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THE ECONOMIC VALUATION OF COMMUNITY FORESTRY: ANALYTICAL APPROACHES AND A REVIEW OF THE LITERATURE

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- *Forests generate recreational opportunities, wildlife habitat, biological diversity, carbon sequestration, air and water quality, viewscapes and rural lifestyles in addition to wood.*

- *Only to count the jobs and income generated by wood production will overvalue the contribution of industrial forest management relative to community forest management to community welfare.*

- *Existing market and nonmarket economic valuation techniques inform our understanding as to the likely direction and magnitude of these various values forest management alternatives might generate.*

Introduction

Community Based Forestry (CBF) implies commitment to the long term ecological, economic and social well being of forest dependent communities. CBF, or community scale sustainable forestry, constitutes a departure from industrial forestry due to this commitment to the preservation of the ecological integrity of the forest ecosystem in perpetuity and to the maintenance or improvement in the quality of life in the host or gateway community in addition to seeking profits from forest products sales (CDS et al., 2000).

CBF and CFOs present a substantial analytical challenge. Here, we identify the potential sources of economic benefit derived from forest related activities and how they may tend to vary across management alternatives. We review what the academic literature has to offer regarding these sources of economic benefit. This analysis simulates the perspective of a hypothetical forest dependent community facing an uncertain future. It attempts to systematically address the question of the appropriate economic development path for a community to follow when faced with the following potential alternatives: industrial forestry, community based forestry led by a private cooperative or nongovernmental organization, or community scale natural resource based development without attempts at private coordination (i.e., no management).

Although wood is a primary, potentially focal, economic output of forest management, forests potentially generate a great variety of economic goods and services including recreational opportunities, wildlife habitat, biological diversity, carbon sequestration, air and water quality, viewscapes and rural lifestyles. If

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we were only to count the jobs and income generated by wood production we would create a highly inaccurate view of the role of forests in the economies of forest dependent communities and, quite likely, overvalue the contribution of industrial forest management relative to community forest management in their contribution to community welfare. The results of existing market and nonmarket economic valuation techniques inform our understanding as to the likely direction and magnitude of these various values forest management alternatives might generate or destroy at the local or broader spatial scale.

Community Scale Forestry Management Alternatives

For our purposes, industrial forestry is a management system that views forest resources as private property (whether they are found on public or private lands) and is motivated by firm level profits alone. Community forestry is seen as a management regime motivated by long term ecosystem health and economic development at the community scale, not simply profits. No management is viewed as the management alternative that is neither industrial, nor community.

Due to the power of financial incentives, it is most likely that community forestry and no management are the actual management alternatives facing a community. It is not likely that community forestry and industrial forestry are, in fact, choices that communities have. It is more likely that community forestry evolves from a situation where industrial forestry was not ever or is not currently sufficiently profitable to attract industrial forestry and where the "no management" alternative is present immediately prior to the decision to move forward with a community solution. Financial incentives may be driven directly by market forces, by ecological factors, the legal or social context, and/or by federal, state or local policies. In essence, we are trying to set up an investigation of what is gained or lost in those communities where these three development alternatives may be available, yet only one path can be chosen in a particular place and time.

We envisage that forest stewardship will differ across two institutional dimensions: ownership (i.e., public or private) and management (i.e., industrial, community, and no management) (Table 1), resulting in a broad typology of six potential stewardship arrangements. We, thereby, define stewardship as a combination of ownership and management dimensions wherein "good" stewardship implies ecological, economic and distributional objectives are likely to be met. Under conditions of perfect information, we would be able to describe in detail the likely stewardship implications of adopting one management style over another, given the property institution in place. However, we are unlikely to have such detailed and generalizable information in practice. As a result, we will first describe the potential factors contributing to forest stewardship and then attempt to assess the relative contribution of each management style to each factor qualitatively (positive, neutral or negative). Then, we will look to the academic and gray literature to gauge the relative magnitudes and ranges of possible values each of the factors might take and therefore, the relative tradeoffs of adjusting the management scheme to improve stewardship over specific factors.

Although these calculations will certainly result in a partial depiction of the role of CBF in the economic development of forest dependent communities, they will provide a more complete picture than currently exists and point to specific areas of informational need in order to complete the economic analysis. Since we are analyzing CBF, an economic approach will provide only one part of an overall understanding of the implications of community development decisions made in forest dependent communities. Ecological and institutional pieces of the analysis, though not lacking in economic implications, are discussed elsewhere.

Measuring and comparing costs and benefits of economic development alternatives

In the spirit of benefits transfer studies, we searched the economic valuation literature for the features of forest stewardship discussed above that might vary

Table 1. Management and ownership dimensions of forest resources

	Ownership	
Management Style	(A) Public	(B) Private
(1) Industrial Forestry (private property)	1A	1B
(2) Community Forestry (common property)	2A	2B
(3) Idle/unmanaged (Status Quo) (open access)	3A	3B

across management regime and property institution. Table 2 provides an illustration of valuable forest stewardship characteristics, a qualitative assessment of the influence of management choices on that characteristic, the range of economic values found in the literature, and the sources of information where the values were published. All values have been corrected to commonly reflect 2005 US dollars, unless otherwise noted.

By identifying the reasonable ranges of values found in the current literature, local decision-making may be facilitated by comparing the published study's location to the focal locality along the more important descriptive and predictive dimensions. For example, if both locations are in the rural western United States and surround the private management of public forestlands, the published value is probably a reasonable substitute for conducting an independent, time consuming and expensive local study. If any of these dimensions vary, it is probably less dependable to adopt published values "off of the shelf." The long term vision is to create a model of community decision-making around forestland management that is transferable to other forest dependent communities facing similar economic development alternatives.

Consumptive uses: Wood products

The most obvious economic benefit of forestry is the harvesting and processing of commercial wood products. We reason that "no management" of either publicly or privately owned forest resources will result in no commercial wood products, while both community and industrial forestry will result in some valuable extraction of wood. However, the volume, time profile/ rotation and variety (and, therefore, sustainability) of wood products harvested will vary substantially between community forestry and industrial forestry management models.

Industrial forestry is oriented toward large diameter timber extraction, commonly involving clearcut harvesting. It is likely that wood extraction using the industrial management model is the most profitable method to harvest large diameter timber. However, it is also likely that this is practically the only clear advantage of this sort of uni-dimensional management model. Raunikar and Buongiorno (2005) infer that non-industrial private forest (NIPF) landowners in the southern United States are willing to forgo as much as 60% of potential profits from timber extraction in order to maintain or increase stand diversity. Boltz et al. (2002) infer that industrial foresters are willing to pay $19.81-$40.50/m3 to avoid diverse forest stands due to the additional costs of forest harvest associated with diverse forests (Table 2).

Timber concessions on public lands can be considered the minimum value that a private company would expect to reap in gross benefits from harvesting timber. Examining private clearcut contracts within the state of Oregon reveals minimum bids of approximately $400-430 per thousand board-feet of harvested timber, great variation in the realized rate of extraction per acre and, therefore, in total contract sizes (Oregon Department of Forestry, 2006). The inclusion of labor, transportation and other costs would get the analyst closer to the real supply side of the situation. Local impact comes in the form of local jobs and income, tax base, and any local multiplier effects due to the harvesting and processing of timber locally and its sale outside of the focal region.

Community forestry tends to be more closely associated with small diameter timber extraction and processing. The US Forest Service contracts or sells permits to clear dead trees from its forests in order to reduce fire risk (addressed later). These trees are commonly used for firewood and posts. Firewood permits in the Wallowa-Whitman National Forest cost $5.00 per cord. A cord is 128 cubic feet or 2,662 lbs of wood. Lodgepole permits cost $0.03/linear foot (USDA-Forest Service, 2006). Community Smallwoods Solutions (CSS), a for-profit subsidiary of Wallowa Resources, sells cords of firewood for $100-125 (Table 2).

Among the most useful economic development strategies for natural resource dependent communities is to create opportunities to add value to raw harvested products through processing. Distinct from industrial forestry, community forestry organizations actively seek such local opportunities to add value. CSS has created additional products using the small diameter wood extracted from federal forestlands. These value-added products include erosion control products (i.e., Flow Check at $40-55 per unit) and stream recovery products (i.e., River Logs, priced from $250-700) (Table 2).

Increasingly, there is evidence that people are willing to pay for products which can be certified to have been produced with certain desirable attributes. Among the attributes people have been shown to be willing to pay for include "locally made," "organic," "sustainable," and "environmentally friendly" products. O'Brian (2004) found that consumers were willing to pay a small, but statistically significant, amount (up to 1%)

Table 2. Relative economic value of forest resources across management alternatives

	No mgmt	Industrial Forestry	Community Forestry	Lit Based Value Range	Units	Related Literature
Raw wood products – public	0	+	+	0.03-5.00	linear foot or cord	29
Raw wood products- private	0	+	+	50-125	Cord or pallet	6
Processed & certified wood products	0	-	+	0.015-0.041	US$ per attribute point	23
Non-timber products	+/0	-	+	38.36	Consumer surplus per day-trip	27
Non-timber products	+/0	-	+	2/day, 50/year	US$ commercial permit price	29
Stand diversity - Producer's value	0	-	+	60	% of foregone revenue	3, 5, 26
Stand diversity - Consumer's value	0	-	+	9.79-20.01	shadow price per m^3	2, 3, 5
Recreational opportunities	+/0	+/-	+/0	4.15-63.79	consumer surplus per day-trip	20, 22
Improved forest quality	0	-	+	55.86-92.16	WTP per household	3, 5, 17, 24, 30
Suspend logging	0	-	+	89.29	WTP per household	4, 24
Wildlife habitat	+/0	+/-	+	19-148	individual surplus per season	10, 31
Fire prevention & risk	0	+/0	+/0	44.45-722.20	WTP per household	1, 16, 20
Recreation & prescribed burns	0	+/-	+/-	12.73-166	consumer surplus per trip	1,10,11
Recreation & crown Burns/ Wildfires	0	+/-	+/-	7.93-123.74	consumer surplus per trip	1,10,11
D in jobs, wildfire-Local	0	-	+/-	18-66	jobs lost due to fire	1,3,5,28
D in earnings, wildfire–Local	0	-	+/-	0.59-1.15	US$ million lost due to fire	1,3,5,28
D in jobs, prescribed burn–Local	0	-	+/-	6	jobs gained due to fire	1,3,5,28
D in earnings, prescribed burn–Local	0	-	+/-	0.12	US$ million gained due to fire	1,3,5,28
D in jobs, wildfire-Statewide	0	-	+/-	1,240-1,941	jobs lost due to fire	1,3,5,28
D in earnings, wildfire-Statewide	0	-	+/-	23.31- 41.39	US$ million lost due to fire	1,3,5,28
D in jobs, prescribed burn-Statewide	0	-	+/-	186	jobs gained due to fire	1,3,5,28
D in earnings, prescribed burn-Statewide	0	-	+/-	3.97	US$ million gained due to fire	1,3,5,28

See works cited and consulted list for corresponding articles and websites. D indicates “change.”

(+) denotes positive values, (-) denotes negative values, (0) denotes neutral value or no discernable effect.

for a marginal increase in the scores for the focal attributes (Table 2).

Consumptive uses: Non-timber products

Forests managed in an industrial model are not likely to provide favorable conditions for the harvest of non-timber products such as medicinal products, mushrooms, herbs, honey and other sap based products, nuts and berries. Industrial practices discourage ecological diversity and often clear away ground growth, reducing the potential for these potentially valuable products. On the other hand, community forestry and no management are likely to create such opportunities, provided access can be arranged.

Wallowa-Whitman National Forest charges $2.00 per day or $50 per year for the commercial (for anything other than personal use) harvesting of mushrooms within the forest (USDA-Forest Service, 2006). Here again, these constitute minimum values for those purchasing the permits. Harvesting for non-commercial use is free, potentially creating an indirect (but non-zero) local benefit in the form of tourism or for local production and consumption in lieu of imported purchased products. For example, Starbuck et al. (2004) found that visitors holding permits to harvest berries and mushrooms in the Gifford Pinchot National Forest (Washington) were willing to pay an additional $38.36 per day to continue to enjoy gathering mushrooms and berries (Table 2).

Nonconsumptive use and nonuse values: Wildlife habitat, Biodiversity, & Recreation

The nonconsumptive use and nonuse values created through community forestry relative to no management and industrial management may differ substantially. However, since our interest is in local economic impact rather than total economic value, we have limited standing to only local people. Since a very high proportion of existence and bequest nonuse values accrue to people who are nonlocal, it is important to reiterate this point, as many arguments for the preservation of forest biodiversity are driven by these substantial potential benefits to nonlocal people. As a result, the differences in nonconsumptive use and, particularly, nonuse economic value generated by different management approaches will appear less stark.

In contrast to industrial forest management, community forestry promotes old growth forests associated with higher quality wildlife habitat and greater biological diversity (Borderlon, et al., 2000). In addition, community forestry will actively manage for these desirable attributes through forest thinning, reducing the risk of fire, insect infestations, diseases and other forest health problems (Oliver, 2003), unlike the no management option. These actions will contribute to recreation values for local residents and tourists alike as well as contributing to nonuse values at levels substantially greater than either industrial forestry or the no management alternative will produce (Oliver, 2003).

The Cedar River Group (2002) found that Washington state residents were willing to pay an average of $89.29 per household-year to suspend industrial ogging activities on Blanchard Mountain. Kramer et al. (2003) found that residents of the Southern Appalachian Mountains were willing to pay $55.86 per household-year to protect public spruce-fir forests from insect infestations or other forest health damaging events. The authors were able to identify $6.27 of the $55.86 as use value, $16.77 as bequest, and $31.84 as existence value for forest health. Walsh et al. (1990) found that Colorado residents were willing to pay some $92.16 per household-year to maintain healthy local public forest density. The use, option, existence and bequest values associate with the Colorado valuation were $25, $20, $20 and $27, respectively (Table 2).

Forests provide recreational opportunities for residents and tourists alike. The quality and quantity of recreational opportunities may vary by management regime. The economic benefits of recreation are somewhat difficult to trace since, often, when activities are undertaken on public lands, entry fees do not come close to reflecting the total willingness to pay for the recreational experience. Again, the economic value of the recreational experience should include indirect local expenditures on food, drink, hotel, and supplies in addition to the direct expenditures at the recreation site.

Loomis and Crespi (1999) found the average daily value of camping, backpacking and hiking, picnicking, and stream fishing on federal forest lands was $13.97, $24.65, $18.67 and $27.97, respectively. Wilman (1984) finds that hunters would be willing to pay approximately $35-278 per person-day for improvements in deer habitat quality. Table 3 illustrates the range of consumer surplus values (the additional amount that people would have been willing to pay but were not required to) calculated by McCollum et al. (1990) across ten focal regions across the United States. Substantially lower values can be expected for

industrial forestry, while somewhat lower values can be expected for the no management option given the arguments provided above (Table 3).

Fire prevention, risk and economic value enhancement/mitigation

Fire reduces or wipes out all economic values derived from forested lands. Management practices that reduce the frequency or magnitude of fire losses effectively increase (avoid loss of) the economic values discussed above. Industrial and community forestry can be expected to mitigate fire risk, no management can be expected to increase fire risk. Bergeron et al. (2004) found that even-aged (industrial) forests are more profitable than diversified forests when fire risk is low and community forestry is more advantageous when fire risk is high. The Oregon Department of Forestry reports that fire incidence is 30% over the historical average due to a prevalence of ground cover. Common community forestry practices would therefore be effective at reducing fire risk relative to industrial forestry or the no management alternative.

Loomis and Gonzales-Caban (1998) found that Oregon residents were willing to pay $44.55-132.89 per household-year to reduce fire risk by 50% in old growth forest areas. Kaval (2004) and Loomis (2004) investigated the effect of fire risk on homeowners on the forest fringe in Colorado. Kaval (2004) found that homeowners were willing to pay $559.10-722.20 to reduce the fire risk to their homes, while Loomis (2004) found that homes in a community near to where a fire had recently struck experienced of reduction in value of 15-16%, or perhaps $30,000-60,000 per house in the study area. Reductions in home value not only have personal wealth implications, they also result in lower tax revenues with which to fight fires or create a better community.

Hesseln et al. (2003, 2004) and Starbuck et al. (2006) investigated the effect of prescribed burns, as a wildfire risk mitigation technique, and crown fires on recreation demand in Colorado, New Mexico and Montana. They found that hikers and bikers positively valued the effect of prescribed burns ($12.73-166.00 per person-trip) and negatively valued crown fires ($7.93-123.74 per person-trip), providing support for forest thinning, deadfall clearing and other common practices in community forestry relative to no management. Starbuck et al. (2006) found that temporary forest closures due to wildfire cost the state of New Mexico approximately $3 million and 66 jobs during the 2001 summer season. The initial damage done to the forests due to the fire created a long term and economically important reduction the recreational value of the site.

Some studies could be used to show an increase in economic activity due to fire. That is, fighting fires provides additional external sources of funds (e.g., FEMA, USDA-Forest Service) employment to local people, brings fire fighters, who stay in hotels and spend money on local services, to the community. However, care should be taken to avoid counting natural disasters as economic benefits. Clearly, economic activity derived from calamitous events is short term and cannot be sustainable.

Concluding remarks

The current body of literature provides a clear illustration of the categories and relative magnitudes of impacts of community forestry relative to other forest management alternatives. However, it clearly falls short in direct application to particular cases or communities. Although input/output modeling provides a quantitative analysis of the economic impacts of programs, it does not completely capture the value of an organization. CBOs help to manage forest land that may otherwise be

Table 3. Value of outdoor recreation on federal forestlands, per person-day

Activity	Consumer Surplus
General recreation	$5.70 - $16.91
Developed camping	$5.13 - $26.12
Primitive camping	$4.15 - $32.97
Swimming	$14.84 - $40.33
Coldwater fishing	$13.31 - $42.91
Warmwater fishing	$18.75 - $19.48
Day hiking	$26.34 - $63.79
Big game hunting	$7.45 - $19.53
Sightseeing	$10.14 - $35.98
Recreation in wilderness areas	$4.26 - $24.00

Source: McCollum et al., 1990. Values in US$ 2005.

unproductive economically, create greater fire risk, or, potentially, be converted for industrial or residential uses. Protection, managed use and restoration of this forest land may have a greater value to local residents than that reflected by the input/ouput model. The impacts of these organizations are not limited to the number of jobs created or the total output impact. CBOs provide job training, environmental education, and community interaction, among other invaluable benefits. Meaningful quantitative analysis of the role of community-based forestry remains challenged by the high degree of variation of organizations under the CBF umbrella. CBF organizations may vary substantially in scale, focus, role, longevity, expertise, local support networks, funding as well as success and measures of that success.

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