Before concluding this paper I would like to touch upon the probability that during this century we shall find entirely new applications for the wood fibre resources of our forests.

Hitherto, the reconciliation of supply with demand has been based upon traditional end usage for our forest products – constructional timber, plywood, pulp and paper, cardboard, chipboard and hardboard – too little attention has been directed towards the chemical properties of wood fibre. With the prospects of new supplies from the man made forests, and from the tropical and even Siberian forest areas, as modern transport methods and mechanical harvesting equipment make it possible to harness the wealth of these resources, we shall have the opportunity, to consider more sophisticated applications of our raw material. Our field of study has barely touched the outer perimeter of this vast area for research. Technical progress may well evolve processing of wood fibre for new products which, heretofore, have represented uneconomic conversion. There is nothing more constant than change, and developments in the application of the chemical properties of wood fibre could influence the pattern of supply and demand during this century.

Theoretically, a forest under a tenth of Brazil's yearly replanting, in perpetual yield, could supply enough paraffin to cover present aviation needs of the United Kingdom. Taking the chemical rather than the physical properties of timber, a whole new generation of use can be postulated. Timber is such a versatile basic raw material, the present modest use for plastics and clothing could well be extended, certainly to fuel, medicines, food and alcohol, particularly if we can develop conversion methods which do not consume the present high energy element.

Who of us in the yesteryear saw the major substitution of paper by polythene for such big consumer requirements as packaging, wrappings or container bags? Who am I to forecast the demands of the nation from the world forest resources? It will, however, be interesting at the end of this century to look back and review what tomorrow's generation has achieved by exploiting the chemical properties of wood fibre.

The reserves of hydrocarbon fields are finite, whereas the utilization and availability of timber are infinite. We can therefore pursue with confidence a forceful policy of maximum reafforestation, confident that the harvests of wood fibre will find a consumer demand, and, at the same time, pride ourselves that we are contributing to the environmental benefits of this country. There is an urgent need to expand British afforestation, not only for the industrial profits from the products, but also for the social benefits of our forests, be it the stabilization of the Earth's surface, amelioration of climate, recreation, or the provision of an infinitely renewable industrial natural resource. No matter upon what ground one raises the issue, one can reasonably state that it seems hardly possible to plant too many trees.

Sufficient let it be to say, that the inventiveness of mankind will match supply with demand, both old and new, for the only major raw material which has an everlasting cropping, always replaceable and not an exhausting factor. Forests that can be managed by mankind to a surprising degree, that so generously provide raw material which is technically one of the most versatile in both utilization and application, while fulfilling a considerable number of environmental, biological and ecological functions, not the least of which are the pleasure pursuits of man.

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May I finally acknowledge the information and statistical data which I received from the E.C.E. Geneva and F.A.O. Rome, which proved of great assistance in the preparation of this paper.

Discussion

R. I. Thomas (*School of Biological Sciences, Brunel University*)

In predicting and planning exploitation of natural timber reserves have you ever paused to consider which areas should be preserved as relief stands of the World's great forests?

F. Palmer

No, but national organizations, including Forest Authorities, are safeguarding special stands and species.

R. I. Thomas

Surely it is important that companies, besides local governments and the United Nations, should feel responsible in such matters?

The Chairman, M. M. Mr Ord Johnstone, said he did not believe that companies should hold any such direct responsibility.

Professor S. D. Richardson (*Department of Forestry and Wood Science, U.C.N.W., Bangor, N. Wales*)

It has been implied that logging in tropical forests is responsible for very widespread regression. The effects of exploitation should be kept in perspective. At the last World Forestry Congress the U.N.D.P. Administrator, Paul-Marc Henry, pointed out that 20×10^6 ha of productive forest are *annually* being destroyed, mainly by shifting agriculture. This area represents seven times the area currently being worked for timber.

W. R. J. Sutton (*Department of Forestry, Oxford*)

My studies on the future world forestry position do not support the very optimistic view of future supplies as presented by Mr Palmer. When asked by Dr Gibson for the basis of my challenge, I replied that I had relied mainly on official long-term supply and demand projections for the U.S.A., Canada, U.S.S.R., Europe and other countries. By the year 2000 there would be few countries with surpluses. Even the U.S.S.R., from which so much is expected, may be deficient. The forests of European Russia have been heavily exploited and poorly managed – much of the best coniferous forests have converted on felling to birch and aspen. The forests of Siberia and the Far East are vast, but many of the best and most accessible areas have already been utilized. Much of what remains are Siberian larch forests on permafrost soils. Exploitation appears to be possible in some of these forests but extraction will be expensive, not only because of the problem of soil and climate but also because larch, being a dense wood, cannot be extracted by floating.

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