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Exporting Hardwood Pulp Chips: Economic Impacts to New Hampshire

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Introduction and Background Statements

This report is based on research that estimates the economic gains to rural New Hampshire communities and the State from increased utilization of surplus low grade logs and residue, resulting from the establishment of a potential wood chip export program. Direct economic benefits are measured for both public and private landowners, consulting foresters, wood harvesters, chipping and trucking operations, and activities at the Port of New Hampshire. Indirect, often called spin-off, economic benefits also are estimated for the State using a state level input-output model. It was developed by researchers in the Department of Resource Economics and Development at the University of New Hampshire.

This topic is timely and important from several viewpoints. The State has recently adopted a policy objective of expanding export markets for renewable natural resource products. The forestry and wood products industries have sought economic information in terms of feasibility of these ventures. Also, the Port of New Hampshire has been exploring the operational feasibility of exporting wood chips in conjunction with the expansion project of the shipping facilities. This integrated analysis may be used by decision makers as a basis for potential public investment in new or expanded infrastructure.

To understand potential economic gain from any new economic activity, it is important to assess the current state of the rural economy. Currently, the forest products sector is marked by underemployed labor and capital resources. Opportunities in complementary agricultural enterprises continue to decline for this surplus labor resource. For instance, dairying continues its long term trend of fewer farms, fewer cows, and increased substitution of capital for labor resources. Tourism, often the most accessible local alternative employment sector, tends to be seasonal, offers low wages and part-time work. It is dependent on favorable weather and generally good economic conditions throughout the country and to a lesser extent, internationally. In general, given the decline in rural New Hampshire economic activity, the need to study alternatives for increased employment and expanded business activity is paramount.

Wood chipping is an established industry in New Hampshire. The State's nine wood-fired electric plants purchased over one million tons in 1992, from New Hampshire sources. However, this represents only 10 percent of the annual tree growth. Recent purchases and continuing negotiations for additional purchases of these plants or buyouts of existing contracts by their public utility purchaser have added uncertainty for established markets for biomass (whole tree) wood chips. It remains to be seen what the final disposition will be of the plants that entered into sales agreements with Public Service of New Hampshire. Additionally, paper mills have indicated a desire to sell surplus chips from their extensive land holdings. Therefore New Hampshire is well poised to capitalize on the projected increase in world demand for pulp wood chips, because the Port of New Hampshire is a deep, year-round port capable of handling large vessels. Expanded harvesting of the plentiful renewable chip-graded wood continues to be a major silvicultural recommendation by the State Forester and the New Hampshire Timberland Owners Association. This practice stimulates growth of trees of higher quality and value for the production of veneer and lumber. New Hampshire has established a record of harvesting and utilizing wood chips in an environmentally sound manner. The State has over 250 licensed foresters available to oversee sound management practices.

The value-added product under consideration in this report does not compete with existing products or users. These chips are produced from random length stem wood that is of inferior quality and can not be utilized by sawmills to produce lumber. Prevailing market prices insure that sawlogs will not be chipped. Likewise, the export value for hardwood pulp chips is above that currently being offered for biomass chips, so the incentive exists to utilize the higher valued market for this product. Thus, it appears that the State and the forestry sector could be in a win-win situation should the export activity become a reality.

The Findings

The following sections highlight the details and direct impacts of this potential economic activity at the major processing sectors, under most likely scenarios. The order of this discussion will begin when a loaded vessel moves beyond the Isles of Shoals under her own power. This could be considered the final product or final stage of economic activity. The discussion continues backwards through the necessary steps to produce that loaded vessel, ending with the tree harvesting at New Hampshire woodlots. The spin-off or indirect impacts to the State from this exporting activity will then be presented followed by a brief discussion of other positive benefits accruing to New Hampshire's woodlot owners.

The findings of this study were based on the following key assumptions:

- A single chipping plant located 35 miles from the Port of New Hampshire;
- Wood chips transported by truck to the Port of New Hampshire;
- 50% of the wood supplied from New Hampshire woodlots (the remainder would come from Maine and Massachusetts woodlots);
- Export shipments consist of 30,000 tons of mixed hardwood pulp chips per vessel.

Vessel Loading Activities

These expenses include piloting the vessel up the Piscataqua River, securing it to the dock, clearing immigration and US Department of Agriculture regulations, loading the vessel with the chips, undocking the vessel, and piloting the vessel from the Port of New Hampshire to the open sea. These data were supplied by personnel from the New Hampshire State Port Authority and the pilot and stevedore companies currently serving the Port.

The stevedore company has indicated that for the initial load, it will provide dockage, wharfage, and terminal usage activities for $138,000 or $4.60 a ton. Of course, after the initial vessel this figure may be adjusted upward or downward based upon the actual results. It is estimated that this activity will require 40 workers over an 8-day period.

Pilot fees are based upon pilotage units and are specific to each vessel. A pilotage unit is calculated as follows: overall length x extreme breadth x depth to upper most continuous deck divided by 100. For a typical chip hauling vessel, these charges would be $2,580. After arriving at the dock, an additional charge of $1,075 would be incurred for the linemen.

The current charge for immigration and US Department of Agriculture activities is $400.

The major activity and expense is wharfage. There could also be other economic activities undertaken at this stage or location. They would include insurance, brokerage, and banking services. These activities were not included in this study as they are dependent upon many factors concerning the business arrangement between buyer and seller and they may even be undertaken at the receiving port or country. Hence, the estimates presented in the section and the following sections should be construed as conservative or minimum economic benefits.

Chip Hauling

The chips will be transported from the chipping plant by semi-trailer trucks. These trucks and drivers may come from existing chip haulers with surplus capacity or transporters looking to expand their operation. The one-way distance is 35 miles and the trailer capacity is 28 tons. The trucking charge is based on a rate of $2.25 per loaded mile. Based on these assumptions, the hauling activity generates $84,420. Again, this is a minimum since it was assumed that no loss of material would occur between the plant and the ship. However, this analysis is based on full loads and this results in an extra .6 tons being delivered to the Port. In all likelihood, several additional loads may be necessary.

It will be necessary to deliver 1,072 loads to the Port for each vessel. The logistics of moving this quantity of chips becomes an interesting case and could potentially be the determining bottleneck when projecting the economic impacts from maximum annual shipments. A likely scenario involves stockpiling chips at the Port over a period of time. When the vessel arrives, loading would involve chips from the stockpile and, simultaneously, chips directly from arriving trucks.

Depending on how much of the Port's facility is dedicated to chip storage, the employment impacts can be estimated for truck drivers. Assuming that 60% or 18,000 tons can be stockpiled, another 12,000 tons has to be delivered over the projected 8-day loading period. It will require 11 trucks and drivers making three trips a day for 20 working days to move the 18,000 tons to the dock area from the chipping plant. Then during the loading phase, it will require another 10, for a total of 21 trucks and drivers making three trips a day to deliver the remaining 12,000 tons during a seven day period to finish the load. This timetable allows for a final day of vessel loading without truck deliveries.

It is quite apparent from these logistics that the upper limit for shipments would be 12 loads a year. Possibilities do exist that would allow more frequent shipments. One such case would be improvements in the time to transport the chips and load the vessel. A scenario with rail transfer from the chipping plant and direct loading from the cars would be a likely case if long term commitments and future demands warrant increased quantities. It could be expected that loading time will decrease with logistic experience.

Chipping Plant

The hypothetical or representative chipping plant would be located 35 miles from the Port. The mileage limitation is based on industry experience with feasible hauling distances of chips. This chipping plant would attract producers and sellers of random length round wood from distances up to 100 miles. It is estimated half of the round wood would be supplied from out of state sources. The plant would be located on a 10-acre site with easy access to state highways and possibly rail access for future growth.

The chipping plant layout would be patterned on existing plants in New Hampshire. This entails three or four buildings. The main building, of course, would house the chipper and this is where the logs are debarked, chipped, screened, and placed in the overhead bins for loading. Options exist for the actual chipper, ranging from small portable chippers with a 40,000 ton capacity per year to large permanent chippers with capacities over 300,000 tons per year.

It is assumed this plant would have a per shift capacity of 150,000 tons and operate using two shifts. Initial investment for land, buildings, and equipment would total $2 million. The chipper would require refurbishment every five years if used at full capacity. Employment will total 20 on a full-time basis. This includes two shifts of 9, a plant manager, and one general office person.

Additionally, local property taxes on land and buildings would range from $5,000 to $7,500 depending on the particular community and tax rate.

For the plant to produce 1 ton of chips, it must purchase 1.175 tons of round wood to off-set the loss due to bark and screenings. Each 30,000 ton vessel load requires 35,250 tons of round wood for chipping. The delivered price was assumed to be $18 per ton. Of the $634,500 total purchases per vessel load, $317,250 would be from New Hampshire sources. The full economic cost of chipping a ton of final product is estimated at $12.85. This results in a per vessel load total economic benefit of $385,500 distributed to plant employees and payments to plant and equipment, taxes, management, and risk.

In addition to wood chips, a by-product is also produced during this process. Approximately 4,500 tons of bark are generated per vessel load. This by-product has value to the plant and can be sold in various forms at different prices ranging from $8 per ton for bark fuel to $27 per ton for processed bark mulch. The particular product that is marketed would be plant-dependent and the resulting revenues are not included in this study. Nonetheless, a bulk sale price of $10 per ton results in additional revenues of $45,000 per vessel load.

Wood Harvesters

The logging community in New Hampshire would be expected to provide 17,625 tons of random length round wood per vessel load. An equal amount will have to be procured from Maine and Massachusetts. The value added for this stage is $229,125 or $13 per ton, including both harvesting and transportation to the chipping plant.

This additional outlet for wood could generate employment opportunities for logging crews currently underemployed or for those operators seeking to expand their business. It could also act as a buffer to the changing economic conditions in other traditional markets such as saw logs, pulp wood, and fuel chips. The actual number of wood harvesting crews that will take advantage of this new market is unknown and would ultimately depend on the current business situation with regard to changing markets and excess capacity of their equipment. It may well be that new firms will enter the industry or established firms will expand.

To illustrate the employment impacts, the number of full-time equivalent crews will be calculated. For these purposes, it is assumed each crew will work 22 days a month and the required vessel load tonnage will be harvested in a month. If all the wood was harvested by a 3-person conventional cable skidder crew, it would take 20 crews to meet this quantity. If, on the other hand, the wood was harvested by a 6-person shear, grapple skidder crew, it would take 10 crews to meet the tonnage requirement. In each case, 60 full-time workers would be employed per vessel load of chips.

Obviously, some combination of crew types, say 20% shear and 80% conventional, will prevail. However, the full-time employment equivalents will remain at 60 workers. It is easy to see that exporting chips has the potential to benefit 100 to 200 woodlot harvesting workers.

Landowners

New Hampshire woodlot landowners would receive stumpage payments on the 17,625 tons of random length round wood per vessel load. An average stumpage of $5 per ton was used in this study. After accounting for consulting and yield tax expenses each vessel load of chips could generate $74,554 for the landowner.

Consulting Foresters

Some private landowners will employ consulting foresters to help them in the sale of their logs. Based on projections of 90% of wood from private holdings, 40% of those woodlot owners utilizing the services of consultants, and a fee of 15%, this generates $4,959 in consulting income over a one month period.

Town and Cities

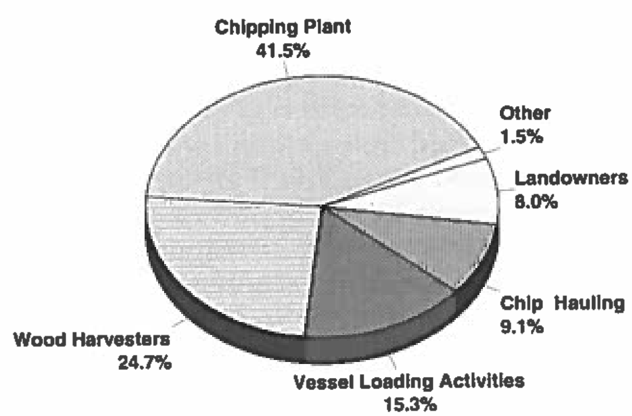
Town and cities, where the logs are harvested, would also receive direct payments from the exporting activity. In aggregate, the timber yield tax amounts to $8,813 per 30,000 ton vessel load. Since this tax is based upon stumpage value, towns and cities receive more than if the stumpage was based on lower values associated with fuel chips, for example.

Direct Benefits to New Hampshire

The direct economic benefits from exporting mixed hardwood chips have been delineated for the major categories or stages as one works backwards from a loaded vessel at the Port of New Hampshire to the woodlot. These direct benefits to New Hampshire's economy were estimated at $929,226 per load. Value ratios that measure the relative size of the contribution at each processing stage were calculated. They are shown in Figure 1.

Figure 1

VALUE RATIOS AT SELECTED PROCESSING STAGES FOR 30,000 TONS OF MIXED HARDWOOD PULP CHIPS EXPORTED THROUGH THE PORT OF NH



- New Hampshire's portion equals $929,226
- Entire shipment totals $1,246,475

Multiplier Effect

Transactions in the New Hampshire economy have impacts that go beyond the originating exchanges between buyers and sellers. A part of the original transaction will be used to purchase other goods and services and a part will be saved. That simple concept leads to the well known multiplier effect. Input-output analysis provides a way to measure and assess the multiplier effects on different sectors of the economy due to a change in final demand in one of the sectors. For example, a wood chipping plant purchases inputs, such as round wood, durable and nondurable goods to maintain and operate the plant, and labor. An increase in demand for the final output, measured in tons of chips or an equivalent dollar amount, would lead to a direct increase in the amount of inputs used by the plant. Those direct effects, however, are just the first and largest wave in a sea of ripples that will follow. Firms that sell their output to the chipping plant will experience an increase in the demand for their product or service. The same is true of other industries that sell inputs to the firms supplying the chipping plant. The increased sales by those sectors are indirect effects stemming from the increase in output from the chipping plant. Because those industries now produce more output, they in turn will increase their purchases of inputs. The ripples created from the original change can be far-reaching depending on the economy's structure. Input-output analysis is used to trace through the economy those direct and indirect effects that emanate due to a change in final demand and assess their impact on the other sectors. Multipliers derived from an input-output model provide estimates of these effects on output throughout the economy.

The New Hampshire model was developed by adjusting the very detailed 537-sector national input-output tables prepared by the Interindustry Economics Division, Bureau of Economic Analysis, U.S. Department of Commerce. After deciding on the level of aggregation, 57 sectors were chosen for inclusion in the model. New Hampshire employment, wage, and output data were collected.

The following simplified steps were then taken to adjust the national tables to New Hampshire:

1. Price update the 1977 national table;
2. Remove comparable imports from the national table;
3. Adjust the industry mix to parallel that of New Hampshire;
4. Derive the direct requirements table, which is a sector-by-sector matrix indicating what each purchasing sector requires in dollars from each producing sectors to increase output $1, and
5. Adjust for regional trade patterns.

The model as constructed gives estimates for combined businesses and analysis rather than for a very specific activity such as exporting wood chips. The sector containing the wood chipping activity covers all wood products. It is this sector that the indirect economic benefits are based upon. Input-output models provide for several types of multipliers. What is called a Type I multiplier is based upon the ripples or continued economic activity in the business and government sectors. Another multiplier, called Type II, accounts for the additional economic activity that emanates from the money received by all households connected to firms benefiting from this activity.

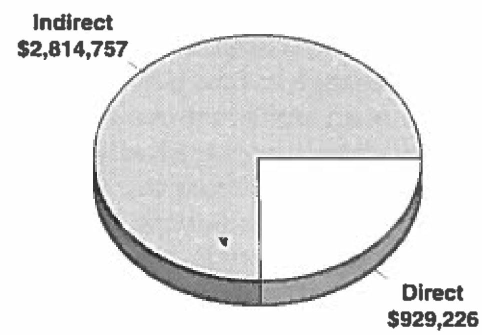
The Type I output multiplier for the sector containing chipping activity is 1.85, indicating that the direct and indirect impact to New Hampshire's economy from a $1 sale of hardwood chips is $1.85. Applying this multiplier to the total output from the plant for a single vessel load of chips results in the total economic impact to New Hampshire's economy. This impact amounts to $2.04 million per vessel load.

The Type II output multiplier for the sector containing chipping activity is 3.39, indicating that the direct and indirect impact, including household activities, to New Hampshire's economy from a $1 sale of hardwood chips is $3.39. Applying this multiplier to the total output from the plant for a single vessel load of chips results in the total annual economic impact to New Hampshire's economy. This impact amounts to $3.74 million per vessel load.

Given the nature of input-output models and the dynamics of foreign markets, the total economic impact associated with exporting a 30,000 ton vessel load of mixed hardwood chips would fall in the 2 to 3.7 million dollar range. The direct and indirect impacts to New Hampshire's economy are highlighted in Figure 2.

Figure 2

DIRECT AND INDIRECT IMPACTS TO NEW HAMPSHIRE'S ECONOMY PER VESSEL LOAD



• Total per Vessel Load $3,743,983

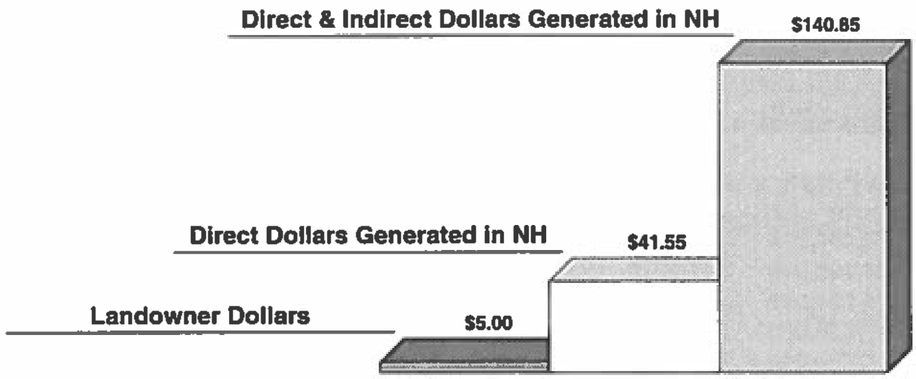
Value Factors

Another method to illustrate the total value of this renewable natural resource to the State's economy is to construct value factors. These factors, specific and unique to this study, measure the magnitude of the economic activity associated with exporting mixed hardwood chips in terms of multiples of the original value of the hardwood at the stump.

The value of chip quality hardwoods on the stump at $5 per ton may seem low and of little consequence to the State's economy. However, $36.55 of value is added or created by processing and transportation in New Hampshire. This translates to a Value Added Factor (VAF) of 7. The total economic impact to New Hampshire from a ton of stumpage exported hardwood chips is $140.85, which can also be stated via a Chip Export Factor (CXF) of 28. This CXF represents the multiple effect of each $1 of hardwood stumpage sales throughout all sectors of the economy. The dollar amounts of these factors are illustrated on the next page in Figure 3.

Figure 3

ECONOMIC VALUES TO NH FROM A TON OF HARDWOOD STUMPAGE DESTINED FOR EXPORT AS PULP CHIPS



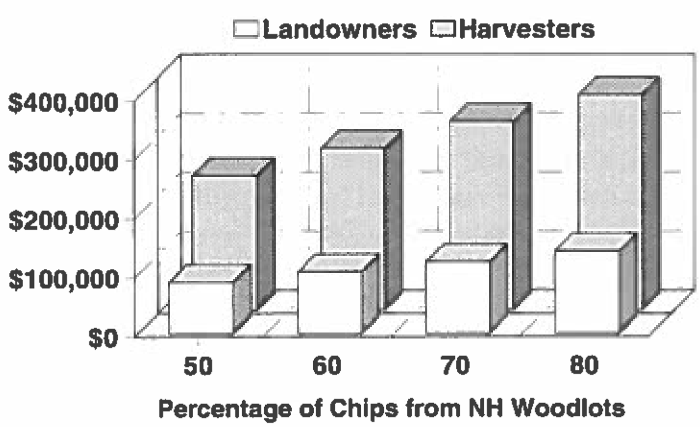
Sensitivity Analysis

Even though the projected direct economic impact to New Hampshire of $929,226 per vessel load of chips appears to be an attractive boost to the economy, it was based upon the assumption that reflected current procurement patterns. This section poses the question, "What if?" That is, what would be the impact of increasing the proportion of random length round wood that was harvested in New Hampshire from the assumed value of 50%? This increase could come about from several areas. Once this export activity is established, aggressive purchasing efforts may secure more local wood. This could result from landowners using income from this new market outlet to offset or subsidize their timber stand improvement activities. Another likely method of increasing the wood supplies from New Hampshire is enhanced transportation systems of the chips to the Port or even logs to the chipping plant. Since the Port has a rail line on site, it is likely that rail transport will replace trucking.

As more and more stumpage is procured from New Hampshire woodlots, the share from a vessel load attributable to wood harvesters and landowners increases. In fact, for each 10% increase in chips from New Hampshire, harvesters receive $45,825 and landowners get $17,625. These increases in direct benefits are shown in Figure 4.

Figure 4

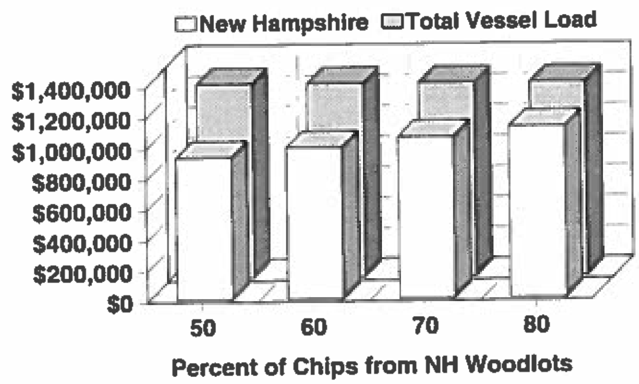
NH Landowners & Wood Harvester Revenues from Increasing Utilization of NH Wood



The relationship between how much value is injected directly into the New Hampshire economy versus the total value generated by a vessel load of chips is shown in Figure 5. The assumptions used in this study result in 75% going into the State's economy. For each 10% increase in New Hampshire supplied chips, the economy would gain directly by $63,450 or 5% of the vessel load value.

Figure 5

NH DIRECT ECONOMIC IMPACTS FROM INCREASING UTILIZATION OF NH WOOD



Additional Benefits

Other significant economic benefits from wood chipping relate to increased adoption of forestry and wildlife management practices made possible by this source of additional landowner income. It has been estimated that over 70% of New Hampshire's forests are overstocked, with the majority of the wood fiber on these timberlands being low or poor quality. Wood chipping has allowed harvesting operations to be conducted on some of these timberlands which before could not have been operated profitably. Chipping operations allow harvesting of the low quality timber leaving the quality timber to mature. The improvement of the remaining timber stand also provides a vehicle for wildlife habitat management. Additionally, this source of periodic income helps landowners meet the ownership costs of open space land.

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Natural resource professionals are working toward improved ways to conserve and use the natural resources of New Hampshire. The Natural Resource Network was formed to improve the interaction among researchers and those who provide outreach education in many kinds of programs. Teachers, outreach professionals and resource managers can bring research-based education to diverse audiences. At the same time, those audiences, or consumers, identify issues and needs for educational programs which can be addressed by controlled research. Well informed and knowledgeable professionals, free-flowing exchange of information, an advantageous and gratifying professional environment, and natural resource planning are goals of the Natural Resource Network.

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