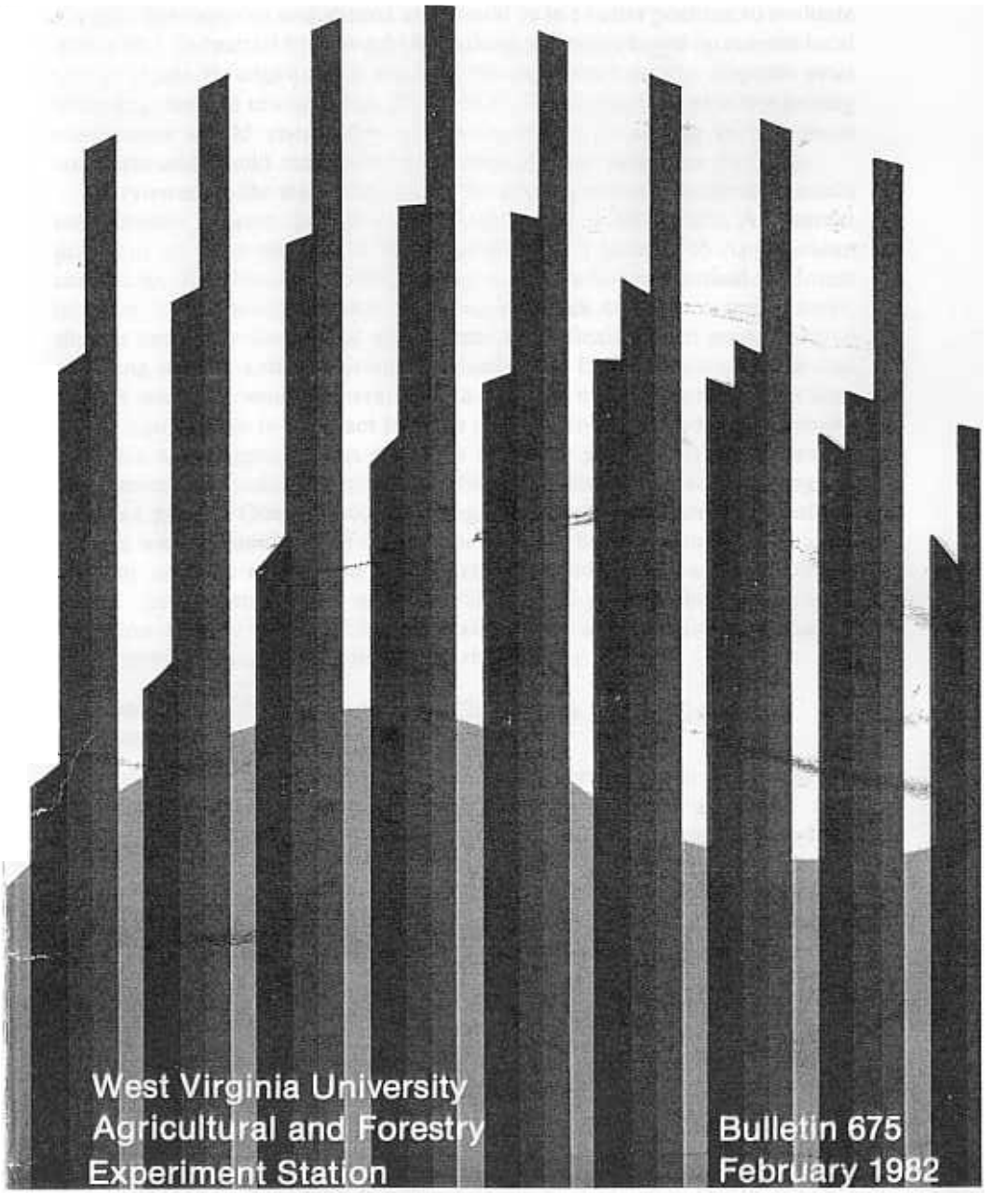
The Increment Contract:

A Potential Means of Increasing Timber Production from Nonindustrial Private Forests in the Central Appalachians



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ABSTRACT

Nearly 500,000 acres of nonindustrial private forestland have been brought into higher levels of timber production through long-term increment-based cutting contracts involving local woodland owners and large wood products firms in the South. Through personal interviews with forest industry executives and professional consulting foresters, this study examined the qualitative factors which affect the feasibility of implementing the increment contract in the central Appalachians (Pennsylvania, West Virginia, Virginia, and North Carolina) as a means of improving timber production on small private woodlands. Results of the interviews indicated that most nonindustrial private forest owners in the region would be receptive to the guaranteed annual payment provided through the contract. Key changes in the basic agreement will be necessary, however, in order to induce both private landowners and forest products industries to engage in increment contracts. These changes include a shorter contract period, establishment of unit prices for all potential products, and the inclusion of specific mechanisms for adjusting the unit prices for changes in local market and economic conditions.

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Gary W. Zinn and Gary W. Miller

INTRODUCTION

Focus of Study

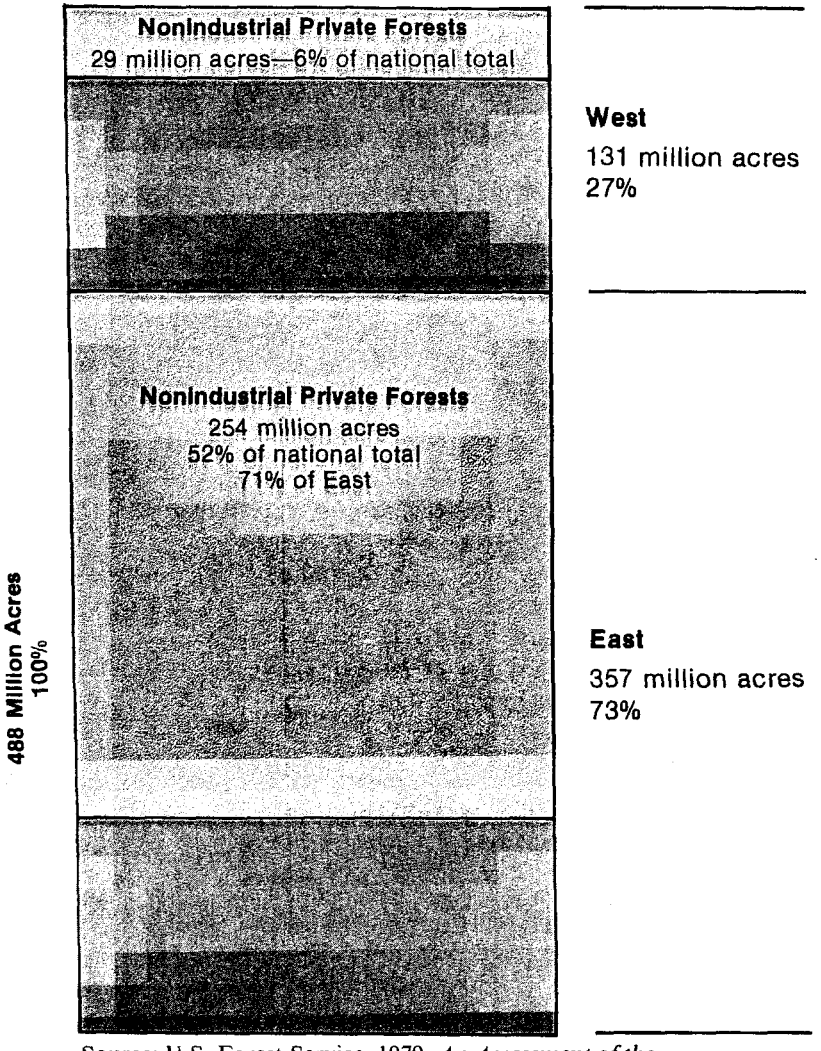
This study was designed to determine, in a general sense, whether the increment contract may be a practical means of increasing timber management and production levels on nonindustrial private forest lands in the central Appalachian region. The increment contract[1] is a unique form of long-term timber management contract which was developed and has been used mainly in the southern pine pulpwood region. The researchers worked from the premise that increment contracts might be useful in the central Appalachian region, but would likely have to be carefully adapted to reflect the timber resource and market conditions in the study region.

The Importance of Nonindustrial Private Forests

In the United States, raw material for wood products comes from three distinct types of forest landownerships: government-owned lands, lands owned by wood products industry enterprises, and lands owned by other private individuals or entities. The latter category, called nonindustrial private forests,[2] is a key part of the nation's timberland base. These lands comprise some 283 million acres, or 58 percent of all commercial forestland in the United States (U.S. Forest Service, 1979). The importance of nonindustrial private forests relative to the nation's total forest land is summarized in Figure 1.

[1]The specifics of increment contracts were described by Greene (1979), and will be highlighted in the "findings and discussion" section of this bulletin.

[2]The term "nonindustrial private forests" is defined as forestland held by owners who possess no wood processing facilities and who are not engaged in the manufacture of wood products (Society of American Foresters, 1979).



Source: U.S. Forest Service, 1979. *An Assessment of the Forest and Range Land Situation in the United States.* U.S. Government Printing Office, Washington, D.C. 556 pp.

Figure 1. Breakdown of commercial forestland in the United States showing proportion in East, West, Nonindustrial Private Forests, and the proportion of NIPFs in East and West.

Nonindustrial private forests (NIPFs) have been identified as a problem area in terms of timber productivity. On the average, these lands produce timber at only about one-half their physical potential (Sedjo and Ostermeier, 1978). With recent studies indicating a potential timber shortage for the early years of the next century, such a situation is problematical, drawing attention to the management conditions on NIPFs and to the alternatives available for improving their yield of wood products. In the eastern United States, particular attention to the NIPF problem could be an important step in closing the gap between expected production and expected consumption of wood. Nearly three-fourths of all commercial forestland in this region is held in NIPF ownerships (U.S. Forest Service, 1978).

Basically, the solution to the NIPF problem must involve some means of inducing private landowners to make investments in timber production and then to practice sound forest management to assure an optimum harvest. The heterogeneity of the forests and their owners make this task complicated. In fact, many NIPFs are well managed in terms of timber productivity, but many others are not. Smaller-sized landholdings, which are ubiquitous in the East, are characteristically undermanaged relative to their potential for wood production. There are ongoing governmental and private programs to stimulate timber management on these lands, but success has been limited.

Potential Problems in Domestic Timber Supply

Several recent studies have indicated that the amount of timber harvested annually in the United States will fall short of what is necessary to meet projected wood products consumption levels within about two decades, assuming 1970 relative prices for wood products (Vaux, 1973; U.S. Forest Service, 1974; LeMaster, 1978; U.S. Forest Service, 1979). The projected gap between consumption and domestic production will necessarily be filled either by imports, by rising relative prices of wood products, which would curb consumption and increase production, or by a combination of these two basic supply-demand adjustment mechanisms. There would be, however, undesirable economic and social consequences from such adjustments (Hair, 1978), so other efforts to increase timber supplies may be desirable.

In the eastern United States, where NIPFs dominate the timberland base, overall timber growing stock has been increasing. Knight and Hilmon (1978), however, reported a gradual deterioration in tree quality and a decrease in average tree size of hardwood growing stock. Veneer and furniture manufacturers are having difficulty procuring certain species, grades, and size classes of hardwood sawtimber (Knight and Hilmon, 1978). This indicates that the eastern wood products industry faces timber availability problems.

The U.S. Forest Service (1974) asserted that the predicted gap between

domestic timber production and forecasted levels of consumption can be narrowed by increased use of eastern hardwoods. LeMaster (1978) commented that increased hardwood growing stock levels might permit some substitution of hardwoods for softwoods in wood products. Implementing these timber supply strategy suggestions would necessarily involve stimulating increased timber production from eastern NIPFs.

Reasons for Low Timber Production on Nonindustrial Private Forests

It is clear that NIPFs are not producing wood at nearly their physical potential. Current net annual growth on NIPFs is about 36 cubic feet per acre, while potential growth is estimated to average some 72 cubic feet per acre in fully stocked natural stands (U.S. Forest Service, 1977). Considering their acreage alone, NIPFs might be expected to supply over half the timber needs of the nation (Greene, 1976). Some studies have indicated, however, that they have been producing only 40 percent of the nation's domestic supply (U.S. Forest Service, 1974).

The low productive performance of NIPFs has been recognized for many years. The conclusions of numerous studies concerning why NIPFs are not more productive of timber are too involved to be treated in detail here. In summary, though, the most common factors identified as deterrents to higher timber productivity on these lands include:

1. Low levels of profitability and high alternative rates of return restraining forestry investments (Stoddard, 1961; Sedjo and Ostermeier, 1978);
2. landowners' lack of technical knowledge concerning timber growing and marketing (Greene, 1976);
3. high tax costs relative to the value of timber growth (Stoddard, 1978) and lack of knowledge of potential tax savings (U.S. Forest Service, 1978);
4. inefficiencies of scale in managing and harvesting small woodlands (Row, 1978);
5. ownership objectives which preclude or are incompatible with timber production (Worrell and Irland, 1975).

All together these factors imply a complex problem situation which is not subject to any simple or uniform remedy. Several publicly and privately initiated programs to increase timber production from NIPFs have been undertaken over the years. Some have met with partial success, but none has proved universally successful. The reader is cautioned that the subject of this study—the increment contract—is not presented as a cureall either. Rather, the researchers worked from the viewpoint that some form of increment contract might be a workable mechanism for achieving some amount of

increased timber production from NIPFs in the study region. In particular, the increment contract may have features which would make it appealing to woodland owners who have not participated in other available programs.

STUDY OBJECTIVES AND PROCEDURES

Objectives

The overall objective of this study was to determine the general feasibility of the increment contract as a means of stimulating increased levels of timber management and production on NIPFs in the central Appalachian region. To this end, specific objectives were to (1) define the key distinguishing provisions of increment contracts, (2) assess the practical advantages and disadvantages of increment contracts to both forest landowners and wood products firms, and (3) define modifications in the increment contract format which would make it usable in the study region.

Procedures

Because increment contracts have seen limited use, little information concerning them was available in the literature. Thus the primary method of investigation used in the study was to conduct open-ended interviews with key individuals who have had experience with increment contracts or who were familiar with the industry-landowner relationship associated with formal contracting. Detailed interviews were conducted with fourteen individuals.

Advance preparation for the interviews was important to the success of the study. In most cases, interviewees could be visited only once, requiring that the interviewer be completely prepared with questions that satisfied the study objectives. Prior to each interview, a set of specific objectives for that interview was developed. Then a list of discussion topics related to the interview objectives was organized to guide the interview. A list of questions on each topic was then developed to elicit as much relevant information as possible.

Potential interviewees were first contacted by telephone, to inform them of the nature of the study and to request their participation. After cooperation had been confirmed, a followup letter was sent to further explain the study and to convey any information which the participant might need before the actual interview.

Interviews were conducted in three stages; the purpose and nature of each stage was as follows:

1. Interviews to define the exact provisions of increment contracts and to establish how they differ from timber lease forms. A U.S. Forest Service researcher who is expert in contractual and legal aspects of forest

management was interviewed to obtain part of this information, and to verify published information already researched. Additional information was obtained by interviewing four forest industry officials who had experience with negotiating and executing increment contracts in the South.

Actual increment contracts were studied and compared with other types of forestland leases and timber management contracts to uncover those features which differentiate the increment contract. It also was necessary to learn the history and development of the contract to reveal the conditions under which it has thrived. Experience with use of the increment contract was explored, in terms of both successes achieved and problems encountered.

In summary, these interviews were designed to gather information on long-term contracts in general and to document the nature of and experience with the increment contract in particular. The information collected helped to establish the specific direction for the remainder of the study.

2. Interviews to determine forest industry reactions regarding the prospects of using increment contracts in the central Appalachian region. This involved acquainting interviewees with the increment contract and seeking their assessment of how it compared with lease arrangements currently used in the region. Six industry representatives were interviewed, representing forest industry firms in Pennsylvania, West Virginia, Virginia, and North Carolina.[3]

The participants were asked to point out problems apparent in the increment contract and possible solutions to these. In this manner, problematical characteristics were exposed and suggestions for their improvement were compiled. Specific advantages which the increment contract might have for forest industry firms in the study region were also assessed in these interviews.

3. Interviews to assess the potential attitudes of forest landowners in the study region toward using increment contracts. This was done by interviewing three professional consulting foresters, based in West Virginia. Since consultants work directly with and on behalf of private owners, their experience qualifies them to discuss the advantages and disadvantages of a management agreement from the viewpoint of the landowner. The decision to use consulting foresters as surrogates for landowners was made because of time and expense considerations which made a valid landowner survey infeasible. It should be noted that some interview responses of forest industry representatives in the study region served to corroborate the information and opinions obtained from the consultant interviews.

[3]Firms represented in Virginia and North Carolina were those with operations in the Piedmon region of those states. They were selected to represent a transition situation between the Southern pine region and the central Appalachian hardwood region.

FINDINGS AND DISCUSSION

The Increment Contract Compared with Other Timber Management Contracts and Forestland Leases[4]

For many years, the wood products industry has used forestland leases and timber management contracts to secure supplies of wood from private lands. These have included the following basic forms (Bradley, 1967; Siegel, 1973, 1974):

1. Lump-sum contracts, in which a negotiated single payment is made for both timber purchased and land rental at the beginning of the contract. The company is free to grow and harvest timber throughout the contract period. Some lump-sum agreements stipulate a volume per acre or stems per acre to be left at the end of the contract. Normally no clause is included for adjustments due to changing economic conditions.

2. Timber and land lease, where the lessor is paid a set annual amount for land rental and timber to be cut together. In effect, the timber stand as a whole is rented. The lessee is entitled to remove a specified volume of timber during the lease period. As under lump-sum contracts, payments for timber and land rent are not distinguishable for tax purposes.

3. Timber sale and land lease, wherein the lessee pays an annual land rental fee and pays for timber either as it is cut or at the beginning of the contract period. This type of contract separates payment for land rent and timber, so that the payments for timber may be subject to capital gains taxation.

4. Cutting contracts, under which the landowner is paid for timber as it is cut, or is prepaid periodically (usually annually) for cuts to be made in the future. Payments under cutting contracts are for timber only; no rental fee is paid for land, even though the lessee has the right to enter and use the land for purposes of growing and harvesting timber.

The increment contract is a refined form of cutting contract. Its key feature is in the method by which the landowner is paid. Payment is determined by the average annual growth (increment) the land is capable of producing under management (Greene, 1979). The productive capability of the land is estimated before the agreement is made, using such criteria as site index, species composition, stocking, etc. The landowner is then paid in periodic installments (e.g., quarterly or annually) for a specified percentage of the calculated increment. Records are kept in terms of a volume credit account. When payments are made, they are carried forward as credits on the account;

[4]Based on literature review and interviews with five Southern respondents.

when harvests are made, they are debited from the account. If harvests exceed accumulated credits at any time, the owner is paid for the balance and the account is brought to zero (Greene, 1979).[5] Thus the landowner is assured of regular payments throughout the contract period, with larger payments possible at certain times.

This study revealed that increment contracts, as used in the South, have other distinguishing features:

1. Prepayments have generally been set at 65 to 75 percent of the calculated average annual growth; prepayments have been made quarterly.
2. Per-unit prices of timber have been established at the beginning of the contract period, with provisions for later adjustments, based on changes in the Producers Price Index.
3. Contract periods have been long, typically for 60 years or more.
4. Increment contracts have been written so that the landowner clearly retains an economic interest in the timber until it is cut; thus income from the contract is more fully subject to capital gains taxation than is common under some other forms of timber lease.

The increment contract has other features which may attract landowners. The period between any necessary investments and returns on those investments is greatly reduced. The landowner is guaranteed a market for his forest products. The owner's other objectives of forest ownership can be protected by suitable clauses being included in the contract. It is the payment system, though, which makes the increment contract unique.

Increment contracts have been used mainly in the most competitive pulpwood market areas of the South, a vastly different situation from the hardwood sawtimber markets of the central Appalachian region. The remaining findings and discussion will focus on what was discovered concerning experience with increment contracts in the South and prospects for their use in the central Appalachian region.

Southern Experience with Increment Contracts[6]

Use of the increment contract by pulp and paper firms in the South has brought nearly 500,000 acres of nonindustrial private forests into higher levels of timber production through the application of industrial forestland management techniques.[7] The circumstances which led to development of increment contracts in that region and experience with them there are relevant to assessing their potential usefulness in the central Appalachians.

In the late 1940s, a large forest products firm was faced with unreliable pulpwood markets prior to expansion of its kraft paper mill operations. The proposed expansion project resulted in limited available capital for the purchase of additional timberland to supplement the firm's source of raw materials. Still, the firm needed to secure control of additional timberlands before the mill expansion could proceed without serious risk of future timber shortages. In the early 1960s, another firm was planning to build a linerboard mill in Alabama under similar circumstances. Limited capital availability and unreliable pulpwood sources forced the firm to develop a method for controlling timber without purchasing the land in fee simple. In both cases, the firms devised increment-based cutting contracts to attract sufficient numbers of private forest owners to consent to long-term industrial management and control of their woodlands.

Today, these firms are actively seeking to purchase additional timberlands and have discontinued negotiating additional increment contracts. They still consider the increment contract a viable form of land management control, but increased availability of capital and a more promising outlook for pulpwood supplies from the open market have allowed the firms to utilize other management control measures better suited to their objectives. The conditions that necessitated the use of increment contracts have changed in favor of fee simple ownership as a means of timber management control. Capital is now available for purchasing timberlands, and the firms have gradually built safe timberland bases. As a result, the firms need not offer the increment contract as a competitive edge over firms that offer the more flexible lump-sum purchase and lease agreement to local forest owners. Because the companies that first used the increment contract now have a reserve of raw materials on company-owned forests, the lease has become a favored alternative to fee ownership. It is less restrictive with regard to management practices, and the payments are often lower than those under an increment contract. The firm is not required to keep records of timber removed, since the timber standing on the land at the beginning of the lease is paid in a lump sum. Through the lease or rental payments, the firm is entitled to remove whatever volume is produced during the remainder of the contract period. Conversely, the increment contract requires the firm to pay for all timber volumes removed from the land.

[5]See Appendix for a sample volume credit account.

[6]Findings in this section and the next two are based on interviews with four Southern forest industry representatives.

[7]Estimate of acreage under increment contracts based on information provided by Southern respondents, 1980; Greene (1979) estimated 350,000 acres under increment contracts.

Future Use of Increment Contracts in the South

During interviews with representatives of forest products firms presently using the increment contract, it was disclosed that the contract will continue to be used to secure particularly desirable forest tracts. In the event that the owners are unwilling to sell or are uninterested in leasing arrangements, the increment contract will be offered as an alternative. Large tracts, preferably 500 acres or more, and tracts which help consolidate company-owner timberlands are considered particularly desirable for increment-based agreements.

Other characteristics of the forest tract also are considered to be well-suited for increment-based contracts. Acreages with large volumes of timber inventory or that are well-stocked with desirable species are potential increment contract lands. A good system of roads also would help qualify a given forest tract to be considered for such arrangements. In the final analysis of a potential contract acreage, the firm would consider the tradeoffs between carrying charges on accumulated prepayments and the loss of logging rights to an especially attractive forest tract. The decision of whether or not to offer the increment contract arrangement to a given owner would ultimately depend on the firm's perception of its future timber needs.

Suggested Changes in Increment Contracts, Based on Southern Experience

Many of the early increment contracts negotiated in the South specified initial prices for pine pulpwood only, and provided for periodic price adjustments based on the U.S. Department of Commerce producers (wholesale) price index. Experience has shown that confusion and disputes have occurred when products other than pine pulpwood have been harvested and there have been similar problems when pulpwood prices did not change over time in line with the general price index. Southern forest industry personnel interviewed suggested that these problems can be avoided by (1) establishing initial unit prices for all types of timber products which might be harvested under a contract, and (2) providing for price adjustments during the contract period based on published timber product price reports, rather than a general economic index.[8] These changes would reduce contract disputes and reduce expenses of contract administration.

[8]It should be noted that local timber market reports were not available during the period when increment contracts were developed.

Another useful change in the basic agreement concerns the length of the contract period. Increment contracts in the South have been negotiated for 60- to 90-year periods. Shortening the agreement to perhaps 30 years would simplify early negotiations with landowners. Shorter contract periods would be more attractive to woodland owners whose holdings may be potential housing development or other high-value project sites near population centers. Flexibility in the length of the contract period is perhaps the best policy in such instances. Contract periods negotiated on an individual basis would make the agreement more attractive to the industry and the landowner alike. Factors important to both parties could be brought out prior to final negotiations, thus enhancing the fairness and workability of the industry-landowner relationship.

Landowner Receptiveness to Increment Contracts in the Central Appalachian Region[9]

Interviewees felt that owners of smaller woodlands often fail to manage them because they cannot afford the investments required to practice timber management. Those owners who have sufficient income to make investments in forestry often fail to do so because they are discouraged by the low profit potential of timber production. Both consultants and industrial foresters interviewed in the study region indicated that annual prepayments for timber would help overcome these obstacles and induce a number of landowners to engage in contracting with industry.

Landowners' general attitudes toward contracting with forest products firms also were discussed during the interviews. Forest owners in Virginia and North Carolina are, for the most part, familiar with formal contract arrangements for timberland management. Their exposure to such contracts would facilitate the introduction of increment contracts in the area. Conversely, landowners in the northern Pennsylvania area have had little experience with long-term management agreements with industry. Still, good markets for quality sawtimber in the area would allow the forest products industry to offer attractive cash payments to many woodland owners. Interview participants judged that the combination of regular payments and guaranteed markets for timber would induce a number of owners to commit lands over a long term in the Pennsylvania area. In West Virginia, two consulting foresters indicated that local forest owners would be receptive to increment contract arrangements. The annual payment clause would attract many owners because timber values in the area are often underestimated, and

[9]Based primarily on interviews with three Appalachian consulting foresters and secondarily on interviews with six Appalachian wood industry representatives.

the regular cash payments would seem fair and reasonable to the average forest owner. Most importantly, however, the owner would react positively to securing a guaranteed market for his or her timber.

In the study region as a whole, many forest landowners, especially those owning smaller acreages, have had little if any experience with long-term timber contracts. Interviewees judged that the combination of regular, guaranteed payments and assured markets would induce owners with no experience in timber contracting to accept increment contracts.

Timberland Characteristics Important to Wood Industry Firms in the Central Appalachians[10]

Interviewees indicated that generally tracts of 500 acres or more are needed for a viable timber contract. Because the average tract size of nonindustrial forests in the Appalachians is substantially smaller, many private ownerships would be considered undesirable contract lands. Moreover, many of the larger ownerships in the region are already under management, either by the owners themselves or through existing contracts with industry.

Of course, tract size is not the only determinant of good contract land; the age, quality, and merchantable volume of timber and the location of a tract are also important considerations. Industry personnel indicated that the increment contract could be helpful in getting desirable small properties under contract. They also judged that the perceived attractiveness of the increment contract to landowners would aid in the contracting strategy of combining contiguous small properties under a common management, thereby creating an area of efficient size for management.

Changes in the Increment Contract Which Would Make It More Practical for Both Wood Products Firms and Landowners in the Study Region[11]

Industry representatives indicated that the percentage of the estimated mean annual increment used to determine the minimum annual payment should be reduced to a range of 50 to 60 percent. This would lower the contracting firm's carrying costs on prepayments, provide a margin of safety against damage to standing timber, and reduce the risks in predicting hardwood timber growth. Annual rather than quarterly prepayments would be most practical in the region.

[10]Based on interviews with six Appalachian forest industry representatives.

[11]Based on interviews with nine Appalachian respondents.

Contracts should establish initial unit prices for all potential timber products at the beginning of the contract period, subject to adjustments based on published stumpage and product price reports (rather than a general price index) throughout the contract period. Interviewees felt that this arrangement would be clearer and fairer to both lessors and lessees. Landowners would find the contract easier to understand and would be in a better position to evaluate its benefits. Industrial firms would be making payments based on current local timber prices throughout the contract period. Based on the disputes most often experienced in the South, it is evident that improvements in the pricing mechanism would encourage more landowners to engage in increment contracts and would make contract administration easier for the firms.

Interviewees in the study region expressed a preference for contract periods substantially shorter than those previously used in the South. A contract period of no more than 30 to 40 years was judged suitable to Appalachian conditions. Shortened contract periods would be more practical for forest industry firms mainly because they would reduce contract carrying costs; shorter contracts also would allow firms more flexibility in responding to changing market and timber supply conditions. Respondents also felt that shorter contracts would generally be favored by most landowners, for they could relate better to contract benefits over relatively short-time horizons.

It also was suggested that contracts explicitly provide for some form of arbitration or monitoring to handle disputes which might arise during the contract period. One method of doing this would be to include contract clauses which would define conditions under which arbitration would be relevant and the arbitration procedures to which both parties would be bound. Another suggestion was to include a third party to the contract at its inception; this third party would serve as an ombudsman who would monitor the contract during its duration and arbitrate any disputes.

Prospects for Using Increment Contracts in the Central Appalachian Region[12]

Competition for forestland and stumpage increases the usefulness of increment contracts, since this contract form is very attractive and advantageous to the forest landowner (Greene, 1979). In circumstances where competition for timberland and stumpage is not acute, other wood procurement strategies which are not so costly would generally be favored by forest industry firms. Thus the competitive situation within the study region indicates the near-term prospects regarding the usefulness of increment contracts.

[12]Based on interviews with nine Appalachian respondents.

In northern Pennsylvania, where many firms compete for preferred species and grades of timber, diminishing inventories of high quality sawtimber are beginning to draw attention to improving timber production on nonindustrial private woodlands. The larger firms are seeking ways to improve the management conditions on local private forests in order to ensure the availability of raw materials in the future. One firm has already begun to investigate the feasibility of long-term agreements, and one of its representatives commented that the basic increment contract will be included in the investigations. He explained that the larger firms in the region would probably begin to engage in formal contracting mainly because the firm's investments would be protected by the right-of-first-refusal clause in the written agreements. The legal commitment made by the landowner would assure that the benefits of increased production would accrue to the company, not to its competitors.

Similarly, large wood products companies in Virginia and North Carolina are beginning to increase their use of formal agreements with woodland owners. Competition for fiber has led one firm to offer local landowners a long-term management agreement very similar to the increment contract used in the South. Other firms contacted during the study were unfamiliar with the increment-based payment system, but they indicated that this form of contract would be evaluated and possibly included as an alternative to their present long-term agreements, perhaps to gain control of particularly attractive ownerships.

Lack of competition for raw material in West Virginia will likely result in little use of the increment contract in the near future. It was disclosed in two interviews with industry personnel in the state that woodland owners must sometimes go as far as 75 miles to find more than one prospective buyer for timber. Because the few large firms that draw supplies from West Virginia need not engage in severe competition for timber, informal arrangements to improve the management of private woodlands will continue to be favored by industry. For this reason, formal agreements with private woodland owners, including the increment contract, will not be used extensively in West Virginia in the near future.

Remaining Questions

It is emphasized that the findings of this study are qualitative; it was not within the scope of the study to assess relevant quantitative questions. The researchers have concluded, though, that increment contracts are generally suitable to central Appalachian conditions, so that further study of key quantitative questions would be useful. These questions will be identified and briefly discussed.

The volume credit accounting system should be examined to determine the firm's carrying costs under a variety of contract circumstances. Factors such as rotation length, percent of mean annual increment used to determine payment, and tract size should be subjected to a sensitivity analysis in order to reveal which factors have the greatest effect on the firm's total costs. This analysis should also include a range of assumptions regarding wood product prices, competition for stumpage, and financial considerations (e.g., interest costs on prepayments).

Realistic contracting situations should be developed and studied, either in the form of actual trial increment contracts or fabricated contract situations. The following questions could then be addressed:

What minimum nonindustrial forest tract attributes (e.g., acreage, timber types, stand ages, stocking, productivity, distance to firm's mills) would make a tract attractive to a wood industry firm for management under an increment contract?

What major contract benefits (e.g., minimum periodic payments, length of contract, property rights waived to firm vs. those retained) would induce landowners to enter into an increment contract?

Under what combinations of resource and market conditions would an increment contract be a desirable alternative to other contract or lease forms, for both landowners and wood industry firms?

Given answers to the previous questions, what acreages of nonindustrial private forestland in the central Appalachian region could realistically be expected to be put under increment contracts in a specified time period, given stated market conditions for timber and wood products? What volumes of roundwood production could be expected to flow from these lands, over and above production under continuation of current timber marketing practices?

Research on these questions would be relevant in areas of the study region where timber supply problems are becoming apparent. Such research also would be useful if increment contracts actually come into use anywhere in the region; monitoring of experience with actual contracts in force should be very revealing.

CONCLUSION

The increment contract can be adapted to make it usable in the central Appalachian region. In the near future, it will be a useful alternative to conventional landowner assistance, lease, and contract forms, however, only in areas where there is keen competition for timber supplies. Further research is in order concerning the resource and market conditions under which increment contracts would be feasible. Experience with any increment contracts actually used in the region should be monitored.

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APPENDIX

Example of volume credit account for a 550-acre Southern pine forest

COMPANY LETTERHEAD

Report of your Cord Credit Account through December 31, 1977

CORD CREDIT:

Credit balance from last year ..... 2,592.8 cords

Annual (1977) 785.0

TOTAL CORD CREDIT ..... 3,377.8 cords

CORD DEBIT (current annual harvests):

Pine Saw	_____	Cu Ft	@ $	_____	/ Cu Ft	= $	_____
Pine Pulp	_____	cords	@ $	_____	/ cord	= $	_____
Hwd Saw	_____	MBF	@ $	_____	/ MBF	= $	_____
Hwd Saw	_____	MBF	@ $	_____	/ MBF	= $	_____
Hwd Saw	_____	MBF	@ $	_____	/ MBF	= $	_____
Hwd Pulp	_____	cords	@ $	_____	/ cord	= $	_____
Misc.	_____		@ $	_____	/	$	_____

TOTAL ..... $ _____

$ _____ divided by $ _____ per cord = _____ cords.

TOTAL CORD DEBIT = Zero cords.

BALANCE:

Total Cord Credit ..... 3,377.8 cords

Current Annual Cord Debit ..... - Zero cords

Net Balance ..... 3,377.8 cords

DUE OWNER:

Annual cord credit (1977)

785.0 cords @ $ 8.52 / cord = $ 6,688.20

*Unpaid cord debit balance

Zero cords @ $ _____ / cord = $ 0.00

Total due owner (payment enclosed) ..... $ 6,688.20

*Applicable only if net balance is negative.

Signed by Company Representative

COMPANY LETTERHEAD

Report of your Cord Credit Account through December 31, 1978

CORD CREDIT:

Credit balance from last year	3,377.8	cords
Annual (1978)	785.0	
TOTAL CORD CREDIT	4,162.8	cords

CORD DEBIT (current annual harvests):

Pine Saw	296,424.0	Cu Ft	@ $	.2311	/ Cu Ft	= $	68,503.59
Pine Pulp	1,562.9	cords	@ $	10.12	/ cord	= $	15,816.55
Hwd Saw	10.8	MBF	@ $	50.00	/ MBF	= $	540.00
Hwd Saw	2.63	MBF	@ $	60.00	/ MBF	= $	157.80
Hwd Saw	10.25	MBF	@ $	70.00	/ MBF	= $	717.50
Hwd Pulp	596.0	cords	@ $	4.05	/ cord	= $	2,413.80
Misc.			@ $		/	$	
TOTAL						$	88,149.24

$ 88,149.24 divided by $ 10.12 per cord = 8,710.4 cords.

TOTAL CORD DEBIT = 8,710.4 cords.

BALANCE:

Total Cord Credit	4,162.8	cords
Current Annual Cord Debit	- 8,710.4	cords
Net Balance	-4,547.6	cords

DUE OWNER:

Annual cord credit (1978)
785.0 cords @ $ 10.12 / cord = $ 7,944.20

*Unpaid cord debit balance
4,547.6 cords @ $ 10.12 / cord = $ 46,021.71

Total due owner (payment enclosed) ..... $ 53,965.91

*Applicable only if net balance is negative.

Signed by Company Representative

COMPANY LETTERHEAD

Report of your Cord Credit Account through December 31, 1979

CORD CREDIT:

Credit balance from last year	Zero	cords
Annual (1979)	785.0	
TOTAL CORD CREDIT	785.0	cords

CORD DEBIT (current annual harvests):

Pine Saw		Cu Ft	@ $		/ Cu Ft	= $	
Pine Pulp	737.3	cords	@ $	11.06	/ cord	= $	8,154.54
Hwd Saw		MBF	@ $		/ MBF	= $	
Hwd Saw		MBF	@ $		/ MBF	= $	
Hwd Saw		MBF	@ $		/ MBF	= $	
Hwd Pulp	689.1	cords	@ $	4.42	/ cord	= $	3,045.82
Misc.			@ $		/	$	
TOTAL						$	11,200.36

$ 11,200.36 divided by $ 11.06 per cord = 1,012.69 cords.

TOTAL CORD DEBIT = 1,012.69 cords.

BALANCE:

Total Cord Credit	785.0	cords
Current Annual Cord Debit	- 1,012.69	cords
Net Balance	-227.69	cords

DUE OWNER:

Annual cord credit (1979)
785.0 cords @ $ 11.06 / cord = $ 8,682.10

*Unpaid cord debit balance
227.69 cords @ $ 11.06 / cord = $ 2,518.25

Total due owner (payment enclosed) ..... $ 11,200.35

*Applicable only if net balance is negative.

Signed by Company Representative

COMPANY LETTERHEAD

Report of your Cord Credit Account through December 31, 1980

CORD CREDIT:

Credit balance from last year ..... Zero cords

Annual (1980) 785.0

TOTAL CORD CREDIT ..... 785.0 cords

CORD DEBIT (current annual harvests):

Pine Saw	_____	Cu Ft	@ $	_____	/ Cu Ft	= $	_____
Pine Pulp	_____	cords	@ $	_____	/ cord	= $	_____
Hwd Saw	_____	MBF	@ $	_____	/ MBF	= $	_____
Hwd Saw	_____	MBF	@ $	_____	/ MBF	= $	_____
Hwd Saw	_____	MBF	@ $	_____	/ MBF	= $	_____
Hwd Pulp	_____	cords	@ $	_____	/ cord	= $	_____
Misc.	_____		@ $	_____	/	$	_____

TOTAL ..... $ _____

$ _____ divided by $ _____ per cord = _____ cords.

TOTAL CORD DEBIT = Zero cords.

BALANCE:

Total Cord Credit ..... 785.0 cords

Current Annual Cord Debit ..... – Zero cords

Net Balance ..... 785.0 cords

DUE OWNER:

Annual cord credit (1980)

785.0 cords @ $ 11.06 / cord = $ 8,682.10

*Unpaid cord debit balance

Zero cords @ $ _____ / cord = $ 0.0

Total due owner (payment enclosed) ..... $ 8,682.10

*Applicable only if net balance is negative.

Signed by Company Representative