IMPLICATIONS FOR THE FOREST PRODUCTS INDUSTRY

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Abstract—Major changes have occurred in the Arkansas timber economy in the last 25 years. Global and domestic demand for forest products continues to expand, doubling every 42 years. Additionally, the U.S. per capita consumption rate of forest products is over three times the world average. Production continues to expand to meet rising global demand, but timber supplies have not kept up with demand. Major reductions in public lands harvest have increased pressure on southern nonindustrial lands. Local procurement problems abound in the face of new entrants and existing mill expansions. Procurement costs continue to increase as social legislation forges an increasingly capital intensive harvesting force. Supply of roundwood falls short of rising demand. Consequently, short-term price run-ups have accelerated harvest into marginally merchantable stands. Growth-drain ratios reflect declining nonindustrial timber reserves. Long-term real price appreciation of stumpage will continue, and procurement officers will face increasing problems and expense in wooding mills.

INTRODUCTION

A broad background for understanding the 1997 Forest Inventory and Analysis (FIA) data and its relevance to the Arkansas forest products industry will be provided in this presentation. It does not dwell on dissecting the FIA data itself. Rather, a set of background conditions is presented. Further, this paper does not presume to interpret FIA data that is best analyzed at the local mill level. I do, however, paint a comprehensive picture of the position that Arkansas' forest industry is in as it enters the 21st century.

RECENT HISTORY AND ITS IMPLICATIONS INDUSTRY

Major changes have occurred in the Arkansas timber economy in the last 25 years. These include major changes and complicating factors in timber demand, technology changes in primary forest products milling as well as procurement and delivery systems, and a changing legal climate within which companies must operate. Roundwood production from the Pacific Northwest has decreased by over 4.9 billion board feet per year. Nationally, increasing portions of public lands have been locked up in wilderness or timber sales have been restricted drastically. This has put enormous pressure on the southern wood basket to pick up the slack. Major changes in mill technology and the independent contractor harvesting force have occurred as well as changes in the legal climate in which southern wood procurement takes place.

Increased Demand for Forest Products

Demand for forest products starts with population expansion. The U.S. population has expanded at a rate of 1.3 percent per year. At this rate, the population of the United States will double in 55 years. Populations of many developing counties are doubling in shorter periods. At the same time that population expands, disposable personal income is also increasing at a real rate of 2.4 percent per year or a nominal rate of 7.2 percent per year. Clearly, people have more money to spend on wood-based products. This is driven home by the fact that consumption per person in the United States continues to increase at a rate of about 1 percent, or about 0.5 ft^3, per year. The annual consumption per person in the United States is now about 77 ft^3 per year, which is more than three times that of the world average of 24.7 ft^3 per person per year.

Total U.S. roundwood consumption and production continue to rise, and we continue to consume more than we produce by 8.5 percent per year. Even though production has increased over time, we have been unable or unwilling as a country to close the gap. This is especially true in softwood lumber production and consumption where net imports have continued to exceed exports by 21 percent per year. The margin between domestic pulpwood production and consumption has narrowed over time, but we continue to import 6.4 percent more pulp products than we produce.

Now, when economists consider demand and supply for a product, they think of the traditional supply and demand curves. Normally, through short-term price adjustments, demand will equal supply. The meeting of supply and demand is at the equilibrium point. Ideally, if demand increases there will be an expansion of supply to meet the increase in demand. However, with timber-based forest products, this takes from 15 to 35 years, depending on whether you want pulpwood or saw logs. Therefore, to meet the short-term run-up in demand, price must increase with a corresponding rise in price along the short-term supply curve. What we see in the short run is a series of increases along the supply curve rather than an outward shift of the supply curve. Over time, then, the equilibrium point of log supply and demand will move as quantity demanded and prices increase. The movement, over time, of the equilibrium point leads to real-price appreciation of timber.

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This is a major benefit to the landowner, but a major source of increasing cost to the procurement forester. Long production times for timber work against real price stability in the industry.

The Harvesting Contractor Force

In 1979, only 22 percent of the harvesting force was equipped to haul long wood; but by 1996, 81 percent of the crews were long-wood or tree-length loggers. Additionally, whereas the ratio of roughly 50 percent of the total pulpwood production is being generated by 14 to 15 percent of the producer force has remained constant, the average size of contractor operations has changed significantly. The median production level has shifted from 50 cords in 1979 to 200 cords in 1987 to about 400 cords in 1996. At the same time, a terrific increase in capital investment has been required on the part of an average contractor. A $1-million investment was unheard of 20 years ago, but now it is common.

Perhaps the most astounding changes in the contractor force are shown in a recounting of contractors' demographics (table 1). Average age of the dwindling contractor force is shifting older. Today's contractors are better educated and have significantly more time in business. The force is thinning out, but new, young producers are not being attracted into the force. It is significant, however, that man-week productivity has increased from 25 to 58 cords. This is attributable to the shift in labor-capital mix. Today's producer requires more wood, larger tracts, better financing, and more sophisticated procurement foresters to understand their production problems.

Changes in Mill Technology

An economic theory, survivorship, stipulates that mills can only remain economically competitive if they possess the latest equipment and enjoy the economies of scale consistent with the latest technology. Generally, this means that primary production facilities will get larger over time to take advantage of increasing economies of scale associated with mill size. This is certainly true with the OSB industry, for example. The average size mill, and, hence, economically competitive mill, increased from just over 1 million square feet of production to almost 250 million ft^2 in 20 years. This is an average 7.5-percent increase in production capability and in wood requirements per year, per mill.

The same phenomenon has occurred in the pulpwood industry. In 1980, 52 mills consumed < 500 cords per year. However, by 1995, this number had dropped to 27. At the same time, mills requiring over 1 million cords per year increased from 9 in 1980 to 27 in 1995. These increases came through expansions and new mill construction. Clearly, the problems involved in wooding a mill of over 1 million cords per year are staggering; but the technology of decreasing marginal cost industries encourages this kind of expansion. The weight of the procurement problem in a major expansion falls on those outside the mill profit center. Procurement foresters face a horrendous problem in this atmosphere.

The mill procurement problem is compounded by the fact that yearly consumption across the South has grown steadily over time. When this happens, demand soars, working circles expand, and competition increases with associated short-term price wars and long-term supply problems.

The Changing Legal Climate of Timber Procurement

As American society has evolved from its postwar production mentality of the 1950s, numerous challenges to harvesting and procurement have arisen. Best Management Practices (BMP) and the implementation of Stream-Side Management Zones (SMZ), mandatory in some States, are still voluntary in Arkansas. However, in either fear of regulation or good social conscience, industry has adopted them. A major question arising out of the implementation of BMPs is the cost. Actually, two costs are involved. The first is the one-time loss of productive area tied up in SMZs. The second includes the increased operating costs due to the movement-restricting presence of SMZs.

Table 1—Timber harvesting contractor demographics in 1979, 1987, and 1997 in Arkansas

Demographics	1979	1987	1997
Contractor			
Average age (yr)	42.7	46.4	45.6
Education (yr)	8.8	10.5	11.9
Employees	3.2	5.7	5.4
Time in business (yr)	12.5	16.9	17.0
Median production level			
Cords per week	50.0	200.0	400.0
Average production			
Cords per week	77.1	231.1	310.5
Cords per man per week	24.7	40.6	57.5
Required capital			
investment ($)	96,500	500,000	>1,000,000

In a study at the Arkansas Forest Resource Center, I found that using a one-chain buffer on the streams tied up about 8 percent of a tract's previous timber area. This is a one-time loss to the total land area. The second cost associated with SMZs is the increase in operating cost due to restrictions in skidding patterns. SMZs can lead to suboptimal harvest layout. When we impose the SMZ no-penetration restriction, it becomes more costly to harvest tracts because of increased skidding distances. Some of this increase in cost can be diminished by the judicious use of low cost, portable timber bridges to traverse SMZs. However, not all areas have easy solutions, and operating costs are generally increased when SMZs are present.

In addition to BMPs, a general tightening of harvest regulations by local and State governments threatens to stifle procurement operational patterns. This is perhaps the greatest long-range fear that operating managers have. As a nation, we are clearly schizophrenic. Our manifest market place actions are for avaricious consumption, whereas we also choose to increasingly regulate production for environmental reasons. We may be painting ourselves into a production corner from which we cannot extract ourselves.

Summary of the Prevailing Conditions

Increasing demand alone would present enough problems for forest industry. But, when this is exacerbated by (1) decreased production in the PNW; (2) rising real prices for stumpage; (3) fewer, but more capital intensive harvesting contractors; (4) increasing mill requirements; (5) a decreasing land base; and (6) increasing harvest restrictions, two facts emerge. First, the problems of producing, aggregating, and delivering sufficient quantities of wood to mills will increase exponentially in the future. Second, there will be an associated rise in procurement cost due to economic scarcity of roundwood.

BASIC ECONOMIC QUESTIONS

Market economists are concerned with questions of allocation and distribution. Allocation questions are ones of production: who will produce the goods and at what cost? Distribution questions are ones of the flow of products: who gets the goods and services and at what cost? An additional question is that of *Qui Bono*?, or who benefits?

For society and the forest products industry in Arkansas the questions are

- Who will grow the wood?
- Will quantities be sufficient to provide adequate shelter and other wood-based products?
- How much will it cost?
- Is this production—consumption level sustainable?
- Are existing incentives to invest in forestry sufficient?

THE ARKANSAS FOREST CONDITION

The preamble to this point has been long, didactic, and, perhaps, too abstruse. But, without the background it is hard to appreciate Arkansas' forest industry position. The forest land distribution by ownership in the state shows only slight changes in all categories since 1987 (table 2). The 2-million-ac increase in the nonindustrial ownerships is due to CRP and SIP plantings, as well as improvements in reporting. The important statistic, however, is the approximate percentage of forest land by ownership because this provides some fundamental insights into the problem of production allocation.

When we look at softwood growing stock by ownership, there have been some subtle, but significant shifts since the 1987 study (table 3). Harvest percentages were not in line with growing-stock inventories in 1987, and the gap between inventory and harvest has grown in the 1997 study. Specific warning signs include the shift in harvest percentage on nonindustrial lands and the continued reduction in harvest on public lands. The softwood growth-

Table 2—Distribution of Arkansas forest land by major landowner group, 1987 and 1997

Landowner group	1987		1997	
	Million acres	*Percent*	*Million acres*	*Percent*
Industry	4.32	27	4.53	25
Nonindustrial	8.64	55	10.65	58
Public	2.88	18	3.20	18

Table 3—Distribution of Arkansas' softwood growing stock, harvest source, and growth-to-drain ratios by landowner group, 1987 and 1997

Landowner group	Growing stock		Harvest		Growth-to-drain ratio	
	1987	1997	1987	1997	1987	1997
	Percent					
Industry	39.0	37.6	51.0	48.4	1.2	1.4
Nonindustrial	40.0	40.0	39.0	43.4	1.5	1.1
Public	21.0	22.4	9.0	8.2	1.3	1.7

drain ratio has improved on industry lands since 1987. This is due primarily to plantations coming on line. However, the increasing heavy reliance on nonindustrial lands for softwood furnish has knocked the growth-drain nonindustrial ratio from 1.5 to 1 (1987) to 1.1 to 1 (1997). Clearly, if this marginal change continues in the same direction, we will soon be mining nonindustrial softwood reserves.

For hardwood growing stock, there have been some major changes since 1987 (table 4). Industry has maintained its position of eliminating upland hardwoods from pine sites. This is revealed in a major shift in growing-stock percentage decrease from 23 to 15.6 percent. This reduction in total hardwood growing stock has in turn shifted the percent hardwood allocation for the nonindustrial lands from 56 percent of the hardwood inventory in 1987 to 59.5 percent in 1997. Specific warnings for hardwood include a growth-drain ratio of < 1.0 on industry land, a reduction of the growth-drain ratio from 2.3 to 1.2 to 1 on nonindustrial lands, and an increase of growing stock, and the growth-drain ratio on public lands.

Total softwood and hardwood growing stock shows the same patterns that were present in the individual components but highlight the problem of falling growth-drain ratios on industry and nonindustrial lands generated by reductions in the public land harvest (table 5). It is difficult to try to balance public harvest reductions by increasing harvest on nonindustrial lands to meet mill needs. The result is obvious in the falling aggregate nonindustrial growth-drain rate.

Questions of allocation will always be present in supply-side economics. Although the Arkansas industry is only a subset of a much larger industry, the problems of increasing demand on a diminishing base are apparent.

The distribution of acres by site class by ownership shows that, in aggregate, the best sites belong to forest industry. The mode for industrial sites is in the 85- to 120- ft^3-per-year class, whereas nonindustrial sites are more heavily concentrated in the 50- to 85-ft^3 class. Part of the explanation for this lies in the concentration of nonindustrial sites in the Ozarks, but, the nonindustrial sites, in aggregate, are just not capable of producing as much timber annually as industrial sites are. This is significant considering the demands being made on nonindustrial sites to replace public land production.

The perennial problem of low stocking on nonindustrial lands continues. Twenty-six percent of nonindustrial lands are 60 percent or less stocked, and 82 percent are at < 100 percent stocking. In contrast, industrial lands are 64 percent < 100 percent stocked. However, the majority of these industry lands is in plantations or young growth and is entering or is on the steepest part of the growth curve. Nonindustrial lands, on the other hand, suffer from the perennial cut and leave syndrome. We know this because

Table 4—Distribution of Arkansas' hardwood growing stock, harvest source, and growth-to-drain ratios by landowner group, 1987 and 1997

Landowner group	Growing stock		Harvest		Growth-to-drain ratio	
	1987	1997	1987	1997	1987	1997
	- - - - - - - - *Percent* - - - - - - - -					
Industry	23.0	15.6	29.0	28.3	2.0	0.6
Nonindustrial	56.0	59.5	62.0	68.3	2.3	1.2
Public	21.0	24.9	9.0	3.4	4.4	7.8

Table 5—Distribution of Arkansas' total growing stock, harvest source, and growth-to-drain ratios by landowner group, 1987 and 1997

Landowner group	Growing stock		Harvest		Growth-to-drain ratio	
	1987	1997	1987	1997	1987	1997
	- - - - - - - - *Percent* - - - - - - - -					
Industry	30.0	25.1	44.0	40.5	1.3	1.2
Nonindustrial	49.0	51.1	47.0	53.1	1.8	1.2
Public	21.0	23.8	9.0	6.4	2.6	3.0

of the concentration of nonindustrial stands in the pole class. Equally apparent, from this figure, is the concentration of sawtimber-sized trees in public ownership. The balance of stocking, size-wise, for nonindustrial lands is not as good as industrial lands. Finally, the aggregate growth rate for nonindustrial softwood is significantly lower than for industry.

Lower growth rates, low stocking densities, a predominance of pole-size timber, and decreased growth-drain ratios for both softwood and hardwood indicate that nonindustrial forests are under extreme pressure. Given continued increases in demand, increasing mill requirements, and the inherently long growing cycles for trees, the aggregate statistics will probably worsen in the future.

IMPLICATIONS FOR THE FOREST PRODUCTS INDUSTRY

Although the changes in acreage categories are not significant, the utilization pattern is. Public demand has all but shut down public lands as an industrial timber base. Regardless of whether you view the long-term effects from an ecological or industrial production standpoint, these forests clearly have been dedicated to other uses. The current production allocation problem is how to replace the loss from public forests. The first response by industry has been short-term price run-ups along the supply curve as we are currently facing. However, this will not answer the long-term challenge of shifting the supply curve to the right to provide more timber at all prices. In the absence of reopening public lands, the challenge clearly is that of bringing the aggregate productivity of all private land to its maximum potential. In most cases, at least when we consider softwood, industry has done, or is doing this. Growth-drain ratio changes are evidence of this. Whereas industrial lands are not yet at the 95 percent percentile, they are nearing their maximum productivity.

The largest area for marginal improvement obviously is raising aggregate productivity on nonindustrial lands. Nonindustrial productivity is much higher in Georgia and Virginia where strong industrial leadership has brought about significant changes in nonindustrial stocking and productivity. Some Arkansans take pride that their nonindustrial lands have been managed on a “harvest and take what God provides” basis. Decreasing growth-drain ratios in the face of ever increasing demand portends the disaster of this thinking in the long run.

New technology, such as OSB, gave the industry some breathing room by using smaller diameter trees to make a panel product that could compete with southern plywood. This is fine as far as it goes. Modern pulping technology can accommodate juvenile wood from short rotations. The only problem, again, is productivity. The challenge is in developing harvesting and mill systems capable of processing multiple low-volume stems in order to maintain high volumes per hour. Finger splicing, laminate construction, and inside-out beams for dimension stock can provide us with new solutions to declining saw-log size. But the basic and most serious challenge remains: how to produce more wood out of fewer acres faster.

Shorter rotations on some industry and responsive nonindustrial lands will help fill this need. But, Arkansas has had a long tradition of providing high-quality dimension stock from its sawmills. As the last of the big pines are cut, this competitive edge will evaporate; and we will be left with fewer and fewer acres of sawtimber growing stock on our nonindustrial lands.

It is a common belief among industrial foresters that most nonindustrial landowners are poor managers. Active nonindustrial landowners counter this challenge and point out that they are following and responding to market forces. They challenge the industry to pay more for stumpage and to provide better management incentives. Perhaps they are correct. It is not hard to sell timber management when log prices are $450 / MBF Doyle, and internal rates of return appear to be 15 percent or so. But, it is surprisingly easy for a landowner to just let things grow at $240 / MBF, as it was in September 1996, if they don’t have a current fiscal emergency.

In order to shift the supply curve to the right for nonindustrial lands, either a significant number of new acres must be planted or regeneration must be keyed to harvest. As industry knows, this is the principal method of increasing productivity of forest land. Industry has been doing this on their own lands for years, strongly believes in it, and would find it anathema to let a 100-ac tract lay out of production for 2 years without regenerating it in some way. Given increasing demand for wood products, perhaps it is time to consider this mentality for nonindustrial lands as well.

SUMMARY AND CONCLUSIONS

World demand for forest products will continue to increase. U.S. consumption will continue to rise as well and at a rate greater than the world average. Arkansas’ forest products industry will be under continuing pressure to increase production to meet this demand. Increasing mill size and increasing capital intensity of harvesting contractors have compounded procurement problems. These requirements, coupled with real price appreciation for forest products, will increase the cost of supplying mills in the future.

Arkansas’ forests have undergone major changes in utilization since the last survey. Public forests have largely been pulled out of the commercial timber base. This has shifted the supply burden to industrial and nonindustrial lands. Sharp declines in industrial hardwood and nonindustrial softwood and hardwood growth-drain ratios reflect extreme pressure on the commercial forest base. Industrial lands are near full productivity, but nonindustrial lands continue to show signs of lack of postharvest regeneration and generally lower stocking levels than industry lands. Baring major changes in nonindustrial management activities, growth-drain ratios will continue to fall, and inventory mining will commence. A major campaign, spearheaded by forest industry, could help in reforestation of nonindustrial lands. A major component of this would be tying regeneration to harvest of forest lands.