Chapter 10

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Potential Supply of Forest Products

THE TOPIC of this chapter, taken in its broadest sense, would represent a task of formidable proportions. Rather than discuss the potential supply of all forest goods and services, I propose to comment on the prospects for the recreational services of the forest rather briefly and on the potential supply of timber products at some length.

Such a restriction of the subject is not altogether without justification. Generally speaking, and looking at the country as a whole for the last few decades of the 1900's, timber production at levels approaching a social optimum could be expected to enhance production of such forest goods and services as watershed benefits, fish and game and aesthetic values. With the exception of areas where problems are particularly acute, it seems fairly reasonable to assume that the products in question are, in large degree, joint with timber. It should be admitted, too, that both the methodology and the data essential to an analytical consideration of these classes of forest value are still far from adequate.

FOREST RECREATION

In thinking of forest recreation it is perhaps helpful to consider two categories of land. The first of these would include areas which are necessarily devoted exclusively to intensive recreational use. Campsites, picnic areas and points of outstanding scenic interest fall into this class. Such use is incompatible with timber production and would presumably represent a more productive use of the land. Expansion of the land area devoted to intensive recreational use will be accomplished by withdrawals from the timber-producing areas of the country and from lands in non-forest use.

The second category is comprised of forest land on which extensive recreational use, with only moderate restriction, is

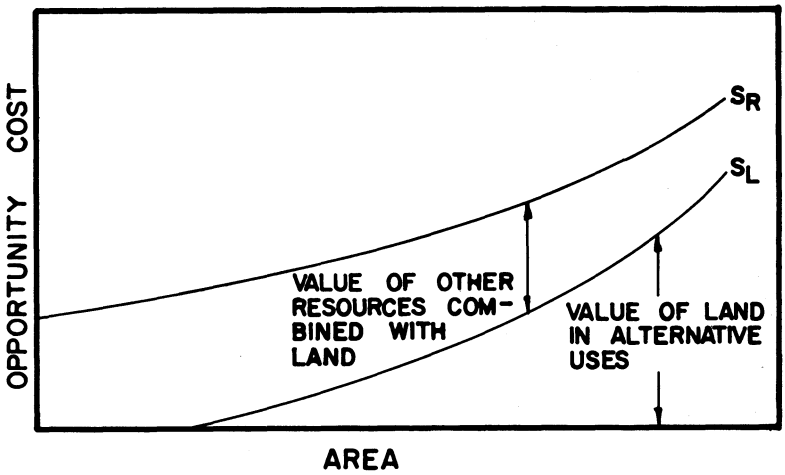

Fig. 10.1. Supply of intensive forest recreation services.

compatible with timber production. This would characterize the great bulk of land now described as commercial forest area. Timber production often facilitates recreational use and, over the course of a rotation, need not detract appreciably from recreational values.

The supply of forest recreation services in the "intensive use" category might be roughly conceived as consisting of two elements as shown in Figure 10.1. As far as land is concerned, such a supply function (S_L) would express the value of successive units of land area in alternative uses, i.e., the opportunity cost of land in recreational use. Since a portion of such land may have no alternative use, the lower part of a supply curve (S_L) would coincide with the abscissa. To this must be added the value of other resources which are combined with land in providing recreational services. The sum of these two elements, indicated by S_R, is perhaps as close as one could get to a concept of the aggregate supply of forest recreation.

Looking into the future, then, the shifts in supply to be anticipated will be governed largely by changes in the value or opportunity cost of land and other resources employed in providing forest recreation. In view of growing population pressures, such values may tend to become greater. Thus, the supply of forest recreation would tend to diminish as indicated by the shift from S_R to S_R' in Figure 10.2.

Demand for forest recreation is increasing and promises to continue to increase at a rate far in excess of the rate of

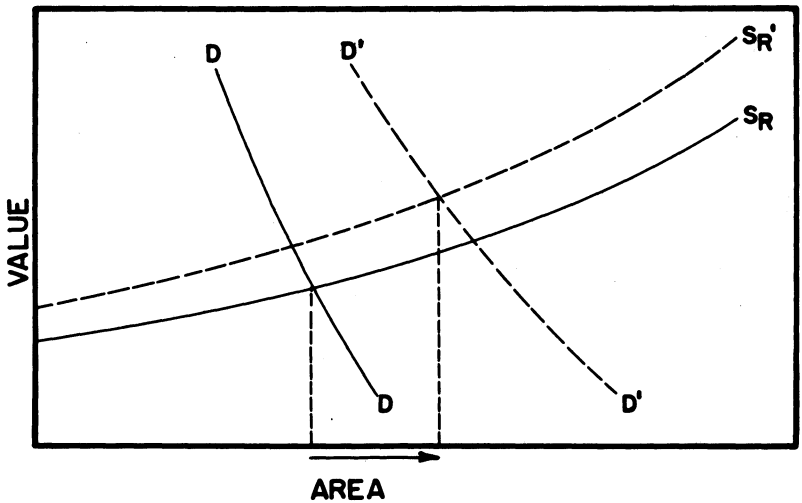

Fig. 10.2. Prospective changes in supply and demand — intensive forest recreation.

population growth. This is attributed to increasing productivity in the economy-at-large, with consequent rising incomes and more extended periods of leisure time. There is also evidence of strengthening preference for this kind of recreation and growing skill in its consumption. The result of these tendencies is that the significance of forest areas for their recreation values is rising more steeply than for timber production. The Forest Service (1959) anticipates a ninefold increase in the number of recreation visits to the National Forests between 1958 and the year 2000. Despite diminishing supply, the prospect for rising demand for forest recreation is such that substantial increases in the land area so utilized, as indicated in Figure 10.2, will come about in the next few decades. It has been estimated that the increase may amount to as much as 20 million acres by the year 2000.[1]

While exceptions are becoming more prevalent, forest recreation is not generally subject to the pricing mechanism. This would be explained partly on an institutional basis. It is also due to the fact that such recreational services, by their very nature, do not lend themselves to the degree of control essential to pricing on the basis of cost and utility relationships. Thus, the

[1] R. E. McArdle. "The sixties — decade of decision," address before the 83rd Annual Convention of the American Paper Association, New York, Feb. 25, 1960.

provision of facilities for forest recreation is primarily a public function. Expansion occurs, as in the case of the Forest Service's "Operation Outdoors" and the National Park Service's "Mission 66," largely in response to public pressure for more adequate facilities. It remains the responsibility of public agencies to determine the extent to which resources should be so allocated, i.e., the point at which marginal social costs and benefits would be approximately equated.

Even in view of the expansion anticipated in the use of land for intensive forest recreation, such use would still be confined to a relatively small portion of the existing and potential forest land area of the country. Actually, the bulk of the land area used for forest recreation will also be used for the production of timber and other forest goods and services. On much of this area, the extra cost of providing recreational services would be small or negligible. A policy of multiple use will have the effect of greatly increasing the supply of extensive recreational services. This would be true because a large part of the opportunity cost of providing for recreation exclusively is eliminated when recreation is combined with other kinds of forest production. Multiple-use of forest land must, however, be better understood and appreciated by the public and by those responsible for the management of forest land.

It should be borne in mind throughout this chapter that the value of land in forest production may stem from potential recreational use, timber production or the production of other forest goods and services, alone or in combination. In bypassing the latter category, it is not my intent to suggest that the values involved are of little significance. On the contrary, such benefits often warrant major consideration in the appraisal of land for forest use, particularly if the social viewpoint is adopted.

FOREST SERVICE PROJECTIONS OF POTENTIAL TIMBER DEMAND AND GROWTH IN THE YEAR 2000

The obvious jumping off place for a discussion of potential timber supply is Timber Resources for America's Future,[2] the report on the latest and most intensive of a series of timber resource analyses conducted by the U. S. Forest Service. In this study, the Forest Service made very detailed projections of "potential demand" for timber products. Potential demand here is

[2] Forest Service, USDA. Forest Resource Report No. 14. U. S. Government Printing Office, Washington, D. C., 1958.

Table 10.1. Summary of Basic Assumptions Underlying Three Estimates of Potential Timber Demand in the Year 2000

Projection level	Population	GNP	Real price of timber products
	(Millions)	(Billion dollars)	(Trend)
Lower	275	1,200	rising
Medium	275	1,200	constant
Upper	360	1,450	constant

an estimate of the quantity of timber products which would be demanded under the conditions assumed, i.e., a point on a future demand function. Unfortunately, the Forest Service did not analyze potential supply except in terms of the prospect for physical inventory of growing timber and growth.

For the year 2000, three projections of potential demand for timber products were developed on the basis of three different combinations of assumptions as to the future development of the economy-at-large and real price trends for timber products. These underlying assumptions are summarized in Table 10.1.

It should be emphasized that the assumption of constant real prices underlying the medium and upper level projections relates strictly to estimates of potential consumption. Sufficient growth to provide for timber products consumption at projected levels would not, in itself, assure constant real prices. It would also be necessary that productivity in harvesting and conversion advance at about the same rate as productivity in the rest of the economy increases. It is evident, however, that constant real prices would be impossible in the presence of declining timber supply at the levels of demand anticipated.

Also basic to forecasts of timber growth are assumptions that forest management practices and technology in harvesting, conversion and distribution will continue to improve. Another pertinent assumption concerns the extent of the commercial forest land area of the country. Since 1910, commercial forest area has tended to increase, but it is anticipated that this trend will be reversed over the period in question.

The supply problem as visualized by the Forest Service is the prospective gap between the volume of growth required to provide for the potential consumption of timber products and projected growth. These forecasts, under the assumptions of the lower and medium level projections of potential demand are summarized in Table 10.2.

The medium level projections indicate that we may, in the year 2000, be growing just a little over half of the timber

Table 10.2. Required and Projected Timber Growth for the Year 2000[a]

	Level of potential demand	
	Lower	Medium
Total growing stock:[b]		
Required growth - (Bil. cu. ft.)	18.0	22.0
Projected growth - (Bil. cu. ft.)	19.1	12.2
Projected growth as percent of required growth	106	55
Sawtimber:[c]		
Required growth - (Bil. bd. ft.)	79.3	105.4
Projected growth - (Bil. bd. ft.)	66.7	25.2
Projected growth as percent of required growth	84	24

[a] *Timber Resources for America's Future*, p. 488.
[b] Total growing stock. Volume of all merchantable trees over five inches, d.b.h. to a four inch top inside bark.
[c] Sawtimber. Volume of all trees suitable for lumber or comparable use. Minimum d.b.h.: E. softwood, 9 inches; hardwood and western softwood, 11 inches.

required to meet demand at 1952 real prices. In the case of sawtimber, more than four times the growth projected would be required to provide for potential demand. With rising real prices the lower level projections indicate that total timber growth would be sufficient but sawtimber growth would fall short by 16 percent.

Aggregate projections such as these fail to disclose more drastic deficiencies which can be anticipated with respect to particular species, sizes and qualities of timber. The prospect of growth insufficient to provide for projected volumes of consumption is largely a reflection of inadequate inventories of growing stock by the year 2000.

With respect to timber products, the outlook for the future presented by the Forest Service is not bright. If demand increases to the extent anticipated due to growth in population and income, timber deficits will become more pronounced. Continued upward trends in real prices will be accompanied by restricted consumption and forced substitution. Barring substantial nonprice substitution, such tendencies can be avoided only by measures to increase timber supply and to advance technology in the conversion industries well beyond those anticipated by the Forest Service. Will it be in the best interest of society to accept the conditions which are imminent? Or would the position of society be improved by diverting more resources to the end of increasing the supply of timber products?

AN INTERPRETATION OF POTENTIAL DEMAND ESTIMATES

The projections made by the Forest Service in the Timber Resource Review are expressed entirely in terms of potential demand under assumed conditions and corresponding growth. A reasonable interpretation seems possible, however, in terms of the changes in demand and supply which such estimates of consumption would represent should they materialize in the year 2000. In taking such liberties with the projections made, it is assumed that the three estimates of timber products demand are points at which supply and demand would be equal under corresponding sets of conditions. Since price changes are projected more concretely for lumber than for other products, sawtimber (for lumber production) will be used to illustrate the supply and demand relationships which seem evident. This interpretation is shown in Figure 10.3.

Turning first to the changes in demand which are implied, demand in 1952 is approximated by DD. With growing population and rising gross national product as assumed in connection with the lower and medium projections, demand would increase to the

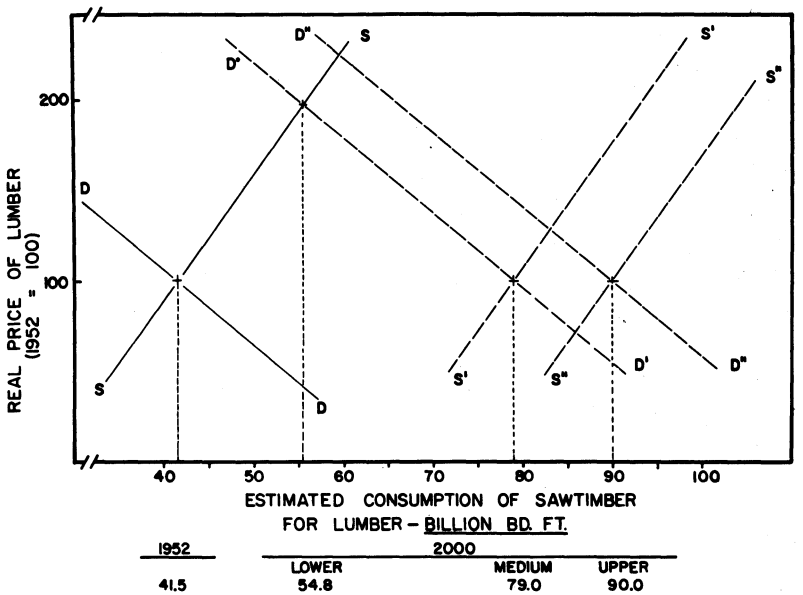

Fig. 10.3. Increases in sawtimber supply required to meet demand projections for the year 2000.

level indicated by D′D′. If, as the Forest Service anticipates in developing its lower estimate of potential timber demand, real price rises 97 percent[3] between 1952 and 2000, the quantity of sawtimber demanded would increase from 41.5 to 54.8 billion board feet. On the other hand, using the same population and income assumptions, if 1952 real prices were somehow sustained, then demand at 79 billion board feet is anticipated for the year 2000.[4] The upper level projection, based on larger estimates of population and gross national product in 2000 (though slightly lower GNP per capita), suggests still greater demand as indicated by D″D″.

Turning to the implications as to the supply of sawtimber for lumber production, one is apt to get the impression that supply is regarded as being perfectly elastic. This is particularly true in looking at the medium and upper level projections in which constant real prices at the 1952 level are assumed. However, the idea that any quantity of timber demanded would be made available at the price level indicated is untenable. In fact, the price elasticity of timber supply in any short period tends to be very low.

For the purpose of this illustration, let it be assumed that the lower level projection represents no change in supply relative to 1952. With a 97 percent increase in real price over 1952 levels, the amount supplied in 2000 is estimated at 54.8 billion board feet, a 32 percent increase over 1952. This supply function is indicated by SS in Figure 10.3. The lower projection might be regarded as an estimate of what will most likely happen by the year 2000 in the absence of extraordinary measures designed to favorably alter timber supply.

If the price elasticity of timber supply is not infinite, then the medium and upper level projections based on the assumption of constant real prices could come about only with very substantial increases in the supply of sawtimber for lumber production. These increases, indicated by S′S′ and S″S″ respectively in Figure 10.3 amount to 90 percent and 117 percent at the 1952 price level.

The prospect of such increases in sawtimber supply as have

[3] Annual rate of real price increase is 1.4 percent or about half of the 2.8 percent annual rate reported for the period 1926 to 1950.

[4] The two points described are shown in Figure 10.3 to be lying on the same demand curve (D′D′). To the extent that the lower level estimate, essentially a projection of past experience, includes non-price substitution, that point would fall on a lower and less elastic demand function. No non-price substitution is assumed in the development of the medium and upper level projections. The point remains, however, that the Forest Service anticipates a substantial increase in the aggregate derived demand for sawtimber. Price is regarded as the major factor underlying substitution.

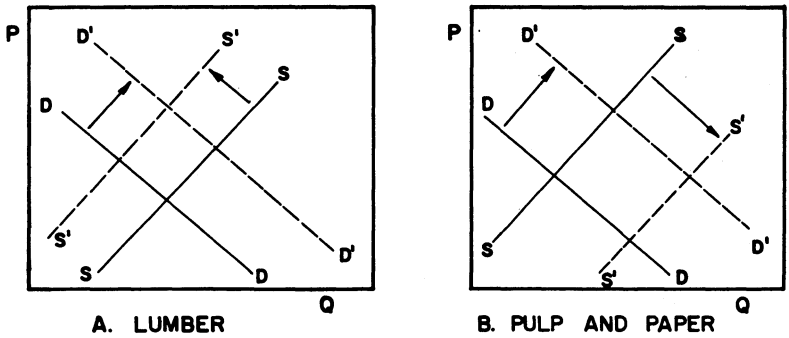

Fig. 10.4. Apparent changes in supply and demand; 1900-50.

just been described would represent a drastic reversal of the direction of shifts in supply experienced in this country over the past century. Zaremba reported that the long-term trend of real lumber prices had been rising at the rate of 2 percent per year between 1860 and 1955.[5] He explained this trend on the basis of failure of productivity in the lumber industry to advance while productivity in the economy-at-large was rising at about 2 percent per year. Technological improvements in the industry were just about able to compensate for the disadvantages of less accessible timber, smaller sizes and poorer quality. Declining supply, however, was offset by increasing demand. Between 1900 and 1950, the real price of lumber rose about 185 percent while consumption, though fluctuating over the period, was practically the same in 1950 as in 1900. The changes apparent are indicated in Figure 10.4-A.[6] While this describes the behavior of lumber supply, the tendency toward diminishing supply is even more pronounced as far as sawtimber is concerned.

In the pulp and paper industry the changes have been quite different. From 1900 to 1950, the long-term trend of real prices has been about level. While real prices have remained about constant, consumption of paper products has increased tremendously. Both demand and supply have increased as suggested in Figure 10.4-B. In this case, however, the increases in supply have come about through technological improvements in conversion and adaptation to the changing character of timber inventories. Productivity has risen along with the rest of the economy. Unfortunately, the downward shift in supply which has characterized the lumber industry has been more typical of the timber

[5] J. Zaremba. "The trend of lumber prices," Jour. For. 56:179, 1958.

[6] W. A. Duerr. Fundamentals of Forestry Economics. McGraw-Hill, New York, 1960.

products industries as a whole than has the behavior of supply in the pulp and paper industry.

It is evident that if the medium level projection were to be regarded as a timber production goal, then the direction in which timber and timber products supply functions have been moving must be reversed. As the Forest Service insists, timber supply must be increased appreciably. A significant upward adjustment of supply would require measures to this end well beyond those now in effect.

Unfortunately, we do not, at present, have estimates with regard to the cost side of the basic input-output relationship for forest production. Without the necessary cost estimates, a suitable goal for purpose of public planning cannot be established. Ideally, such a goal should be an estimate of an optimum level of timber production as seen from the viewpoint of society — a level which represents an equation of marginal costs and benefits.[7] Currently, we seem to be relying upon the conviction that reallocation of resources in favor of timber production is in the public interest, but we have yet to determine how far such reallocation should go.

SOME ECONOMIC FACTORS AFFECTING TIMBER SUPPLY

Two characteristics of timber bear special consideration in any attempt to project timber supply. The first is the familiar fact that production periods are relatively long, up to 100 years or more, depending upon the economic circumstances of the owner, the site, the species and the product. The second is the fact that timber can be regarded either as a means of production or as product at the discretion of the owner.

The price elasticity of the timber supply functions shown in Figure 10.3 for the year 2000 is low. This is characteristic of timber supply in any short-term (stock or market supply) period. There is relatively little that a timber producer can do to increase the amount supplied in response to a positive price change. He (or society) might reach out to harvest stands, trees or parts of trees which are geographically or technically more remote. That is, the margins of availability may be extended. Basically, however, any supply response he exhibits is a stock response. The quantity of timber made available rests largely upon his forecasts of the advantages of holding growing stock relative to the opportunity cost of carrying inventories of timber.

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[7] Ibid.

He weighs the prospect of growth in volume, improvement in quality and a favorable change in timber prices against the return he sees possible through alternative uses of the capital tied up in timber. Thus, the cost of capital, the interest rate, or, as it applies to a particular timber producing firm, the alternative rate of return is of overwhelming significance with respect to supply responses made from timber inventories. If the price rises, the value of growth increases, but the production (capital) cost also increases to the same extent, and no supply response is to be anticipated.

While the quantity of timber which would be made available from growing stock is inelastic with respect to price, the amount supplied is very responsive to changes in the opportunity cost of capital. The more productive alternative opportunities to use capital appear to be, the more pressing the demands for current consumption, or the greater the apparent risks in timber production, the more an owner would be inclined to liquidate timber capital. The stock supply of timber is positively correlated with the alternative rate of return.

It must also be recognized that a positive stock supply response, or reduction of growing stock, in one period means that less timber will be available in future periods. In the longer term, then, timber supply is negatively correlated with the alternative rate.

In looking ahead to the year 2000, or to any other future target date, any projection of timber supply must reflect the stock supply responses which will be made in intervening short-term periods. If substantial increases in supply are to be effected by the year 2000, it would be largely due to conditions over the intervening period which are consistently favorable to the accumulation of growing stock on a substantial portion of the commercial forest land of the nation. This is a large part of what the Forest Service implies in assuming a continued trend of improvement in forest management practices.

The treatment of timber supply to this point is appropriate to existing commercial forest lands, and particularly to those lands which are stocked with timber to some extent. But what about forest land which is, at present, unstocked or seriously understocked? And what are the circumstances under which some lands now used for other kinds of production might be shifted to forest production? Here we are concerned with long-run timber supply responses.

In the long run, timber supply may be somewhat more elastic in relation to prospective price (or cost other than capital) than is stock supply. The prospect of price levels sustained at high

levels or of low establishment and administration costs would tend to elicit a positive long-run supply response. Such response would be manifest in the seeding or planting of understocked or barren forest lands, or possibly in the diversion of non-forest lands to timber production. In view of the long production periods entailed, however, the interest rate is still highly significant. Presumably the condition essential to such action is that the estimated present net worth of the land (soil expectation value) under such a management program exceeds that under alternative uses. Planning of this order must, of course, anticipate decisions concerning the disposition of growing stock as the stand matures. The lower the alternative rate, other things held constant, the greater the extent to which positive long-run timber supply responses can be expected. This is the sort of response implied by the Forest Service in referring to the 52 million acres or nearly 25 percent of the commercial forest land area of the United States in need of planting. Some restocking of such lands occurs naturally, of course, usually by default rather than by positive decision. Though trees planted or otherwise established in the 1960's may not reach maturity by the year 2000, such action would substantially increase the allowable cut from older stands by that time.

The Timber Resource Review outlined in broad terms the measures which would reduce the gap between anticipated timber production and consumption at 1952 prices. Basically, these measures all have the effect of expanding the capital plant for timber production, i.e., increasing the volume of growing stock. In addition to the planting indicated, protection against fire, insects and disease must be improved. Growing stock levels on existing forest areas should be increased. Technology in conversion must be improved to increase product recovery from timber harvested and to permit utilization of a wider range of species. Such developments would also have the effect of increasing growing stock.

As in the earlier Reappraisal Report,[8] the forest management practices of small forest owners are described as falling short of socially desirable standards most drastically. According to Timber Resources for America's Future, forest management practices on the part of some 4 million small owners who control about half of the commercial forest land of the country must be greatly intensified if timber production is to be substantially increased. One might wonder if it's not suggested here that small

[8]Forest Service, USDA. Forests and National Prosperity. Misc. Publ. No. 668, U.S. Government Printing Office, Washington, D. C., 1948.

producers subsidize society. Forest Service proposals for specific action to reduce problems identified are to be published in the near future.

The economic factors that bear most directly on future timber supply are those that relate to the timber producers' decisions concerning the level of growing stock. Growing stock, or timber capital, is the basic and predominant ingredient of timber production. By and large, the output of timber can be increased only by increasing growing stock, the timber producing machinery.

SOME IMPLICATIONS FOR LAND-USE PLANNING AND POLICY

Turning now to the possibility of shifts in land use, the Forest Service's assumption with respect to prospective changes in the extent of the commercial forest land area of the country is of particular interest. In Timber Resources for America's Future, mild concern was expressed for an expected downward trend between 1960 and 2000. More recently, however, the Forest Service has come to view such prospects with much greater alarm (McArdle, 1960). The chief of the Forest Service cited the possibility that our present 484 million acres of commercial forest land might, through pressure of alternative uses, be reduced by 25 percent over the next 40 years. This could reduce timber growing capacity by as much as one-third.

In view of the central issue which is the concern of this book, however, it seems conceivable that additions of submarginal cropland to the commercial forest area may continue to more than compensate for such inroads as are being made by urban and industrial developments, highways, reservoirs and intensive recreational requirements. As long as the rate at which increases in productivity in agriculture exceeds the rate at which demand increases, a normal tendency toward falling prices and rising output may be expected. In the absence of public measures to control price and production, the value of agricultural lands on which technological improvements cannot be applied would tend to fall. Under competition, crop production would yield to forest production where conditions are favorable to the latter.

There is nothing particularly mysterious about the economic principles underlying changes in the use of land. When more can be paid for the use of land in one kind of production than in another, that use would tend to predominate. Two considerations seem to be critical with regard to any comparisons between forest production and marginal agricultural production. The first

has to do with the circumstances under which shifts to forest production might represent a desirable re-allocation of resources. The second consideration, closely related to the first, bears upon institutional problems that inevitably arise in the process of accomplishing such adjustments.

It was mentioned earlier that capital is the principal ingredient in forest production, and that the opportunity cost of capital is the critical determinant of the intensity of forest management. If the cost of capital to a landowner is high, forest production may be economically impossible. The value (present net worth) of land is low or negative. Productivity is low and the potential contribution to supply is small. These circumstances lie at the heart of the so-called small forest owner problem in the United States and other nations. They lie behind the present unproductive condition of extensive areas of land on which crop production has been abandoned and forest production, largely involuntary, has taken its place in the Northeast and other parts of the country. A shift to forest production exclusively on an existing marginal farm could not be expected to improve the lot of the owner and his family.

If forest production is to compete with even marginal agricultural production, then, the first essential condition is that ownership be transferred to firms characterized by a relatively low alternative rate of return. Generally speaking, this means public ownership or ownership by large, vertically integrated corporations among the wood-using industries. A second condition essential to high productivity is the aggregation of substantial areas of land in the ownership of a single firm. In timber production, the economics of scale to be realized with increasing size of forest holding are appreciable up to several thousand acres. In the absence of public subsidy to forest production on the part of present landowners, or of drastic public regulation, changes in ownership are indicated along with shifts in the kind of production to which land is devoted.

As to the relative merits of public ownership versus ownership by the larger, vertically integrated wood-using concerns, trends suggest that the most intensive management and greatest productivity in timber production can be anticipated on the part of the latter. This is to be explained, in part, on the basis of the advantages of integration, particularly the opportunity to realize the values inherent in high productivity more fully.

From the social viewpoint, however, non-monetary elements may carry great weight in the appraisal of land. In some areas, the value of land based on timber production alone may not be sufficient to be competitive, but when recognition of other forest

benefits is taken into account, forest production would represent the most desirable use. The issue between public and industrial ownership rests, to a large extent, upon the possibility of additional non-monetary net benefits under public management.

At the risk of over-simplification, the changes which appear to be taking place in the value productivity of land for farm crops relative to that for land in forest production may be shown by means of a ceiling rent model as in Figure 10.5. Ceiling rent, the highest price per acre per year which could be paid for the use of land in alternative kinds of production, is shown in relation to land areas arrayed in order of diminishing value productivity. In the absence of public support programs the ceiling rent gradient for much of agricultural production would appear to become more steep. Where productivity is relatively low, land tends to become worth less. Where technological advances can be applied to greatest advantage, the value of land would tend to rise.

In the case of forest production, the relatively low and flat ceiling rent gradient appears to be rising. The combined effect of these two tendencies would be to shift the extensive margin for agricultural production (the intensive margin for forest production) to the left to some extent. Some land which has been most

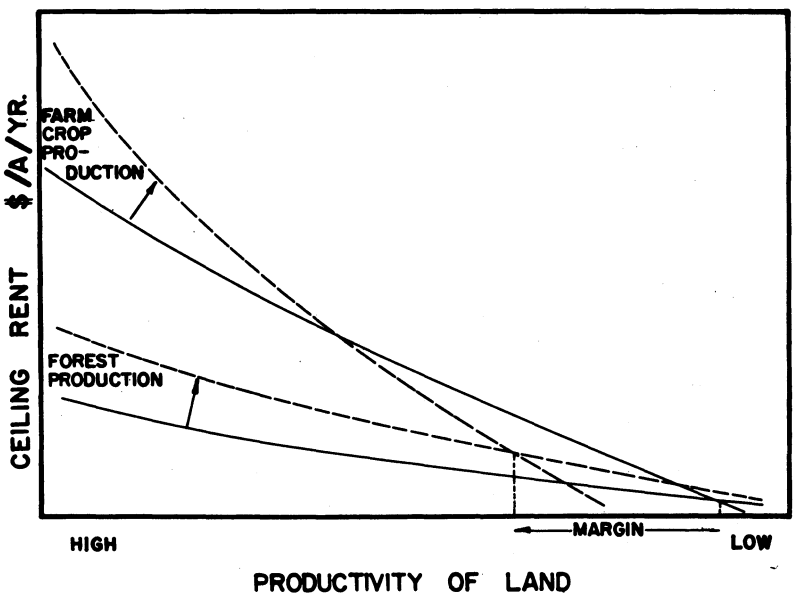

Fig. 10.5. Apparent shifts in hypothetical ceiling rent gradients for farm crops and forest production.

productive in agricultural use may now be more productive in forest use.

The institutional problems entailed in such an adjustment in land use are apparent. What's to become of the people now gaining, with the aid of various public programs, a meager livelihood from these farms? Alternative employment opportunities for these people are apt to be limited. Often, they simply don't want to leave the land and their accustomed way of life. An acceptable adjustment policy must give primary regard to facilitating the changes implied on the part of the families and communities involved. To some extent, simply the fact that a public agency or private firm stood ready to purchase the land at a fair price based on its most productive use would meet the problem. In other instances, it might be desirable to provide that families could remain on the land, as tenants or otherwise, after purchase. The conversion process could be expected to provide some opportunity for gainful employment. While they are great, the institutional problems do not appear to be insurmountable.

The degree to which shifts in land use from agricultural production to forest production appear to hold favorable prospects varies considerably among the geographic regions of the country. In terms of the three major problem areas considered here, the cotton area of the Southeast is, without question, the one in which forest production would hold the greatest promise as an alternative use of marginal farm land. Physical conditions are favorable to forest production. Wood-using industries, particularly the pulp and paper industry, are well established in the South. The intensification of forest management, especially on private holdings, has generally proceeded more rapidly than in other regions of the country. It is with regard to the eastern softwood species that the most critical shortages of timber have been anticipated by the Forest Service. The Southeast is the area in which supplies in this species group can be enhanced to the greatest degree.

In the Corn Belt the areas on which forest production could compete with the production of farm crops are perhaps more limited than in the South. There are, however, rather substantial areas of near marginal farm land on which productivity in forest use would be high. In parts of the region, recreation would be a relatively important factor in contemplating an expansion of the forest area. Shelterbelts and roadside strips present significant opportunities for productive alternative use of croplands.

The Wheat Belt offers the least promising prospects for forestry as an alternative to the production of farm crops. By and large, precipitation is inadequate for forest growth except in the

river bottoms. In this region, limited forest areas would have their greatest value in recreational use and as shelterbelts. It is unlikely, however, that the productivity of the region can be enhanced by attempts to shift from wheat to forest production on an appreciable scale at assumed and lower levels of consumption. The most drastic shortage anticipated by the Forest Service is in the eastern softwoods. If consumption proceeded as assumed in connection with the medium level projections, the inventory of eastern softwood growing stock would be practically exhausted by the year 2000. Some shift in land use in favor of softwood timber production in the cotton area, and to a lesser extent in the Corn Belt, would help to alleviate this condition. Adjustments in land use and intensification of forest management in other parts of the East would also tend to increase supply.

SUMMARY AND CONCLUSIONS

In contrast with substantial portions of the agricultural sector, the prospects for timber production are characterized by deficit conditions. Without more aggressive measures than are contemplated at present, rising real prices and restricted consumption of timber products can be anticipated. The relative significance of forest recreation and of other forest goods and services is rising rapidly. There is strong evidence that more intensive management of forest resources may be in the best interest of society. The productivity of some land now in agricultural use may be enhanced by shifts to forest production in public or corporate ownership.

There are significant opportunities for increasing the marginal efficiency of capital in timber production. Greatly expanded research efforts, in timber growing and in the technology of utilizing timber products, would contribute substantially to this end. Measures designed to increase timber supply, however, must also focus upon means of reducing the opportunity cost of capital required in timber production. Among the important approaches in this direction which would tend to favor expansion of the timber supply would be:

1. Reduction of risks in timber growing.
   a. Increased protection against fire, insects and disease.
   b. Expanded availability of insurance on growing stock.
2. Low-cost credit.
3. Continuance of favorable income tax provisions.
   a. Capital gains treatment of income from timber.
   b. Expansion of costs incurred in cultural practices.

4. Measures to favor transfer of ownership from small, low income owners to public agencies and large wood-using firms characterized by low capital cost.

These measures and others, including programs now in effect, would tend to alleviate the timber supply problem anticipated, and to enhance the production of other forest goods and services. Furthermore, such measures would tend to increase the productivity of land in forest use, and to improve the competition position of forest production for land which is near marginal in agriculture.

It seems possible that, by subsidizing forest production to a relatively small extent, society has the opportunity to de-subsidize agriculture substantially. The institutional problems incident to such adjustment do not appear to be beyond solution. There is reasonable prospect that social benefits arising from expanded production of forest goods and services would exceed the extra costs entailed. The public interest requires that forest production be considered as a possible alternative use of land of low value in the production of farm crops.