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Evolving challenges and changing expectations for forestry extension and technology transfer:

Meeting the needs of people and forests around the globe

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Evolving challenges and changing expectations for forestry extension and technology transfer:

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Popular summaries of IUFRO conference held September 21-26, 2008 at Mattawa and Ottawa, ON

by

G.K.M. Smith and L.J. Buse, compilers

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Abstract

Early in the 21st century, the inter-dependency between humans and forests has never been greater. Ecosystems are strained by multiple natural and human-caused disturbances. Demand for raw materials is on the rise. Forests are supporting a range of non-timber needs such as conservation of soil and water resources. Thousands of small communities dependent on forests are facing new challenges wrought by globalization.

In this volume, contributors from five continents provide their perspectives on the role for extension and technology transfer in meeting the needs of people and forests around the globe. A number of the contributions address best practices for sustainable management on areas under public or private forest land ownership. Others focus on socio-economic conditions and measures for encouraging stewardship at the community level. Optimizing the uptake of knowledge is another theme evident in the collection, with a number of papers sharing approaches for improving policy, planning, and practices. Examples of effective programs and partnerships are provided to share experiences in supporting the need to adapt to changing ecosystems and changing human needs.

This compilation provides documentation to support the 9th Extension Working Party Symposium of the International Union of Forest Research Organizations (IUFRO), hosted in Mattawa and Ottawa, Ontario, Canada, September 21 through 26, 2008. Besides marking the first time Canada has played host, the symposium brings together for the first time the IUFRO Working Parties for Extension (Working Party 6.06.02) and Technology Transfer (Working Party 6.06.01). Participants shared ideas, practices and experiences in the hopes of enabling greater use of knowledge to meet the needs of landowners, managers, interested citizens, and forest-based communities. Collectively, symposium participants are helping to characterize the *Evolving Challenges and Changing Expectations for Forestry Extension* around the world.

Resumé

L'interdépendance entre les humains et les forêts n'a jamais été aussi forte qu'elle l'est actuellement. Les écosystèmes subissent les pressions de nombreuses perturbations naturelles et anthropiques. La demande en matières premières est à la hausse. Les forêts satisfont un éventail de besoins autres que ceux en matière ligneuse, comme la conservation des sols et des ressources en eau. Des milliers de petites collectivités dépendant des forêts doivent relever de nouveaux défis posés par la mondialisation.

Dans cet ouvrage, des auteurs provenant de cinq continents présentent dans leurs articles leurs points de vue sur le rôle de la vulgarisation et du transfert de technologie pour satisfaire les besoins des gens et des forêts partout au monde. Un certain nombre des articles portent sur les meilleures pratiques de gestion durable des terres forestières publiques ou privées, tandis que d'autres abordent les conditions socioéconomiques et les mesures de promotion de l'intendance communautaire. L'optimisation de l'acquisition de connaissances est un autre thème récurrent de l'ouvrage, un certain nombre d'articles présentant des démarches qui visent à améliorer les politiques, la planification et les pratiques. L'ouvrage présente des exemples de programmes et partenariats efficaces afin de mettre en commun les expériences en matière d'adaptation aux changements qui touchent les écosystèmes et les besoins humains.

Cet ouvrage constitue la documentation à l'appui du 9ème Symposium du groupe de travail sur la vulgarisation de l'Union internationale des instituts de recherches forestières (IUFRO), lequel s'est tenu du 21 au 26 septembre 2008 à Mattawa et à Ottawa (Ontario, Canada). Non seulement s'agissait-il de la première fois que le Canada en était l'hôte, mais le symposium a aussi réuni pour la première fois le groupe de travail de l'IUFRO sur la vulgarisation (groupe de travail 6.06.02) et celui sur le transfert de technologie (groupe de travail 6.06.01). Les participants ont mis en commun leurs idées, leurs pratiques et leurs expériences en vue d'accroître l'application des connaissances afin de satisfaire les besoins des propriétaires fonciers, des gestionnaires, de citoyens intéressés et des collectivités dépendant de la forêt. Ainsi, les participants au symposium aident collectivement à caractériser *Les défis et l'évolution des attentes en matière de vulgarisation forestière* partout au monde.

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Canadian Ecology Centre
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Service des forêts de la Slovénie
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United States Forest Service

Contents

Note to reader

The following popular summaries reflect the diverse content of the oral and poster presentations made at the 9th Extension Working Party Symposium of the International Union of Forest Research Organizations (IUFRO) in Mattawa and Ottawa, Ontario, Canada, September 21 through 26, 2008.

Popular summaries are ordered alphabetically by senior author surname. Where a popular summary was not available, an abstract has been included.

Science Delivery and the United States Interagency Joint Fire Science Program

R. James Barbour[1], Timothy Swedberg[2], and John Cissel[2]

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The Joint Fire Science Program (JFSP) is a science consortium serving United States Federal Agencies that have responsibility for managing, or overseeing the management of fire-prone forest and rangeland ecosystems. The JFSP is charged with solving practical problems in fire fighting, fire hazard reduction, and other issues associated with prescribed and wildland fire. The JFSP faces several unique challenges associated with technology transfer and science delivery. It serves six agencies with very different cultures and operational mandates. It manages a rolling portfolio of research projects that are of interest to an ever-changing group of management and regulatory practitioners and policymakers. Its geographic extent covers the entire United States. During the past three years a science delivery strategy was devised and implemented. This strategy includes problem framing activities that are designed to gather input from practitioners and policy makers about information needs. This process leads to the establishment of focused lines of work that are designed to attract a community of practice who interact with researchers as studies are performed and are therefore ready to use information as it is developed. A number of science delivery techniques are also being tested, such as written reviews of individual studies or groups of studies by the practitioners who will use the information, brief descriptions of results written by professional science writers, interactive workshops that are repeated in different locations and designed to put practitioners in control of content, and a variety of web-based products.

The United States Forest Service, Science Delivery, and the U.S. National Environmental Policy Act

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In the United States, all federal land managers are required by the National Environmental Policy Act of 1969 (NEPA) to conduct environmental analyses for land disturbing management activities. In practice, this means that whenever management projects are proposed for National Forests (or other federally administered land) a formalized environmental disclosure process must be followed. For the USDA Forest Service, conforming with this law occupies all or part of the time of approximately 8,000 of the nearly 35,000 agency employees so the agency is quite interested in finding ways to reduce costs associated with NEPA analyses. Over the years, groups and individuals who want to influence agency management plans have become adept at using the public comment process, the formal appeals process, and litigation associated with NEPA to shape management activities to fit their views. As a result, the agency is interested in gaining understanding of the effective ways to plan for and respond to these interactions with the public. Taken together, the dual needs of more efficient analytical processes and more effective public interactions present a vast research opportunity but how should the agency attempt to tackle these issues? Although the USDA Forest Service Research Branch is the largest forestry research organization in the world, it has almost no capacity to study techniques for environmental policy analysis or business processes. From this need, the NEPA for the 21st Century project was born. This project is heavily invested in problem framing and technology transfer processes. A user-driven process has been developed to identify and prioritize important information needs. A “virtual” think tank has been established to collect and analyze research results related to those needs. And a set of hierarchical information channels have been established to provide results in appropriate forms to specific organizational levels.

Mobilizing Wood Resources for Energy Use – the Example of Slovenia

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Introduction

The conditions in the European energy sphere demand thorough changes in the use of renewable energy sources, which should, within the European context, cover 20% of energy needs to 2020 (UNECE, FAO, University of Hamburg, 2007). Among them, one of the most important is woody biomass, which is very important, especially for Slovenia, one of the most wooded European countries. The goal is attainable but it is important to know that the quantities of sustainable use of woody biomass are limited. Forestry professionals know and understand that but those who create energy policy are not always as aware of the limits.

Sustainable use of all the woody biomass sources demands, firstly, some knowledge about its potential. It is necessary to establish the balance between supply and demand. Once the potential is known, it is necessary to find a way of mobilizing it. Adequate formal processes need to be established, social and economic effects studies undertaken, means to promote effective use found, and strategies of institutional work set out.

In Slovenia, we tried to find the answers to all the questions – relative to the forestry aspect of biomass use – with a study called "Supply and Utilization of Bioenergy to Promote Sustainable Forest Management (TCP/SVN/2901)", conducted in cooperation with FAO. This study focused on the performance of the Slovenia Forest Service (SFS), which is the central forestry institution in Slovenia and was composed of four modules. With the information module, which was also the main part of the project, we established the available potential of woody biomass as well as the balance between supply and demand. The other three modules were mostly focused on the mobilization of available wood identified as surplus by the information module.
The focus of the economics module was to conduct technical, economic, environmental, and socio-economic studies to determine the viability of different wood energy options being promoted. The institutions module was focused on analyzing the roles of different national organizations in the implementation of integrated wood energy policies and programmes; this module also included studies of legal aspects related to wood energy activities. The training and extension module focused on the preparation of training and extension material, the organization of training courses, and establishing the energy advisors network. Results from all four modules were summarized in "Wood Energy Development Strategy for Slovenia Forest Service", which is the final document used as framework for an increased and sustainable utilization of forest biomass for energy in Slovenia and defines where SFS should focus future activities.

Methods

The information module within the study consisted of two parts: Wood energy maps WISDOM and wood energy information system (SWEIS). WISDOM is a spatially explicit method oriented to support strategic wood energy planning and policy formulation, through the integration and analysis of existing wood fuels demand and supply related information and indicators and has five steps: (i) definition of spatial unit for analysis, (ii) development of demand module, (iii) development of supply module, (iv) development of integration module and (v) selection of priority areas. For analysis, different spatial units were used at different levels: the whole area of Slovenia, the county level, and local and cadastral communities. The supply module dealt with sources of wood for energy: forests, non-forest land, wood residue from industry, and black liquor. The main source of data about forests is forestry information system of SFS, collected through forest inventories and annual reports.
Within the economics module, technical, economic, environmental and socio-economic studies were conducted to determine the viability of different wood energy options being promoted. Within the institutional module, the roles of various national organizations in the implementation of integrated wood energy policies and programmes were assessed. This module also included studies of legal aspects of wood energy activities. Activities in the extension module focused on several topics. The energy advisors network, with its main goal of connecting different services and projects and ensuring knowledge transfer among sectors, was also established.

Results

The main source of wood biomass is forests, which contribute (as annual allowable cut of fuel wood) at most 2.7 million m^3/yr. On non-forest land, annual allowable cut is 0.3 million m^3/yr. The annual production of wood residues is tentatively estimated at some 0.8 million m^3. Wood residues are used by forest industry itself. At present, almost the entire consumption of fuelwood from the forests and non-forest land is absorbed by household uses, principally for heating. The balance between production and consumption shows a surplus of wood biomass of 1.3 million m^3 (Annual Report SFS 2007). Spatial pattern of potential fuelwood balance between current non-timber allowable cut plus the estimated non-forest productivity and household consumption is shown in Figure 1, developed using WISDOM technology (Drigo andVeselic 2006).

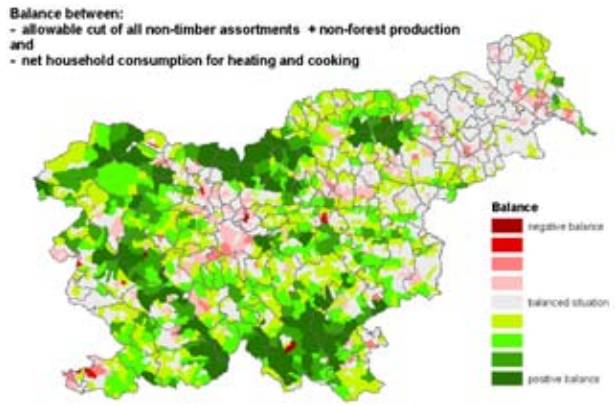

Figure 1. *Spatial pattern of potential fuel-wood balance between current non-timber allowable cut plus estimated non-forest productivity and household consumption.*

Analyses in the economics module show that in households logs are most frequently used as wood fuel and this will remain constant in the mid-term period. As a consequence of increased demand, we can expect a rise in prices of raw materials. We can also expect increased consumption of wood pellets and quick development of associated markets. The main finding of the institutional module is that active co-operation among different stakeholders in the preparation of the national programmes and legislation of utilization of wood biomass in Slovenia is needed.

Discussion

The basic questions are why woody biomass remains in the forest and how to mobilize its present and expected potential. The reasons for non-utilization of woody biomass include its location in small and fragmented forest property and that small-scale forest owners are not well linked. In addition, the rural population is growing old, the woody biomass market is not sufficiently developed, and the share of systems for its effective use is low (Beguš 2007). So, the question becomes how best to mobilize the available woody biomass? The main options are:

- Developing adequate legislation containing acts and strategies to promote higher production of woody biomass and its effective utilization
- Increasing the role of the forestry profession to offer users adequate information, perform extension activities, cooperate with other sectors and, last but not least, offer the market sufficient quantities of raw materials
- Establishing forest owners associations to surpass the fragmentation of private forest estate
- Creating a reliable and stable market for woody biomass

Conclusions

We can conclude that the main result of the project was an improved wood energy information system, as access to information about wood fuel production, trade, and uses have been considerably improved. New knowledge on key wood energy issues was generated. The project also assisted in considerably improving the communications and interrelations of the SFS with its main partners and private stakeholders. Following implementation of the project, many extension activities were organized. On the basis of the information system, SFS did many studies about biomass potentials for local communities. The project has clearly contributed to improving skills of SFS staff in dealing with wood energy matters and has introduced the necessary tools for wood energy planning and policy development. It has also contributed to activities related to how to mobilize available and potential woody biomass.

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Simulation Approach to Effective Reformation of Plantation Forests

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Introduction

Of the forested area in Japan, man-made forests represent about 40%, most of which were established after World War II. However, because of high labour costs and wood prices in recent domestic forestry, unmanaged plantation forests are increasing all over Japan. In response to the deterioration, the policy for forest resource management was formulated to transform monoculture plantation forests into uneven-aged mixed forests with complexity in forest structure and species composition, in an attempt to make them resemble natural forests.

Considering the current situation of Japanese forestry, it is required to elucidate the effects of canopy thinning on tree/forest growth including understory trees. Particularly, the practically technical expertise should be provided to transform into healthy forests by averting natural disturbances such as typhoons. This study addresses the technical support tools for such forest management, by developing simulation models for predicting forest stand growth, light environmental change under the forest canopy, and the growth of understory trees.

Methods

To understand and examine the effects of thinning treatments on timber production and stand structure, the data set of sugi (*Cryptomeria japonica*) plantations provided by Ando et al. (1968) was used. It includes information about tree sizes (tree height H, diameter at breast height DBH, height at crown base HB, and dry weights) and tree densities before and after thinning operations.

Stem form can be approximated by a hyperbolic function with the two asymptotes of the exponential functions representing the upper and lower parts of tree stems, respectively (Chiba 1990). This stem form model includes five parameters that can be estimated from tree size.

When the stand density remains constant after canopy closure, the crown length may remain almost constant due to rising of crown base accompanying with tree height growth. However, once canopy is opened up by thinning, the height at crown base HB may remain unchanged until the canopy closes again. Provided such process of crown development with repeated thinning management, crown depth will increase stepwise with every thinning operation. In this study, it is assumed that an average crown width CW was determined simply by stand density. Crown length CL was determined using an allometric relationship with CW for closed canopy stands.

To develop a tool for evaluating light environment in a forest, simplified tree form with branch size distributions and conical stem shape was hypothesized to construct “virtual forest” in a computer. Converting 3D structure of virtual forests, hemispherical images were depicted for evaluating light environment in forests with a variety of tree locations and stand structures.

Results

(1) Stand development

Applying ordinary and typical thinning regime for sugi plantation, tree sizes in a stand was simulated as shown in Fig.1. At the initial planting stage, HB was almost zero because the canopy had not yet closed. Then HB starts increasing at a stand age of about 10 years. Then, the crown length (= H - HB) shows a gradual increase due to repeated thinning treatments in the course of stand development. Figure 1 demonstrates the remarkable correspondence to the real data. Furthermore, employing stem form model, DBH was also estimated for each stand age, showing good fit to the data.

As mentioned above, the mean crown depth CD in a stand can be calculated with a considerable level of accuracy for every stand age. Using these CD values, the weights of leaves and branches were estimated using allometric relations, and also the stem weight was calculated using D^2H. Then, the biomass development of sugi plantation forests was simulated as shown in Fig.2. The saw-tooth appearance of the growth pattern for each organ is the result of thinning treatments.

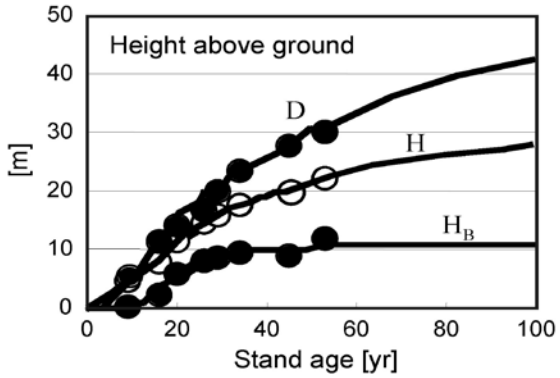

Figure.1 *Simulation of tree sizes in a plantation forest with thinning. D, H, and HB denote diameter at breast height, tree height, and height at crown base, respectively.*

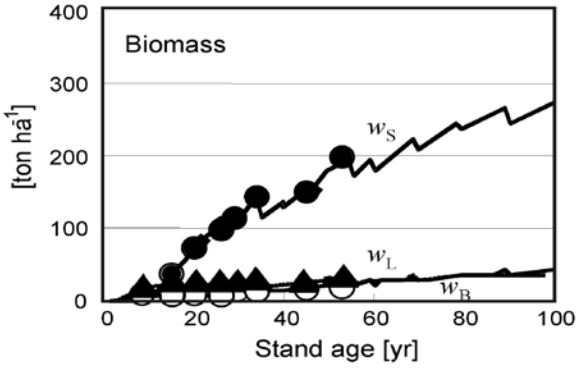

Figure.2 *Simulation of biomass growth in a plantation forest with typical thinning regimes. Solid and dashed lines: results of the simulation; symbols: measured biomass of stem wS, branch wB and foliage wL.*

(2) Virtual forest for estimating light environment

Variety of virtual forests were set up in a computer and light environment or canopy openness were examined. Figure 3 exemplifies the "hemiForests" converted from the "virtual forest" whose stand area was 100m × 100m, spacing 4m × 4m, mean tree height 20m, mean crown length 7m. Counting the doted points of the hemiForest, the canopy openness can be evaluated. Figure 3 shows the examples of a closed canopy without thinning, one-row-cut stand, three-row-cut stand. Their estimated canopy openness were 13%, 23%, and 40%, respectively.

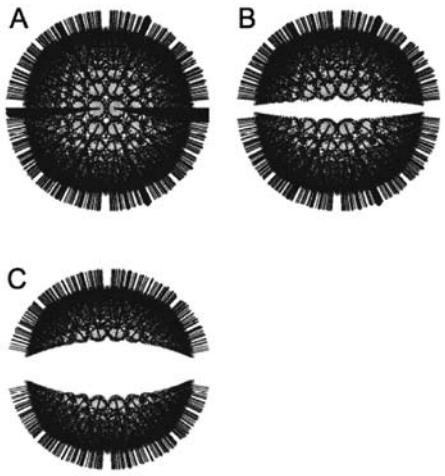

Figure 3. *Examples of "hemiForest" image Closed canopy (A), one-row-cut canopy (B), three-row-cut canopy (C) have canopy openness 13%, 23% and 40%, respectively.*

Discussion

The stand growth model presented in this study was based on architectural development of forest trees with respect to stand density, so as to link stand structure with forest stand density thus thinning practices. In order to evaluate thinning effects on tree growth, it is needed to formulate tree form through crown structure, because tree crown should play a key role to respond to stand density. Some models for predicting stand growth have been reported so far (e.g. Mäkelä 2002, Mäkelä et al. 2000). Comparing these models, the present model shows good performance for prediction of tree size and biomass growths, as exemplified in Figs.1 and 2. Using the model, prerequisite examination for various thinning practices can be conducted in advance.

As mentioned already, the considerable area of plantation forests in Japan are required to transform monoculture plantations into uneven aged mixed forests. In order to realize such forest management policy effectively, modeling approaches linking with light conditions in a stand are needed to promote regeneration and replace to multi-storied and mixed species forests. The modeling approach with "virtual forest" and "hemiForest" can provide practical information about light environment in forest stands where a variety of thinning or harvesting will be made. Since forest management takes long periods, check-and-trial approach is necessary to conduct our forest planning for long term forest resource management.

Conclusions

Employing mathematical models of tree architecture, a forest growth model is developed to describe the effect of various thinning regime. Applicability of the stand growth model was validated using the data on stand growths obtained for various thinning regimes. Employing this model, tree growths and biomass partitioning were modeled along stand development with various initial tree density and subsequent thinning regimes. Accompanied with a light environment prediction model, the recovering of undergrowth trees will be modeled. Using these models, adequate thinning practices could be presented through the various thinning simulations for better procedures for the required silviculture.

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County-wide Family Forest Habitat Conservation Plans: Acknowledging Forest Ownerships as a Social Relationship

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Family forest landowners are facing an increasing array of economic, regulatory, and social challenges that threaten their long-term viability. A quickly globalizing economy has caused market fluctuations that make the value of timber unpredictable, and decrease the market leverage of small-scale producers. Simultaneously, societal concerns with environmental protection have led to changes in forest management regulations that have increased the regulatory burden on forest landowners and reduced the economic return from their lands.

In an effort to address some of the many challenges facing family forest landowners, Lewis County, in cooperation with the Family Forest Foundation (Foundation), has prepared the programmatic, multiple species Family Forest Habitat Conservation Plan (FFHCP) for family forestlands in the county that meet specified criteria. The intent of the FFHCP is to provide a regulatory incentive for family forest landowners to maintain their lands in sustainable forest use and to provide habitat for fish and wildlife species. By creating a planning mechanism that provides regulatory stability to family forests, the FFHCP will protect the public values these lands provide, such as fish and wildlife habitat, water quality, flood control, biodiversity, aesthetics, and contributions to rural economies and cultures.

The FFHCP was prepared in cooperation with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) (collectively called the Services) to meet the Endangered Species Act (ESA) issuance criteria. When substituted for the applicable Washington State Forest Practices Rules (State Rules), the FFHCP will provide landowners the opportunity to create long-term forest management plans. As an alternative to individual HCPs for each family forest ownership, the FFHCP will reduce the administrative burden on State and Federal regulatory agencies. Given the large number of individual landowners, their need for technical assistance, and the dispersed nature of their lands, individual HCPs or similar agreements would be neither technically feasible nor within the current capabilities of the State and Federal agencies to process and implement. A programmatic approach is an effective way to implement the ESA and the Washington Forest Practices Act. A programmatic approach also provides a critical solution to the fiscal and technical challenges facing agencies and family forest landowners during the development and administration of an HCP. The successful implementation of the FFHCP represents a win-win situation for regulatory agencies currently struggling to address the needs of listed species, and the land stewards whose commitment to sustainable forestry is challenged in the present regulatory environment.

Family forests in Washington State represent an estimated 4.2 million acres (17 mill. ha) and roughly 96,000 landowners (WDNR 2001). Due to historical settlement patterns, these forests are located primarily in low-elevation watersheds, encompassing or adjacent to stream systems and often in the rural-urban interface. Because of their location and management practices, family forestlands make critical contributions to the natural resource values enjoyed by the State's citizens. Family forest landowners interested in long-term stewardship face a multitude of challenges that include, but are not limited to:

- Reduced capacity to produce traditional wood products
- International competition that influences the value of harvested timber
- Estate taxes of up to 55% of the land and timber value upon generational transfer
- Escalating land prices driven by population growth and urban expansion
- Increasing regulatory burdens

Distinctive differences in individual landowner management objectives, along with the diverse demographics of family forest ownership, present a series of challenges to family forest owners and regulatory agencies. These include:

- The large numbers of landowners relative to the area of forest

- The small scale of individual ownerships (average 54 acres (22 ha))
- The sensitivity to management costs associated with small parcels and family economics
- The need for lands to change ownership about every 30 years through generational transfer
- A diversity of ownership objectives derived from intimate knowledge and personal attachment to the land, including love of the land, family heritage, maintenance of a legacy for descendents, wildlife habitat and recreation
- Profit incentives based on family values and needs rather than return to shareholders
- Forest management styles (e.g., long rotations and small harvest units) that result in a diversity of habitats

The ability of the Services and the landowners to develop individual HCPs is limited by the varied and unique needs of the landowners for technical and legal assistance, the sheer number of owners, and the funding constraints of the Services. The unique nature of family forests requires a different approach than that used for industrial forestlands. Such an approach must be creative and focus on incentives and outcome-based mechanisms to succeed. Family forest HCPs should address unique individual ownerships and management practices if they are to serve as a viable tool for this constituency.

Lewis County family forest landowners exemplify a range of reasons for owning forestland and a range of objectives for managing forestland. Since 1991, seven different family forest ownership surveys of County and State-wide data have been conducted. Most striking in the results is the difference in ownership objectives when compared to the industrial forest landowners typically thought of when forest management issues are brought to the public's attention. When asked what their top management priority is, over 75% of family forest landowners respond that providing wildlife habitat, a legacy for their children, and aesthetics are a higher priority than timber revenue (Lien 2004). Recent Washington Department of Natural Resources (WDNR) data indicate the rate of harvest on private forestland (including industrial forests) is less than 1% per year (Larsen et al. 2000). Survey data also show that the average regeneration (clear-cut) harvest on family forestland is about 20 acres, while current State Rules allow harvests of up to 200 acres (81 ha). Both figures indicate that family forest landowners practice thinning regimes and extended harvest rotations. When asked, about 30% of family forest landowners said they have management plans, and another 55% indicated a willingness to develop one (Lien 2004).

Clearly, family forest management objectives differ from their publicly held industrial forest landowner counterparts. These differences in ownership and management objectives reveal an opportunity within the regulatory framework to provide incentives to maintain family forestlands in the managed landscape.

Family forest landowners in Lewis County need *incidental take* coverage to relieve them from the threat of prosecution under the ESA, and to enable them to continue investing in land stewardship over the long-term. The ESA definition of incidental take includes significant habitat modification that actually kills or injures a listed species through significant impairment of essential behaviours (e. g., nesting or reproduction). Such incidental take could occur unintentionally as a result of timber harvesting on family forest lands, where those lands provide habitat for a listed species. When landowners are faced with the threat of prosecution for harvesting timber, they lose the incentive to make the necessary investments of land, capital, and time to grow the timber. Over the long term, the net result can be a reduction in habitat for listed species rather than an increase.

The incidental take coverage sought by Lewis County family forest landowners needs to be specific to the economic and biological constraints of their lands. The regulatory options provided under current State Rules have a disproportionately high economic impact on family forests due to the small scale of individual ownerships. The Small Business Economic Impact Statement developed for the Forests and Fish Report (WFPB 2001) estimated that the average impact on family forest landowners by the current State Rules represents a 25% value loss for landowners in western Washington. Recent statistics for the WDNR Forestry Riparian Easement Program, a compensation program for landowners with timber in riparian areas that cannot be harvested according to new State Rules, indicate that of 41 landowners participating in the program, 19 were affected at 100% (i.e., could not harvest any timber on their ownership). The average impact to landowners participating in this program was nearly 75% (WDNR 2001).

Although the Washington Forest Practices Board (WFPB) recently adopted the Forest Practices HCP to cover the State Rules, it lacks several necessary features critical to protecting the viability of family

forest enterprises. The Forest Practices HCP only covers aquatic species and has been proven to unduly affect the timber harvest potential of small forest landowners who have riparian resources on their ownerships, consequently affecting their ability to remain in forest use (WDNR 2001). Although the current State Rules may be appropriate for industrial forestlands, for the Forest Practices HCP to succeed in its goal of aquatic resource protection it is critical that alternative planning mechanisms be developed for family forestland that addresses their scale of ownership and unique management strategies.

The current regulatory burden, combined with a fear of additional regulatory losses, has led to a sense of regulatory uncertainty among many family forest owners. As a result of this and other pressures, such as rapidly increasing population, the most current data available indicate western Washington is losing family forestlands at a rate of 100 acres (40 ha) per day (56 square miles (145 sq. km) a year) through conversion to non-forest uses (WDNR 1998). When forestlands are converted to non-forest use, the habitat, water quality, biodiversity and other public values they provide are lost. If landowners can achieve a sense of regulatory stability through the FFHCP, they will have a critical incentive to continue contributing to public values and local economies.

The FFHCP, Administrative Draft Environmental Impact Statement (ADEIS) and ITP applications were submitted to the Services on September 4 2007. The next step in the HCP process is for the Services to submit the FFHCP and ADEIS to public review under the National Environmental Policy Act. The Services have so far refused to submit the documents for public review or provide any written response to the application package. Verbally, they have indicated that they are “uncomfortable with the proposal”, “unable to deconstruct the algebra of the underlying science,” and “still have some technical concerns”. In the meantime, family forest land continues to be converted at an unprecedented rate in Washington State. Unless agency leadership willing to move forward with the FFHCP (and broader efforts at regulatory reform) can step to the plate, it is doubtful that the state will be able to attain its goals of salmon recovery, climate change mitigation, much less maintain the quality of life enjoyed by this state’s citizens.

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Counting Down To Change: Identifying Early Adopters and Effective Extension Multipliers of Cashew Agroforestry in Senegal

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Introduction

Soil degradation, persistent drought, and decline in peanut prices combine to put Senegalese farmers in a difficult position. In response, many have called for greater emphasis on participatory resource conservation and regeneration (Rodale Institute 1989, Chemonics International Inc. 2000, Franzel and Scherr 2002). One such approach is to encourage farmers to adopt cashew (*Anacardium occidentale*) alley-cropping, which can restore soils and provide additional firewood while maintaining economic productivity. In this paper, we assess the factors that determine when farmers adopt this new technology.

Specifically, we define and identify observable indicators of two types of farmers ("early adopters" and "effective advisors"), arguing that they are the best extension multipliers and therefore the best points of contact for extension agents to effect quick diffusion of an innovation through a village (Rodale Insitute 1989). Second, we model time of adoption as a function of farmer characteristics, including their spatial and social relationships.

Methods

Information on cashew agroforestry in the Senegalese villages of Mamouda and Simong (Figure 1) was gathered using three methods: direct observation during nine months of village life, mapping of agricultural fields, and a survey of all households in the two villages. Survey instruments were administered at three levels: households (N=33), farmers (N=61), and plots (N=93). These field methods informed and provided data for a survival regression model of the time of cashew adoption. Specifically, the model includes a measure of social proximity to early adopters, "median age of advisors' cashews." This model identifies the characteristics of "early adopters." In addition, the data are used to characterize "effective advisors," defined as farmers who adopt cashews early *and* have many advisees.

Figure 1. *Location of study sites.*

Results and Discussion

Estimation results are presented for two models of the year that cashews are planted in a particular field: one without and one with the social proximity variable (Table 1). Both models were highly significant overall, and both showed "number of advisees" to be significant and negative, indicating that opinion leaders are likely to be early adopters. These farmers may make excellent hosts for field trials, because they are both willing to adopt early and a preexisting source of information for others. A principal component representing household wealth is significant in the non-social model, supporting the common finding in the literature that wealthier farmers are more likely to take on the risk of adopting a new and unknown technology (Pattanayak et al. 2003). Wealth buffers the subsistence threshold, ensuring survival if the venture should fail (Current et al. 1995, Vanclay and Lawrence 1994). The social proximity variable, "median age

Table 1. *Survival model of time until cashews are planted in a field.*

	Cashew fields w/o social var. n=55	Cashew fields w/ social var. n=45
Wald test chi-squared; sig. level	36.2; 0.000	22.5; 0.001
Dependency ratio	-	+
Number of advisees	-**	-**
Wealth	-*	-
Extension & Experience	+	+
Max. adjacent cashew age	+	+
Median age of advisors' cashews	Not included	+**

* Significant (p<0.15); ** highly significant (p<0.05)

of advisors' cashews," is highly significant, but the sign is surprisingly positive. This counters the hypothesis that a farmer is more likely to adopt early if his advisors have adopted early. One possible explanation is that early adopters tend to have older advisors who are reluctant to invest in cashews because of the delay till harvest (a "life cycle" effect).

To test the combined effect of farmer and field characteristics, OLS regression models of advisor effectiveness (proxied by total advisee cashew years) are estimated. Because of the small sample size of 21 advisors and multicollinearity among field characteristics, the models are limited to two independent variables. Results (Table 2) show that effective advisors tend to have a larger area of agricultural fields and more fields on the main road. It was necessary to specify two separate models, as total field area and number of fields on a main road are highly correlated (0.670), reflecting the fact that farmers with more hectares of fields naturally have a higher chance of some of those fields bordering a major road. Road frontage may proxy for higher status farmers, to the extent that they have more centrally located and easily accessible fields, but it is more likely an indicator of the importance of plot location in promoting a new technology. These results also could suggest that farmers with road-front cashews are more likely to be chosen as sources of advice by other farmers with questions about cashews. After controlling for field characteristics, age is not a significant factor, showing that elders are not always the best points of contact for diffusion of a new technology.

These findings imply that when searching for ideal extension multipliers, an extension agent should perform a quick survey of the fields lining highly-trafficked roads and paths to identify their owners, and then follow up with interviews to assess whether these owners have other key characteristics of effective extension multipliers. The models reported here as well as direct observation and responses to open-ended survey questions suggest that factors to consider include age and wealth. Well-travelled villagers are likely to adopt early, but may not be available to care for the cashews or to effectively extend their cultivation to other villagers.

Table 2. *Advisor OLS model results. (Dependent variable = total advisee cashew years; n=21)*

	Using total field area	Using road frontage
R-squared	0.213	0.309
Total field area	+*	Not included
Farmer age	+	+
Number of fields on main road	Not included	+**

* Significant (p<0.15); ** highly significant (p<0.05)

Conclusions

Effective extension multipliers are likely to have sufficient land and other assets to survive the possible failure of new technology, have fields that are highly visible and located in an area appropriate for the new technology, be an elder (> 60 years old), and be socially well-placed as an advisor to many and an advisee to none.

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Forestry Extension for Sustainable Community Forest Management in Sri Lanka:

Prevailing Opportunities, Remaining Challenges, and Possible Resolutions

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Background

National Forest Policy and a Forestry Sector Master Plan in Sri Lanka have promoted the concept of community forestry since 1980. A variety of community-based forest management projects have been implemented since 1982 with the intent to increase tree planting and thereby reduce poverty and rehabilitate environmentally degraded areas. The introduction of community forestry involves a variety of changes, including new management procedures and technologies. The communities require the knowledge to help with choosing among multiple management options and multiple uses of community forests (Tanaka 2007). Extension is the process of delivering knowledge while extension professionals engage in various strategies to move information along a continuum from questions to solutions (FORREX 2006). Our goal was to review the available literature on community forestry programs and forestry extension strategies, and use that information as a basis to discuss prevailing opportunities, remaining challenges, and possible resolutions to promote forestry extension for sustainable community forest management in Sri Lanka.

Prevailing Opportunities

Establishment of forestry extension service, technology development, education and training, and community empowerment are revealed as prevailing opportunities. The Forestry Extension Service in Sri Lanka was established in 1982 under the Forest Department (FD) to promote Social Forestry initiated in 1980s. Deputy Conservator of Forests (Extension & Education) was given overall responsibility for forestry extension and community forestry projects. A Community Forestry Research Unit was established in 1982 to provide technical support functions. Beginning in 2000, the Forest Resources Management Sector Project (FRMSP) improved the technical knowledge base of extension foresters and community-based organizations (CBOs) (ADB 2000). Small Grants Program for Operations to Promote Tropical Forests (SGP PTF) implemented since 2005 is enhancing skills and capacities of local communities and developing forest services (UNDP 2006). Major objectives of the extension programs of the Community Forestry Project (CFP) were the education and training. The Participatory Forestry Project (PFP) in 1993 has provided extensive education for FD staff, motivators, and household participants (ADB 2001). SGP PTF has conducted an awareness-building workshop for the extension foresters. The SGPPTF is promoting regular interaction among communities through cluster workshops. The CFP setup Village Forest Societies (VFS) with the aim of motivating the communities and carrying out tree planting campaigns. The SGPPTF through forest-based enterprises increased local capacity in planning, management, value addition, and equitable governance of enterprises (UNDP 2006).

Remaining Challenges

Disorientation of extension programs, institutional difficulties, and non-participatory approach are recognized as remaining challenges. The CFP organized awareness programs to popularize fuelwood without considering the fact that there was no fuelwood shortage. FD conducted extension programs to plant pine under community forestry programs ignoring social and environmental consequences. Some Community Wood Lots (CWL) of CFP have been abandoned by farmers due to the incompatibility of the new system with their traditional farming systems. Some of the Farmer Wood Lots (FWL) are facing risks due to lack of sustainable silvicultural knowledge and technologies. The semi-subsistence and small scale community forestry are presently moving from multipurpose trees towards trees that produce products of commercial value. The forest dependency for livelihood in wet zone is decreasing with the shifting economy and changing job aspirations. The forestry extension programs are lacking a gender strategy. Home gardens of

forest communities are important sources of multiple products amd are usually managed by women. The extension service of the FD is inadequate to provide silvicultural management technology to the communities due to inadequate capacity and insufficient skills of the field officers. The major problem for conserving forests in wet zone is loss of forest land due to illegal encroachments for agriculture and settlements. The existing community organizations have limited experience to channel forest resource management-related information between the community and other stakeholders.

Possible Resolutions

Possible resolutions suggested are refocusing forestry extension services, targeting forestry extension programs, adopting multiple extension approaches, and developing and restructuring institutions. The community forestry extension program has to deliver the knowledge to the communities for participatory decisionmaking over multiple management options, multiple uses of forest resources, as well as equitable benefit sharing. Forest extension has to create and disseminate knowledge about diverse innovation and offer a means to ensure innovations are applicable across heterogeneous community forestry systems. Management strategies should generate additional income and complement government efforts to address widespread poverty among forest communities. The application of technology should be flexible, simple, relevant, and cost effective. Major community forestry management issues should be discussed with different groups within communities, including the women. A media campaign pertaining to community forestry has to target planners, politicians, and other non-forestry institutions. The stewardship capabilities of the community may ensure meaningful and effective education.

Participatory extension strategies would draw on the knowledge and experiences of communities, foresters, researchers, academics, policymakers etc., as required for planning sustainable community forest management. Farmer Forest Management School (FFMS) facilitates user-led experiments and generates knowledge and skills by users themselves to make decisions required for sustainable management of community forest resources. The Ministry of Science and Technology in Sri Lanka is implementing 'Vidata' and 'Nanasala' projects to improve the Information Communication Technology (ICT) capacities of the rural people. These facilities could be used for interaction between key players in community forestry innovation systems to disseminate innovations. Building bridges between government, private sector, and community may facilitate multi-stakeholder input and commitments in preparing and implementing effective forestry extension programs. Effective community forestry extension requires the identification, co-operation, and collaboration of a range of other development and extension partners. Extension foresters should be professionals and able to work with other related extension services, interested agencies, and organizations in developing and providing research-based technical information on community forestry. As well, they must be equipped with knowledge about adult training, community mobilization, participatory approaches, and facilitation skills.

Conclusions and Policy Implications

Extension components of community forestry projects play a dynamic role in disseminating knowledge about the broad spectrum of technical, social, and economical aspects of forest management. Community forestry extension service is yet to be developed through participatory extension strategies that draw on the knowledge and experience from related extension organizations and local communities to provide alternative innovative technology transfer mechanisms. Community forestry extension requires an interdisciplinary approach with multi-organizational facilitation for sustainable community forest management leading to an environmental conservation and rural development.

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Profiling Private Landowners to Design a Targeted Forest Extension Program:

A Case Study of Renfrew County, Ontario, Canada

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Introduction

Influencing private landowners to improve management of their forested lands is a challenge in non-regulatory jurisdictions. Renfrew County in Ontario, Canada, has about 250,000 ha of private forest land owned by over 2,000 individuals, families, and small corporations. These forests are primarily mixed conifer-hardwood forests dominated by white and red pine, poplar, white birch, and tolerant hardwoods managed under various silviculture systems but primarily by partial harvesting. This paper describes the process that a volunteer committee, the Forest Stewardship Committee of Renfrew County (referred to as the committee), undertook to develop a targeted work program that would likely result in improved management activities on these private forests. The principles may be of interest to other jurisdictions in similar situations.

Methods

The committee was formed in recognition of a void as government support mechanisms had been withdrawn and landowners were reluctant to trust government-sponsored extension programs. The committee consists of nine volunteers, each representing one of three categories: landowners, forest industry, and technical issues. Staff support is provided by the local provincial Ministry of Natural Resources. During its first year, the committee undertook a theoretical exercise to develop a foundation for future activities, bringing in guest speakers to describe their activities and what did/did not work. In parallel, a discussion paper was commissioned to document issues facing private land forestry in Renfrew County. Through these exercises, the committee narrowed down a target audience and prioritized proposed activities.

Results and Discussion

The discussion paper highlights seven landowner profiles (McCready and Richardson 2005):

- woodlots on family farms owned for several generations
- managed woodlots owned by forest companies
- managed woodlots owned by active managers
- unmanaged woodlots owned by non-residents
- woodlots used for hunting or other traditional recreation owned by non-residents
- unmanaged woodlots owned by residents who believe no management will result in a healthier forest
- land being held for a future harvest benefit such as retirement or funding a child's education.

The committee generalized the seven profiles and extended the scope to include extremes at both ends and added a theoretical long-term societal benefit (Figure 1). The long-term societal benefit includes the total economic value of traditional goods and services such as wood fibre plus the non-paid conservation values that a forest provides such as clean air and water, scenic landscapes, wildlife, etc. Under this theoretical curve, the maximum societal benefit occurs when sustainable amounts of wood fibre are produced in balance with conservation values. Wood fibre from this type of managed forest can generate upwards of $1,000/m^3 of economic activity and growth rates are traditionally 2 to 4 m^3/ha/year or more for conifer plantations.

Landowners with attitudes at the two extremes of woodlot use (hard conservationists and full exploiters) were not seen as a potential target audience for an influence-based program. This is because locking up land in hard conservationists-type nature reserves is a valid program more attuned to being determined by regulations and government support. At the other extreme, full exploiters affect the productivity of

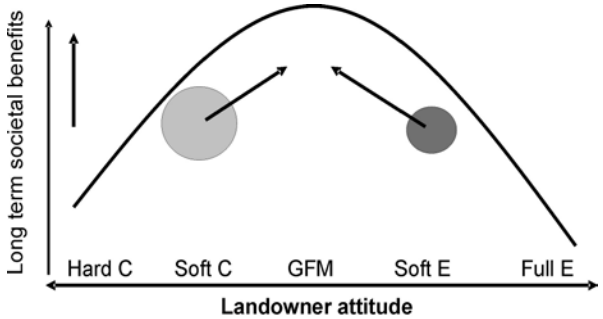

Figure 1. *Theoretical benefits to society in relation to landowner use of woodlots.*

Table 1. *Profile of two landowner types most likely to benefit from an influenced-based extension program in Renfrew County.*

	Soft C 'Doubter'	Soft E 'Historic Owner'
Background	New forest owner, other source of income, formally educated but not in forestry	Family has owned property for generations, traditional knowledge, comfortable with forest operations
Experience	No/little forestry experience, mostly theoretical knowledge of forest management	Grew up with forestry/agriculture; knowledge from personal experience
Personal values	Pride of ownership	Independence, pride, capital nest egg
Finances/goals	Forest operations economics not important; more interested in improving forest health	Traditional income from forestry/agriculture; now retirement, health care, taxes
Sources of info	Reading, online, networking, peers	Past practices (good or bad), peers
Influenced by	'Show me', 'convince me'	Neighbours, economic benefit, 'show me'

the land so severely that it will likely only produce degenerated wood products in the future, with little conservation value. Regulations banning the latter activities are more effective than an influence model.

Good forest managers were already seen to be doing the right thing and producing close to the maximum societal benefits and thus a program targeted to this audience was deemed unnecessary.

Soft conservationists tend to move cautiously, emphasizing nature benefits at the opportunity cost of underutilizing potential wood products. These 'doubters' do not believe that active forest management will improve the health of their forests and their joy of ownership but they can be influenced to actively manage their land. By moving this group slightly towards the middle, some immediate and long-term benefits can be realized. Soft exploiters tend to slightly overharvest their land for short-term gain at the cost of long-term sustainability in terms of quality high value wood products (Hall 1981). Moving them slightly to the middle will yield long-term benefits but their tendency to return to their previous position on the curve must be accounted for.

Thus the soft conservationist and soft exploiter groups were seen as the most promising to influence through an extension program prompting the committee to conduct more in-depth profiling of these two landowner types (Table 1). Using the targeted audience profiles, the committee considered up to 14 potential programs that would balance short- and long-term efforts with high potential for uptake. Further consideration was given to the effort and expertise to undertake a program, the likelihood of getting funded, and the interest of the volunteers within the committee to lead such a program. This resulted in a choice of five programs that became the foundation for the committee's five-year work plan:

- Tree planting on former agricultural land
- Silvicultural demonstration forest(s)
- Renfrew County forest issues/solutions web site
- Expanded topics: provide landowners with information on non-timber values as well as wood fibre economics
- Landowner consulting extension program

Conclusions

Since 2004, the Forest Stewardship Committee of Renfrew County has received about $400,000 in grants to plant 485,000 seedlings, established four demonstration forests, and published three studies including "Success Stories from Renfrew County's Private Forests" (D'Eon 2008). Tree planting has been funded for carbon sequestration, although to date not a single landowner has shared that goal but have agreed to the program for other benefits. The demonstration forests draw upon the 'show me' influence model and usually include both good and bad practices to provide landowners a means to compare among treatment effects. The success stories magazine expands peer-to-peer conversations and shows landowners what their neighbours are doing. Perhaps surprisingly, the committee has yet to obtain funding for web site development as most funding agencies view that market as already saturated.

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Optimize Knowledge Uptake: Employ a Knowledge Management System to Drive Principles to Practice

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Introduction

A systems approach is needed to effectively and efficiently deploy principles developed in research to practical application in policy, operations, and/or business. The purpose of this paper is to introduce a knowledge management system that helps guide research and product development teams through a process that ensures the transformation of creative ideas into innovative products and their adoption and use in mainstream business – whatever that business may be. Figure 1 describes a knowledge management system that conveys the iterative process required to drive principles to practice through the development of effective policies or products and to engage participants in continual improvement.

The Knowledge Management Cycle™ (KMC™) helps optimize the process of engaging partners to effectively and efficiently manage the process of translating and transferring principles to practice in policy, operations, and business. It operates by using "all-inclusive teams" that include all relevant participants who have a vested interest in the project. The team remains in place after product deployment to monitor and evaluate performance and capture secondary innovations that arise as users experiment with the new product and consider ancillary improvements.

Cultural Diversity and Communication Gaps

The KMC™ process is all about developing positive, proactive, and productive relationships. It starts with the partner forum. Effective communications among team members from start to finish, and beyond, is essential to enable the cycle and capitalize on its synergies. The first, and most critical step, understand the cultural attributes and character of team members – the researchers who develop the principles and the clients who use the products. Figure 2 provides a synopsis of the cultural framework that drives behaviour for researchers and different key client types.

Given the cultural disparity in character and attributes among team members it is evident that this diversity can create communication gaps. It is not uncommon to hear clients state, "scientists do not understand the real world". However, it could be said with equal fortitude that, "clients do not understand the real world of scientist". The fact is, different real worlds, with different mandates, different priorities, different reward systems……create different reasons for being. The point: Respect the "real world" of each partner and the rules that govern their beliefs and actions and get on with it! People skilled in extension or knowledge exchange can help facilitate and mediate cultural disparity and guide projects to a successful conclusion.

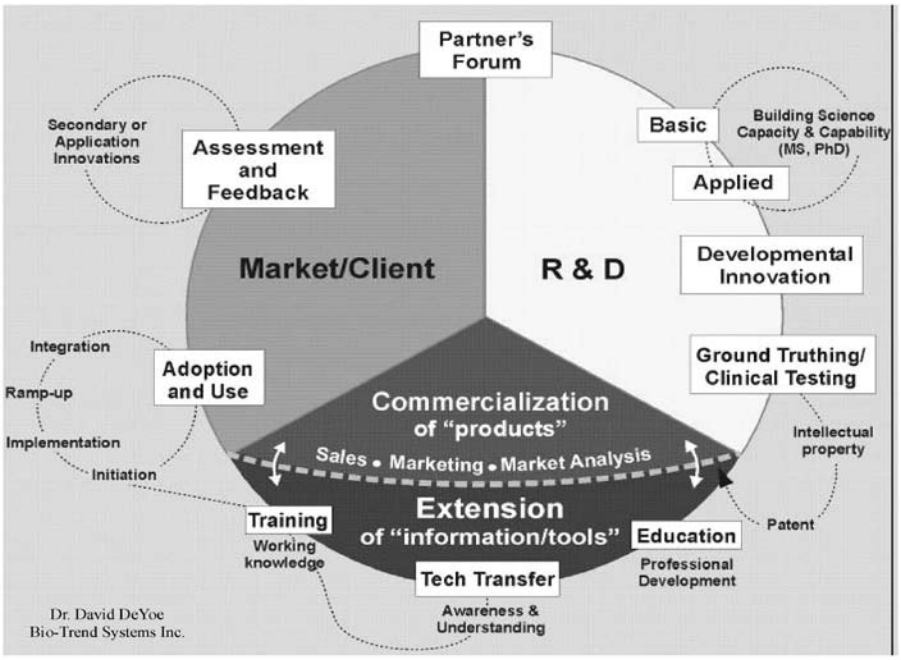

Figure 1. *The Knowledge Management Cycle™.*

Cultural Type and Character	Environmental Setting	Conditioned Behavior	Approach to Problems and/or Opportunities
Researcher or Engineer + *"Intellectual Growth"*	Studious Skeptical Scrutinizing	Curious Free-Spirited Self-Assured	Analytical Cautious Opportunistic
Policy Developer + *"Restrictive"*	Perpetual Crisis Management	Control the Pieces and the Players	Band-Aid
Corporate Management or Finance + *"Stay in the Black"*	Bottom Line	Competitive Wary Savvy Secretive	Move quick, make it happen, and move on
Operations Field or Plant + *"On the Ground"*	Get it Done	Practical and Pragmatic, with a Dash of Frugal	Common Sense

Figure 2. *Cultural diversity among team members.*

Knowledge Exchange Services – Making KMC™ Work

The extension professional possesses the character and attributes that can create harmonious interaction and collaboration. The extension mantra is one that epitomizes a character of congeniality – a quality that helps bridge the cultural gap between the research scientist and the practitioner. Figure 3 conveys how the attributes inherent in extension professions serve to fill the cultural and communications gap.

Knowledge exchange works best when extension professionals are integral to member organizations that are part of the all inclusive team, not just a lone facilitator. This is because each culture is complex and there are inherent barriers to transfer of innovation and change that impede extension efforts.

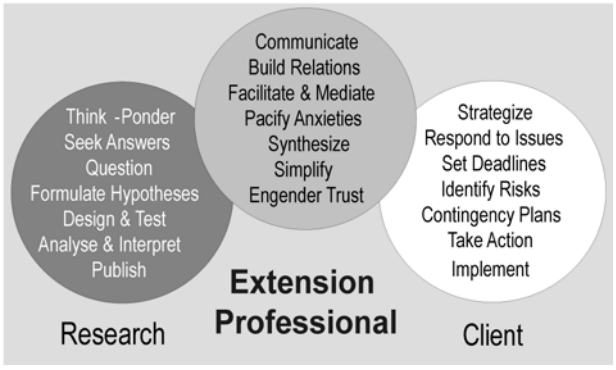

Figure 3. *Extension professions bridge the gap between research and practice.*

Barriers to Knowledge Exchange

A fundamental barrier in transferring science principles to practice is time and scope. The research and development process can be slow and tedious, typically 3 to 10 years from concept to commercial product. Further, the approach is comprehensive – the breadth and depth of the study being tied to safe use protocols and regulations. The user, once they have identified a problem or admitted a need, typically wants resolution immediately, or shortly thereafter. The KMC process can provide clients with immediate solutions to problems, and help position the corporate culture for ongoing advances that maintain competitive advantage. Mediating this process is a key function of the extension profession or inter-organizational extension network.

The behaviour of an intra-organizational culture towards innovation and change can present an ominous suite of barriers to adoption and use of new information. This is often exacerbated by the tendency of organizations to be suspicious and secretive of "new things". Figure 4 provides a synopsis of the four intra-organizational challenges that can scuttle adoption and use of new information and tools.

The categories into which the key barriers to innovation adoption fall are: (1) trust and relationships, (2) education, (3) organizational culture, and (4) motivation. The KMC™ process helps mitigate resistance by using communication as the basic tool to translate information among forum partners and minimize resistance to change, whether it is the researcher being open to unknown realities or the client being open to new ideas and opportunities. The education of individuals in the respective partner organizations helps build trust so positive and progressive relationships can develop. This helps trigger the types of motivating forces that engage people and create a more enthusiastic atmosphere for interactive innovation that drives the cycle. The organizational tendency to remain aloof and reclusive is dissipated as people better understand one another and begin to align their respective objectives towards common goals. Developing a formal extension network across partner organizations can help expedite the process and optimize performance.

An important side note – extension is not marketing (Figure 1). Although the activities may be similar, the objectives are very different. When organizations try to economize their operations by blending the two it actually creates a negative synergy (2+2=3, not 5), and both critical functions suffer.

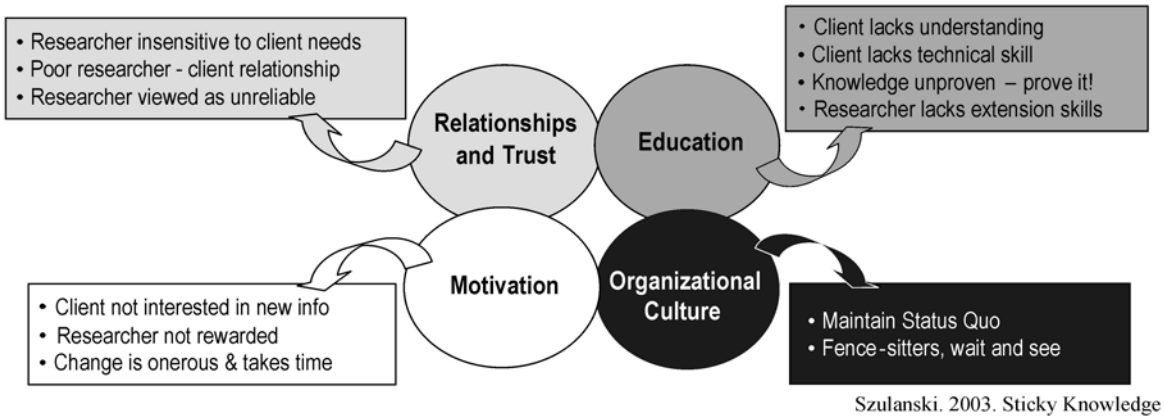

Figure 4. *Intra-organizational challenges to use of innovation.*

The Benefits of Employing a KMC™ System

Employing a KMC™ system can have multiple benefits. Those recognized by team members include:

- Science activities are better aligned with corporate goals and objectives
- Resources can be allocated to support new knowledge that enhances production growth and competitive advantage
- Resources are used more efficiently by identifying where technology transfer will suffice, conserving R&D dollars for high priorities
- Employing extension professionals allows researchers and resource managers freedom to focus on their primary function, knowing key information exchange is being accommodated
- Innovation results are more likely to be adopted and/or commercialized
- Return on investment is maximized through updated policies, improved practices, or product development and market expansion
- Trust in information and information sources is increased
- Resistance to change is minimized

These benefits translate directly into economic growth, regulatory compliance and/or operational efficiencies for partners, and consequently increased funding for researchers to advance the science and further improve the product. However, without extension professionals in place to facilitate the process and help drive principles to practice, the likelihood of effective translation and transfer of information and tools is reduced.

Successes and Failures

Several examples will be presented that describe what can happen when partners either fail to use, or succeed in using, a knowledge exchange system to manage projects in a manner that helps ensure inter-organizational collaboration. Examples include: (a) a pilot study to demonstrate an emerging technology, (b) striving for perfection in the face of ill-fated decisions, (c) development of science-based policy and (d) extension messaging at its best.

Conclusion

The KMC™ system is designed to provide a positive and progressive process for information and innovation to find a home in mainstream business. It is portrayed as a cycle to emphasize the iterative nature of continuous improvement. Success is based on creating strong relationships among partners that are built on shared knowledge and trust. It works, but it is not easy. Extension professionals are central to success.

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Loss of Forest Cover and its Socio-Economic Implications:
A Case Study Along the Offin River Basin of the Ashanti Region

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Introduction

Forest cover is desirable in catchments as they are one of the best and most natural types of protection for streams (Kunkle 1974). Hence any careless land use practices can lead to severe sediment problems, at great costs to both rural and urban communities (Kunkle 1974, Brooks et al. 1997, FAO 2003). According to Barlertey (1977), deforestation causes water tables to fall, which results in water shortages compelling rural women to travel for long distances in search of water. This seriously affects the socio-economic life of the rural poor.

Forests all over the globe are dwindling at a fast rate with the tropical rainforest dwindling at the rate of 15 million hectare per year (FAO 2003). In Ghana, the rate of forest loss as of 1988 was 750 km^2 yr^{-1} (Upton 2001).

Logging has consistently been undertaken in the Tano Offin and Offin Shelterbelt forest reserves and within the off-reserves along the Tano and Offin watercourses. Loggers claim they maintain the prescribed buffer (50 m for rivers and 25 m for streams). Yet these perennial rivers/streams have become irregular in flow. Consequently, the livelihoods of the riverine communities may be negatively affected. Therefore, there is the need to understand the effects of forest removal on river flow, water quality, etc. to develop appropriate prescriptions for sustainable and environmentally responsible logging. The objectives of this study were (i) to determine the percentage loss of forest cover due to logging in the Offin river portion in the Tano Offin and Offin Shelterbelt forest reserves and (ii) to determine the impact of logging on the social life (employment, health, food supply, and water supply) of the people in the adjacent riverine communities.

Methods

Study Area

Tano Offin (402.2 km^2) and Offin Shelterbelt (60.3 km^2) forest reserves are located in the moist semi-deciduous zone of Ghana (Figure 1). The names were derived from the Tano and Offin streams that drain the area. They were established as forest reserves in 1949 and harbour much of Ghana's prime flora and fauna.

Assessment of Logging Impacts on the Riverine Communities

1. Questionnaire Administration
One hundred individuals were selected from the 7 riverine communities using a simple random method and interviewed using structured questionnaires. The generated data were analyzed using cross-tabulation and descriptive statistics under SPSS (Version 13.0). Figure 1. Map of Tano Offin and Offin Shelterbelt forest reserves.

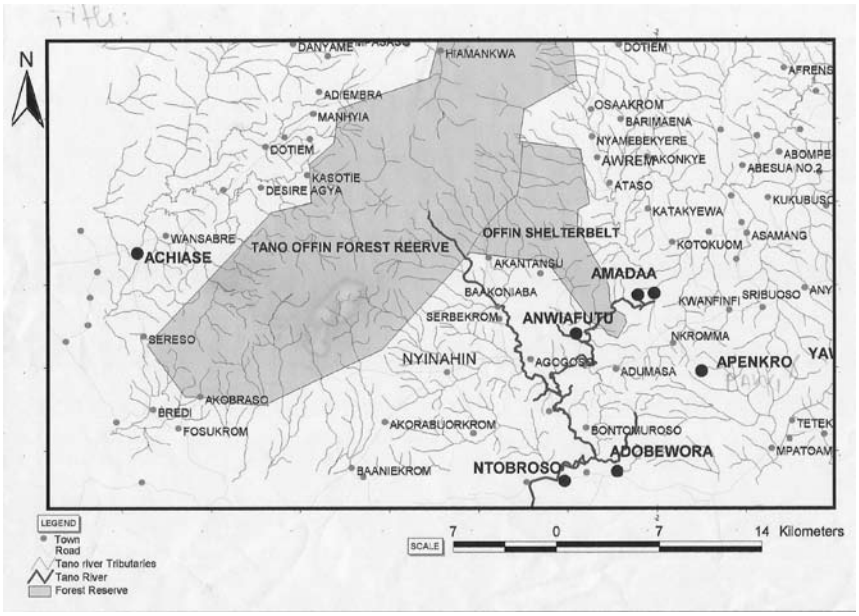

Figure 1. *Map of Tano Offin and Offin Shelterbelt forest reserves.*

2. Forest Change Detection with Maps and Satellite Imagery

Satellite images for 1990 and 2000 were acquired and geo-referenced to Ghana co-ordinate system. Forests were classified using Erdas imagine. The classified image was subset by a 500 m buffer on each side of River Offin. A 'ground-truthing' exercise was undertaken to validate the classification. The two images (1990 and 2000) were analyzed and compared using a simple bar chart in Arc View to determine forest cover change over the 10-year period.

3. Forest Inventory of Tano-Offin and Offin Shelterbelt Forest Reserves

Stand parameters, i.e. stem numbers, volume, and basal area per hectare were compared from inventory data (1990 and 2000) for the two forest reserves using Excel (TSPs) and Access (PSPs) programmes.

Results and Discussion

The area is primarily populated by farmers (Figure 2). The forest cover on the study site has been reduced over 20% (Table 1, Figure 5). In addition, the site is heavily cultivated with other areas under mining activities (Figure 3). This might account for the occasional water shortages and the prevalence of water-borne diseases, i.e. Bilharzia, Buruli ulcer, Guinea-worm infestations, etc. (Figure 4) (Amofa et al. 1993, Fukunishi 1999, Onsongo 2002, Aiga et al. 2004, WHO 2004). These findings are consistent with Amanor (1996) and Kunkle (1974) who proposed that trees and other vegetation and in fact natural forest is the best and most natural protection for streams because they maintain good water quality and stabilize flow. Consequently, without them, the socio-economic lives of the communities within the catchment become threatened (Ilegbodu 1987).

Figure 2. *Settlers age groups and their main occupation.*

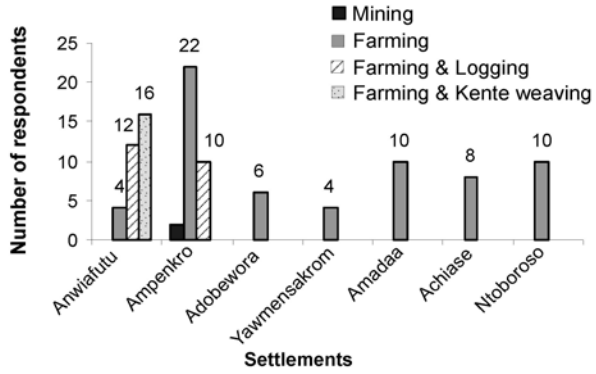

Figure 3*. Settlers economic activities.*

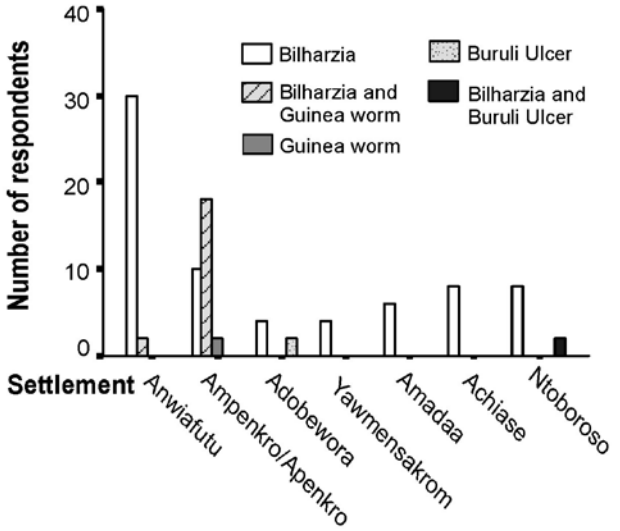

Figure 4. *Incidence of water-borne diseases.*

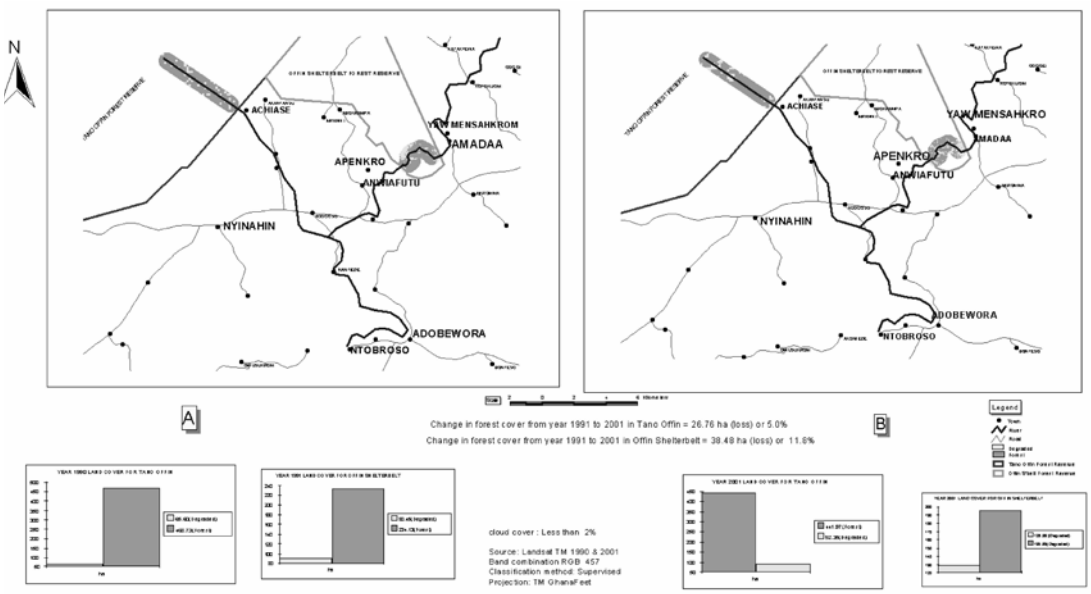

Figure 5. *Changes in forest cover from 1990-2000.*

Table 1. *Comparison of rates of decline (%) in forest conditions in Tano Offin And Offin Shelterbelt forest reserves between 1990 and 2001.*

Forest Reserve	Area (ha)	Stem Numbers (ha^{-1})	Basal Area ($m^2\ ha^{-1}$)	Volume ($m^3\ ha^{-1}$)
Tano Offin	40,220	0.99%	2.76%	0.80%
Offin S'belt	6,030	1.42%	2.92%	2.47%

Source: Determined from inventory data of RMSC, Kumasi-Ghana

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Supporting Forest-Dependent Communities in Economic Transition: A Canadian Approach

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Introduction

Canada has over 300 communities whose economies depend on the forest sector for at least 50% of their citizens' income. In recent years, the Canadian forest sector has been hit hard by a number of converging factors. These include changes in the market demand for products such as lumber and newsprint, a weakened U.S. dollar resulting in less revenue from sales to Canada's largest trading partner, growing competition from global producers, and high transportation and energy costs.

The combined result of these and other factors has been the closure or downsizing of a number of sawmills and pulp and paper facilities. In Canada, over 33,000 direct jobs have been lost in the forest sector in the past five years, or about 10% of total jobs in the sector.

Communities Take Charge of Their Destiny

While many forest-dependent communities in Canada are presently vulnerable to global influences that are beyond their control, analysts predict a brighter future. Canada is still the proud steward of one of the largest areas of sustainably managed forests in the world. We have a favourable global reputation for our forestry practices around the world. The forest sector has the wherewithal to become more efficient and cost-competitive.

To their credit, forest-dependent communities are not resting on their laurels. Some are seeking greater long-term economic security by looking for alternative product and service opportunities from the forest. Others are developing new partnerships with First Nation communities to support business development with this rapidly growing segment of the workforce. In some cases, the outcome will be forest industries that produce a different suite of products than is presently the case. Determined to keep forest-based jobs, many communities are also working on regional economic strategies and are not averse to actions such as retraining workers or supporting enterprises in neighbouring towns.

Governments Stimulate Community Action

A plethora of federal and provincial government programs in recent years have been aimed specifically at forest-based communities. Two programs that began prior to the current crisis continue to serve communities. The First Nations Forestry Program has long provided grants to First Nation communities to support new business opportunities related to the forest, and Canada's Model Forest Program developed numerous resources for forest managers and landowners that are still in use despite the termination of the program in 2007.

A relatively new program was announced in 2007 and has already demonstrated its impact. The Forest Communities Program (FCP) is a five-year, $25 million program aimed at helping select regions of the country explore innovative ways to grow their local forest-based economy (NRCan 2007). The communities in each region have recognized that they must work together, and with a wide range of partners, to ensure their survival. To reach this goal, each site selected to participate in the program is collaborating with all levels of government, non-governmental organizations, academic institutions, Frist Nations organizations, and the private sector. Through an evaluation of over 50 proposals, a total of 11 sites, representing many communities, were selected across the country (Fig. 1).

Incubators and Disseminators of New Knowledge

Each FCP site is developing and sharing knowledge, tools, and strategies to address transitional challenges and capitalize on emerging forest-based opportunities. This is being achieved through the following four program objectives:

- Develop new forest-based economic opportunities through collaboration with industry and other community stakeholders

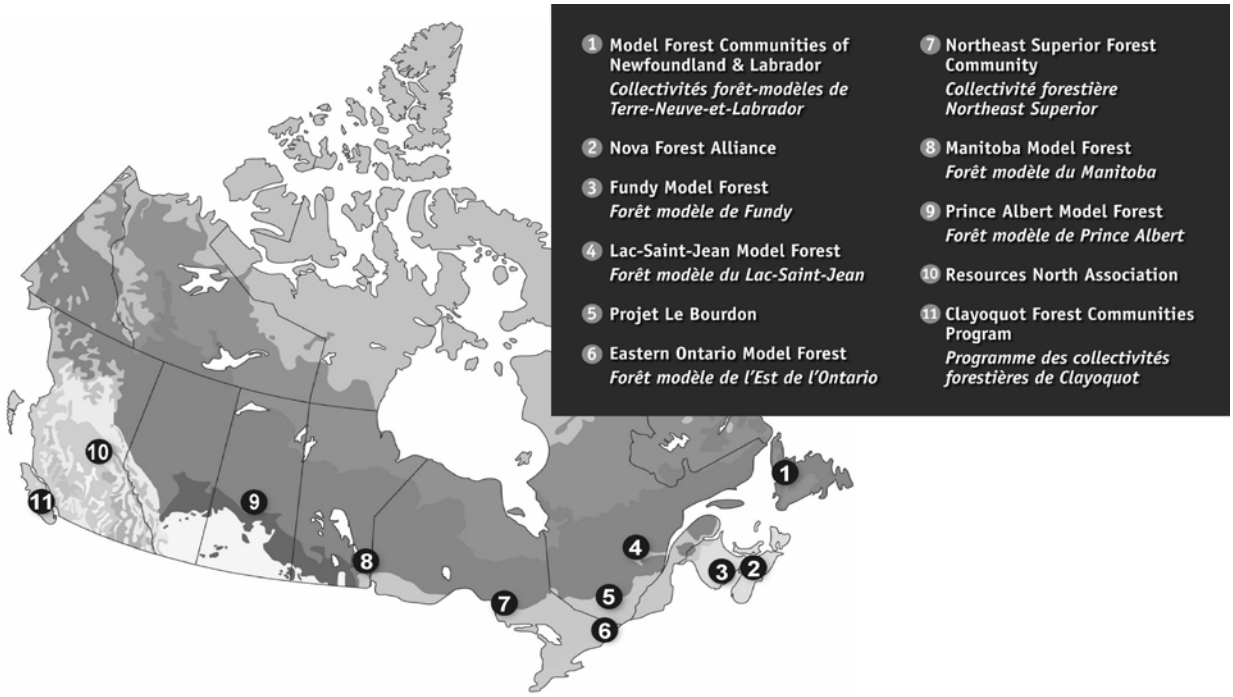

Figure 1. *Distribution of Forest Communities Program sites in Canada*

- Assist communities in building the capacity necessary to meet sector transition issues
- Develop and share integrated, multi-sector approaches to community transition
- Share best practices and information tools with forest communities across Canada and internationally

Each of the 11 sites receives up to $325,000 per year from Natural Resources Canada to develop creative solutions to local issues. A number of activities are underway in each region, including:

- Creating conditions that would allow the commercial production of blueberries and related products
- Developing a pilot project to demonstrate how a tract of forest can be managed, not only for its commercial timber products but also for its environmental services including clear air and water
- Providing the knowledge and information upon which new value-added wood products and wood-based biofuel industries can be built
- Strengthening the relationship with local First Nation communities by recognizing the value of traditional ecological knowledge and supporting efforts to create skilled forest-based employment opportunities

A requirement of each region receiving funding under the Forest Communities Program is that it shares knowledge and experience with others. FCP sites are taking a number of actions to address this, building on the lessons learned during Canada's Model Forest Program (NRCan 2007). Knowledge is shared at many levels, from local to global. As a member of the Canadian Model Forest Network, and de facto member of the International Model Forest Network, sites have a vehicle for putting their findings into the hands of a broad audience.

Examples of successful knowledge transfer approaches include establishing Canada's most comprehensive Forest Stewardship Council group certification program for private woodlots, initiating a national workshop series to promote newly created private land forest management tools, and working with multi-stakeholder groups to ensure that knowledge is placed directly into the hands of end users.

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Research Partnerships for Better Questions and Useful Answers

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Canada's forest sector faces the familiar challenge of incorporating research results into meaningful management approaches and policy changes. The diverse range of people involved in forest management reflects the interdisciplinary and multi-stakeholder nature of forest research and management. Organizations seeking to influence forest management must tailor knowledge exchange products and processes to this diverse audience.

The Sustainable Forest Management (SFM) Network is a national interdisciplinary forest research network, funded through a partnership of forest businesses, federal, provincial and territorial governments, Aboriginal organizations, non-government organizations (NGOs), and universities. These partners identify SFM Network research priorities and collaborate with researchers on specific projects of interest. The SFM Network includes more than 190 researchers across Canada and has an annual operating budget of CDN $7 million.

The SFM Network develops and promotes the concept of sustainable forest management among governments, industry, and other forest land stakeholders by funding research and facilitating networking. Since 2000, it has actively promoted a model that integrates research and knowledge exchange. This integrated model facilitates the development of alternative policies and practices to support sustainable forest management in Canada.

Integrating Research with Knowledge Exchange: The SFM Network Model

This integrated model incorporates knowledge exchange throughout the research process, not just after project completion as is the case for traditional extension models. Researchers and project partners understand their respective responsibilities in the knowledge exchange process. Through a two-way flow of information, researchers and partners identify information gaps and knowledge needs at the start of the research project, leading to improved research questions. Partners are engaged throughout the research project to provide feedback and to learn from interim results. At the end of the project, the final deliverables already 'fit' the partners' needs, and can be incorporated directly into the partners' specific sustainable forest management systems and management policy (Figure 1).

Three core strategies have evolved to facilitate knowledge exchange and application of SFM Network research (SFM Network 2005):

SFM strategic frameworks, in which partner organizations identify their approach to sustainable forest management, their information gaps and research needs.

Enhanced partner and researcher linkages through networking opportunities, workshops, and the collaborative development of research priorities, funding proposals and project implementation.

Knowledge exchange documents: Inventory, organization, synthesis and dissemination of completed research through printed and electronic media.

Knowledge Exchange in Canada

Forest managers in Canada face diverse issues, some of which are national in scope, others of which are regional. To be effective, the SFM Network knowledge exchange efforts strive to be accessible to a broad audience, interactive and sustained, focussed on the management implications of research, and directed to the appropriate audience.

Accessible: Websites, e-lectures, and distance-based learning opportunities enable a broader range of participation, although these must accommodate the limitations of dial-up internet connections. Regional workshops draw larger audiences and are less costly than national workshops; these become increasingly important venues for knowledge exchange with a rise in travel restrictions and cut-backs for industry and government employees. Documents written in plain language, in both English and French, are available in hard copy or electronically to maximize opportunities for uptake. Some documents focus on specific research results; others synthesize a larger body of research on a topic; still others focus on transferring specific skills.

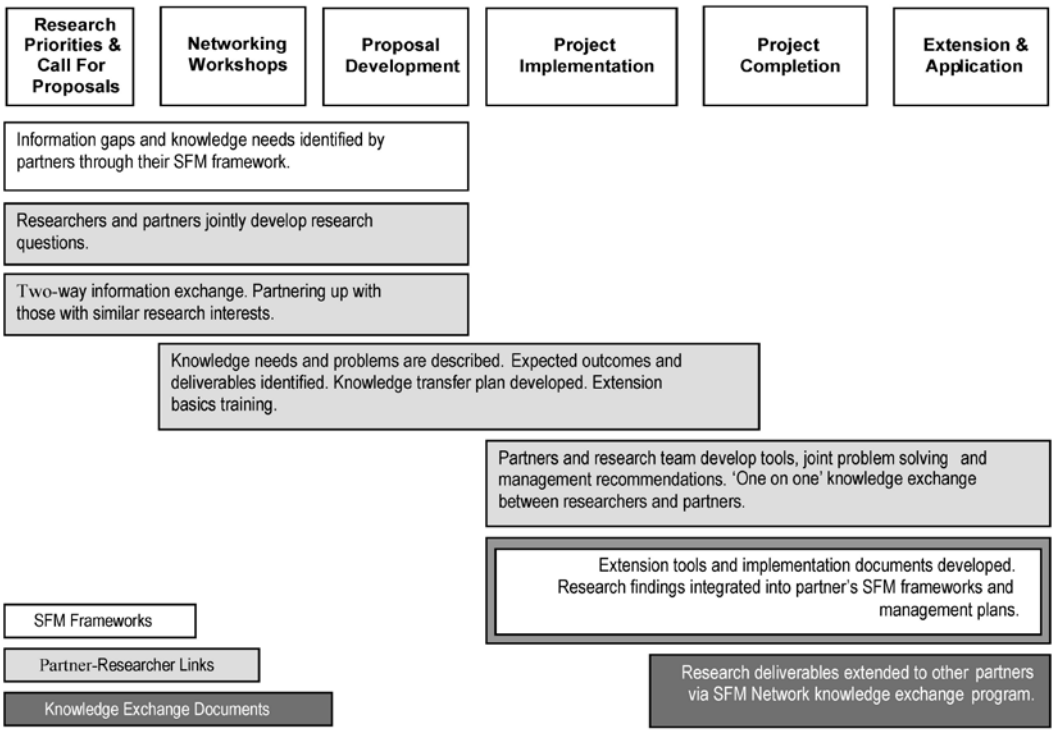

Figure 1: *Knowledge exchange between partners and researchers is integrated throughout the Sustainable Forest Management Network research process (Splinter 2006).*

Interactive and sustained: SFM Network activities serve to build and strengthen relationships among researchers, students, Aboriginal members, foresters and policy makers in industry and government. These connections are relationship-based. They need networking opportunities and time to develop.

Focussed: The Network publication series and workshops emphasize the management and policy implications of the funded research. Partner organizations work with Network staff in the review of publications and the development of workshops.

Targeted to appropriate audience: Different regions in Canada have different needs and priorities. To better respond to this regional diversity, the SFM Network facilitates the development of regional discussion forums. These groups encourage networking between industry, province, Aboriginal groups, and NGOs, and initiate workshops of regional interest.

Over the past decade, the SFM Network has contributed to changes in forestry research by increasing direct collaboration among industry, government, Aboriginal groups, and researchers. Through a collaborative approach, the SFM Network has successfully:

- Developed research projects of interest to industrial partners
- Influenced provincial forestry policy in several jurisdictions
- Facilitated new working relationships amongst researchers
- Contributed to the training of a generation of graduate students in collaborative research with partner organizations
- Altered industrial forest management practices even before final research results were published in the scientific literature

These direct connections between forest managers and researchers create an embedded knowledge exchange link, facilitating better research questions and producing useful answers.

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An Interactive Approach to Science-Based Planning in California's Oak Woodlands

Gregory A. Giusti
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Introduction

Unlike the State's commercial timberlands, California's oak woodlands are not subjected to the rigours of mandatory state-wide regulations. To the contrary, oak woodland conservation has been relegated to county governments who may or may not have appropriate resource professionals on staff to address the complex ecology of these native forest systems. In most cases, the local responsibility of oak management is administrated through the county's planning departments. The University of California Cooperative Extension's Integrated Hardwood Range Management Program (IHRMP) has dedicated several projects during the past 10 years aimed at providing local planners with science-based information to assist in their decisionmaking process related to oak.

California's legislature enacted SB 1332 in 2005 requiring that counties determine the effects of proposed non-agricultural projects on oak woodlands under the guidance of the California Environmental Quality Act (CEQA). The legislation specifies that counties will make a "determination of significance" of the proposed project and provides language that guides mandatory mitigation measures. Once the legislation was enacted, counties were faced with applying relatively vague language contained in the new law in a planning environment that is often contentious and politically charged, and thus searched for guidance and assistance.

The matrix provides a mechanism for planners to first assess initial forest conditions thereby establishing a baseline to compare relative effects of proposed management. The matrix provides examples, using various formats, i.e., checklists, tables, and charts to assist planners in quantifying the impacts from a proposed project. It further provides guidance to help qualify the impacts using simple terminology of high, moderate or low impacts to assist in the determination of significance as defined in the law. The publication provides example matrices to assist planners design and defend their decisions in an often politically charged environment.

Methods

The IHRMP approached the California Wildlife Conservation Board (WCB) and proposed a collaborative effort to develop and distribute a newly conceived idea of designing an interactive outreach project that can provide information exchange in "real time". A grant of $43,500 was secured and a working committee was formed with representation from the California Department of Fish and Game (DFG), California Department of Forestry and Fire Protection (CDF), WBC and UC.

The committee's task was to envision the myriad of conditions, situations and scenarios that would be possible across the 41 county's that are recognized as having oak woodlands as part of their natural landscape. The challenge facing planners across this broad geographic landscape is being faced with making a determination of impacts from the various commercial, industrial and/or residential projects that could have a significant impact on oak woodlands.

The committee met four times over the course of nearly a year to 1) identify project parameters that could qualify as "significant" under CEQA; 2) design regional educational workshops to explain the new law and its requirements; 3) explain and distribute the matrix for immediate use and 4) design a conceptual approach for a web-based interactive portal for "real-time" exchange of questions and ideas between UC academics and county-based planners.

In recognition of the wide array of possibilities that a planner may face when put in a position to determine significance the committee determined that the matrix use initial site condition of the oak woodland as a starting point of discussion when a proposed project is brought to a county.

Once drafted the matrix was shared with both academic and practicing planners for their review and editorial inputs. Now finalized, the matrix is available through the IHRMP web site.

Results

In response to their queries and requests for assistance the IHRMP has released a second edition of a publication entitled "A Planner's Guide to Oak Woodlands" supported by five regional workshops attended by nearly 500 participants. Additionally, the IHRMP has designed and released (2008) an oak woodland decision matrix intended to provide planners guidance on how to address SB 1332.

The 23 page matrix strives to establish common language and concepts to assist planners in making a

determination of significance when faced with multiple scenarios, choices and challenges. These common points of language include sections and sub-sections that provide guidance on subjects including:

- What is Woodland?
  -descriptions of various oak woodland communities
- Step I: Getting Started – Establishing Site Condition
  - Using common terms that recognize past disturbances e.g. intact, moderately or severely degraded
- Step II: Assessing Thresholds of Significance
  - Using Impact Prediction as a Means of Determining Significance
  - Determination of Impact Magnitude
  - Designing an Oak Woodland Matrix
- Step III: Identifying Potential Mitigatory or Remedial Actions
  - Mitigation Considerations

By establishing these common starting points the matrix provides a basis from which to develop a conceptual approach to determining impact. Table 1 provides an example of how the matrix is designed to help people get started.

Using check lists, tables, cross-reference guides the matrix strives to direct a planner in making a decision that is ultimately scientifically valid and politically defendable.

Discussion

In order to make a valid determination of significance a planner needs enough project information and a process by which to assess a number of ecological and biological criteria. The matrix provides various approaches to help guide a decision process including sample checklists that assist in identifying how a project may affect impacts:

- Net loss of oak woodland acreage.
- Increase habitat fragmentation.
- Loss of vertical and horizontal structural complexity.
- Loss of understory species diversity.
- Loss of food sources.
- Loss of nesting, denning, burrowing, hibernating, and roosting structures.
- Loss of habitats and refugia for sedentary species and those with special habitat requirements i.e. mosses, lichens, rocks, native grasses and fungi.
- Net loss of oak woodland acreage.
- Road construction, grading, trenching, activities affecting changes in grade, other road-related impacts.
- Stream crossings, culverts, and road associated erosion and sediment inputs.
- Road building activities that aggravate existing conditions.
- Changes in environmental conditions that prevent existing residual trees the ability to naturally regenerate.
- Proposed project designs that result in the construction of obstacles that pose as barriers to wildlife or fish passage.
- Proposed project designs that result in the probable introduction of invasive plants and animals.

Each of these criteria could arguably be considered when trying to make a determination of environmental significance under California law. This example checklist underscores the scope and array of scenarios that a planner could face when trying to balance environmental, economic and political objectives.

The next and final step is to complete an interactive web-based “planners portal” as a means of establishing a communication link between UC researchers/ educators and municipal and private industry planners and consultants that allows for “real time” exchange of challenges and ideas.

Conclusions

The planning process in California can be overwhelming and intimidating to both a planner and a project proponent. It is critical that all interested parties have sufficient guidance in the early stages of a project to make decisions that will not add substantial time delays and/or costs. The matrix adds another source of reference for a county-based planner who is challenged with these decisions.

***Table 1**. Conceptual sample of how the decision matrix is intended to demonstrate the determination of **significance** by comparing the initial condition of the site with the proposed impacts of the project.*

	Site condition		
Degree of Impact	**Undisturbed (Intact)**	**Moderately Degraded**	**Severely Degraded**
Low	Moderately Significant	Least likely significant	Least likely significant
Moderate	Highly likely significant	Moderately likely significant	Less likely significant
High	Significant	Highly likely Significant	Most likely significant

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The Redwood Forest Foundation – A Case Study:

A New Model Engaging Local Communities in Sustainable Forest Management

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University of California Cooperative Extension

Introduction

In 1997, Louisiana-Pacific (L-P) Corporation, a long-standing, corporate timberland owner in Mendocino County, California, divested their lands. The sale announcement caused a group of individuals representing the various factions that had been at odds during the redwood "timber wars" of the late 1980s to get together and form a not-for-profit foundation premised on the notion that local timberland ownership would promote sustainable forest management based on the principle of establishing "working community forests". They formed the Redwood Forest Foundation, Inc. (RFFI).

In this paper, I review the process, failures, and successes that in 2007 ultimately led the foundation, with financing from the Bank of America, to purchase nearly 51,000 acres (20,640 ha) of coastal land supporting red wood forests. As well, the structure of the Board of Directors and the "social license" that they influence, which ultimately gave the Bank confidence to structure a loan that will address the Foundation's conservation goals while meeting its fiduciary responsibilities, is explored.

Secondly, I explain how using a quasi-corporate structure, the foundation has successfully structured county-based advisory committees, over a large geographic region, that serve as "shareholders" in RFFI's decision-making matrix.

Lastly, the various regulatory, management, financial, social, and environmental components that must be navigated to ensure a successful, community-based program are outlined.

Methods

The Redwood Forest Foundation, Inc. was founded in the living room of a retired stock broker who had been involved for years in the public debate over corporate management of local forests. At this initial meeting were a mill owner, an academic, two members of Earth First!, two foresters, a restorationist, a County Supervisor, and a play write. The meeting was held one week after the L-P Corporation had announced its intention to sell nearly 250,000 acres (101,200 ha) of coastal redwood properties. An attendance sheet was passed for people to sign and RFFI was formed.

Though unsuccessful in that initial attempt to purchase the property, the formality of having an IRS recognized 501 (c) (3) foundation gave the agents administering the sale enough confidence to allow RFFI to sign a letter of confidentiality and the group was provided with the proprietary sale information. Two years later, the Georgia-Pacific Corporation followed suit and offered its California redwood lands for sale. Once again RFFI was included in the group of potential buyers and had access to the sale information.

In both cases, access to proprietary information provided an opportunity for RFFI to model projected timber growth, harvest rates, and income revenues. Both examples gave the members of the foundation board a chance to understand the nuances of high-stakes bidding and the importance of establishing their credibility in the finance world.

The all-volunteer board continued to meet monthly for the next 10 years. In that time, they developed by-laws, forest management tenets, conservation goals, draft management policies, and plans. Early on, the foundation secured grant monies to hire a part time executive director, a relationship that lasted about 3 years. For the past seven years, board activities have been run entirely on a volunteer basis.

As a means of engaging the broader community in decision processes, the board adopted the notion of advisory committees throughout the redwood region, of which there currently two, one in Mendocino County the other in Humboldt. These committees reflect the broader communities outside of timber and the environment and work with the foundation's board to develop outreach strategies, activities, as well as influencing future management directions.

Throughout the foundation's tenure, the board members tirelessly marketed the idea of community-based working forests to local, state, and Federal legislators, philanthropic foundations, lending institutions, and the general public. The board convened public workshops to explain the foundation's mission, its board membership, and its management philosophy. Additionally, the foundation created a 12-minute introductory video that explained the need for such an organization as a means to address resource sustainability and community stability.

Results

In 2007, after three years of negotiations with the Bank of America, the Redwood Forest Foundation, Inc. became the sole owner of nearly 51,000 acres (20,640 ha) of coastal redwood forest. The Bank provided a US$65M loan for the purchase. The loan is structured with provisions that do not allow RFFI to ignore its conservation tenets and the debt is structured to the revenues expected to be generated from timber harvest over the next 20 years.

The foundation has negotiated with the Conservation Fund to have them acquire a Conservation Easement (CE) on the property to reduce the debt. The major elements of the CE will (1) establish protections on small ephemeral streams currently not protected under the California Forest Practice Rules, (2) collapse all existing Certificates of Compliance to eliminate the possibility of future subdivisions of the property, and (3) limit all future timber harvesting to no more than 2.9% of inventory into perpetuity. The estimated value of a CE on nearly 95% of the property is approximately $40M.

As part of the arraignment with the Bank, The Campbell Timberland Management Group (TCG) has been retained to provide day-to-day management of the property. The foundation's management committee members work with TCG weekly in designing management plans, financial planning, and outreach activities.

The foundation has secured several philanthropic donations and is in the process of recruiting a new executive director. This will provide greater opportunity for grant writing and outreach.

The RFFI will be co-sponsoring a two-day workshop in the fall of 2008 exploring the meaning of community forestry and specifically what it means to the local citizenry.

Discussion

This is a work in progress, and one that has no precedents from which to learn. The Foundation's purchase is the largest, privately funded conservation purchase in history. The community is learning what it means to have a voice in local timber management decisions and how those decisions may affect generations to come. Finally, the Foundation and the community are engaged in a discussion articulating the differences between a community *forest* (which this is not) and community *forestry*.

The need and reality to address the Foundation's fiduciary responsibilities has served as a basis for common ground in discussing various management options and future directions.

Changing Roles in the Southern United States

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Natural resource agencies are being called upon to provide solutions to increasingly complex challenges at the wildland-urban interface (WUI). Communities are growing rapidly, landowners' management goals often conflict, residents may not understand the benefits of resource management, and the resulting risks to environmental quality and human quality of life are becoming more apparent. The *Changing Roles: Wildland-Urban Interface Professional Development Program* was developed to builds skills and provides tools to successfully tackle WUI issues. The program was developed by InterfaceSouth of the U.S. Forest Service, the University of Florida, and the U.S. Fish and Wildlife Service.

Changing Roles consists of four training modules: (1) Introduction to the range and complexity of wildland-urban interface issues, (2) Tools for effectively managing natural resources in the wildland-urban interface, (3) Strategies for understanding and influencing the development of policies and plans that affect natural resources, and (4) Communication skills for working with interface residents and community planners and leaders. Each module contains a trainers' guide with background information and interactive exercises to be used with workshop participants. Much of the information in the modules is presented in 28 fact sheets that can be distributed as reading material or used with other audiences as handouts. Twenty-three case studies provide vivid descriptions of interface issues across the southern United States and how they are being resolved. PowerPoint® Presentations and evaluation materials are also provided. The program materials can be found at: http://www.interfacesouth.org/products/training/changing_roles.html.

InterfaceSouth: Providing Resources for a Changing Landscape

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The south is one of the fastest growing regions in the United States, with an estimated population increase of 1.5 million people each year and 65 of the top 100 fastest growing counties in the nation. It also consistently has the highest number of wildfires per year of any region in the United States. Some of those fires are quite large, as in the case of the 1998 Florida wildfires. These wildfires brought the challenges of working and living in the wildland-urban interface (WUI) to the forefront for the U.S. Forest Service (FS) and other natural resource agencies across the south. Shortly after these fires, the FS chief conducted a review of the south and identified the WUI as an area on which to focus research and information efforts.

In response, the FS conducted an assessment of the research, technology, and education issues that confront the WUI in the South. This assessment, titled *Human Influences on Forest Ecosystems: the Southern Wildland-Urban Interface Assessment*, served as the foundation for the establishment of InterfaceSouth (formally known as the Southern Center for WUI Research and Information) in 2002 in Gainesville, Florida.

InterfaceSouth has taken a novel approach among research work units in the FS in that a technology transfer component is fully integrated within the research program. Additionally, InterfaceSouth's advisory council, the Southern Wildland-Urban Interface Council (SWUIC), provides feedback about research and technology transfer needs and exemplifies the diversity of InterfaceSouth's partners and program areas. SWUIC is a chartered council of the Southern Group of State Foresters and consists of members from state forestry agencies, the U.S. Forest Service (Research, State and Private, National Forests), universities, cooperative extension, and non-government organizations. In addition to advising on research and information needs, SWUIC also helps identify emerging WUI issues, serves as a liaison to the state forestry agencies for the delivery of technology transfer products, and helps to identify and communicate the needs of other stakeholders. This council has been crucial to assuring the relevance of the research conducted and the applicability and delivery of technology transfer products to InterfaceSouth's constituents.

InterfaceSouth has focused much of its research and technology transfer efforts on WUI fire issues, though it also covers a range of issues related to the urbanization of southern forests. It is currently part of the USFS Southern Research Station research work unit "Integrating Human and Natural Systems in Urban and Urbanizing Environments." Although InterfaceSouth was created to serve the same 13 states as the Southern Research Station, it has come to be recognized as a national leader for WUI information development and dissemination.

Through a partnership with the University of Florida and the USDC National Institute of Standards and Technology, InterfaceSouth has focused on minimizing fire risk to property owners by evaluating the flammability characteristics of commonly planted shrubs and commonly used mulches, choices that can contribute to wildfire house damage. This information is also being used in the development of physics-based models to assess and predict fire spread through communities. From this and other research projects, information is developed in a variety of formats to reach diverse audiences, including homeowners, policymakers, and natural resource professionals.

One such format is publications. The *Fire in the Interface* fact sheet series explains WUI fire concepts related to understanding fire and selecting appropriate plants for landscaping in interface areas. The *Quick Guide to Firewise Shrubs* ranks the 34 shrubs tested in the flammability study into high, moderate, or low flammability categories. The *Wildfire Risk Assessment Guide for Homeowners in the Southern United States* allows homeowners to evaluate their particular exposure to fire as well as the critical factors that increase their risk. These fact sheets and guides provide information to help homeowners and communities take personal responsibility for the protection of their homes in the event of a wildland fire. Additionally, at the

request of the Southern Group of State Foresters, InterfaceSouth is currently developing *Fire in the South II: the Southern Wildfire Risk Assessment*. This publication (to be released fall 2008) brings attention to the critical fire situation in the south, presents key findings of this region-wide assessment, and demonstrates through case studies some practical applications. The book titled *Forests at the Wildland-Urban Interface: Conservation and Management* provides information, strategies, and tools to enhance natural resource management, planning, and policymaking at the wildland-urban interface.

Another important resource is the InterfaceSouth web site (www.interfacesouth.org), which provides resources such as a literature database, a photo gallery, and a listing of WUI news and events. Individuals also can sign up for the SWUINET listserve, through which members receive the *Interface South Update*, a monthly electronic bulletin focusing on critical WUI issues; the *InterfaceSouth Post*, which is sent out weekly and offers timely information about upcoming conferences and topical news items; and *Leaves of Change*, a quarterly bulletin about the activities of InterfaceSouth, its sister center Urban Forestry South, and partners. The web site is being translated to Spanish, as are many of the fire publications.

The web site also offers several decision support systems to help homeowners and resource professionals reduce fire risk around homes. One is the flammability key, which includes a step-by-step ranking method based on easy-to-identify characteristics such as type of plant (tree, palm, shrub, or vine), distance between the ground and branches, denseness, and other factors. After completing all of the steps, the homeowner can identify plants as “not firewise,” “at-risk firewise,” “moderately firewise,” or “firewise.” This method allows fire professionals and extension personnel to make *firewise* lists that can help residents make informed decisions about landscaping in fire-prone areas.

In addition the web site offers training program materials, such as the *Changing Roles: WUI Professional Development Program*. Although wildland fire prompts many natural resource professionals to pay attention to the WUI, this program makes clear that interface issues are much more extensive than fire. Many natural resource professionals are well trained in managing rural resources and are comfortable communicating with rural landowners. Work in the interface, however, brings different challenges and opportunities. The materials in this program teach new skills necessary for managing fragmented forests and communicating effectively with interface residents as well as encouraging participants to apply those skills through interactive exercises.

Demonstration sites are another valuable format that InterfaceSouth has participated in establishing to help raise awareness about *firewise* issues. InterfaceSouth participated in a Firewise Retrofit project demonstration site in Alachua County, FL with a coalition of federal, state, and local partners. The project, which is documented in a Flash presentation on the web site, involved retrofitting a Florida home and its surrounding landscape to reduce its vulnerability to wildfires, as well as other hazards.

In collaboration with Auburn University, InterfaceSouth sponsored two international conferences – *Emerging Issues along Urban-Rural Interfaces I* and *II* – that were focused on a range of interface issues. These conferences brought together diverse groups of people from the U.S. and abroad to share information and talk about challenges and opportunities in the WUI across of spectrum of disciplines.

InterfaceSouth has brought together natural resource professionals from fire, urban forestry, forest health, community planning, and a range of other disciplines to work together towards approaching and solving interface issues. These partnerships and the resources provided by InterfaceSouth are vital to the southern U.S. as the wildland-urban interface continues to expand.

Woodland Owner Networks
Part 1: Peer-to-Peer Learning and Best Practices

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The use of learning circles, learning communities, virtual communities, collaborative and participatory learning strategies, and other types of social networks to facilitate peer-to-peer learning has accelerated with the increasing pervasiveness of the Internet in homes, schools, and businesses. There has also been an increasing recognition of the potential benefits of all types of peer-to-peer learning including but not limited to web-based approaches. These benefits include participant leadership, community building, and exchange of practical experience.

While much is known about traditional forest owner behaviour change strategies related to financial and technical assistance through an expert approach, little is known about the role and outcomes of informal and formal peer interactions in the landowner community. Although peer-to-peer learning networks are widely used in other arenas, such as the Expanded Food and Nutrition Extension Program (EFNEP) program in cooperative extension and various business models, little is known about the composition, extent, efficacy, and nature of peer networks among family forest owners.

Important questions that need to be answered are:

1. What catalyzes a social network? A peer-to-peer learning network?
2. How do factors such as network size, structure, and geographic extent influence the establishment and maintenance of social networks?
3. What are effective methods of establishing, facilitating, and maintaining social networks and/or peer-to-peer learning opportunities?
4. What are the challenges to the development of social networks (e.g., resistance to change from the expert model of delivery, creating appropriate learning spaces, and defining, monitoring, and assessing success)

We will present current knowledge about best practices in peer-to-peer networking and learning from a variety of applications including business, education, and extension. Knowledge gaps will be identified. Conference participants will be asked to discuss the potential application of these practices in forestry extension with particular emphasis on non-industrial woodland owners.

Science Communications That Help Adapt to a Changing Environment

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Introduction

As ecosystems change with climate change so do the needs of land managers for information. Where once definitive answers towards static states were the expectation, land managers are faced with scientific understanding that itself is dynamic and without definitive answers. As land managers and others work to cope with uncertainty through gathering knowledge, they need scientific information and expertise that is current and readily comprehended.

This paper addresses how U.S. Forest Service scientists are communicating about changing ecosystems and climate in the western United States. It provides a case study of the initial development of a climate change web site to provide information that helps land mangers in making decisions to adapt to changes related to climate and to reduce human effects on climate. The case study is used to describe how a research organization can respond to the interplay of changing ecosystems, information demands, and new communication technologies in addressing key science and communication issues including product development, quality assurance, and information updates.

Initial Reflections on Climate Change and Land Management

In 2005, scientists in the U.S. Forest Service who worked in the area of climate change identified the need to meet with land managers to address climate change and, as a result, a workshop was held in Portland, Oregon, on the topic: *Bringing Climate Change into Natural Resource Management*. In the proceedings of this workshop, Joyce and Haynes (Joyce et al. 2007) stated "overwhelmingly, there was lack of knowledge among the participants about how energy policy and climate change policy were moving, particularly in terms of carbon sequestration, what role forests might play and what the benefits might be to land owners." Reflections of workshop participants included the need for recognizing a changing relationship between climate and ecosystems, managing ecosystem as dynamic rather than static systems, managing ecosystems with agility, and bringing climate into the planning and management processes.

This workshop and other experiences brought scientists to conclude that a key way to help land mangers become knowledgeable about current scientific information on the broad topics of climate change and forests was through a resource centre on the Internet. Targeted to resource managers, the site would provide information resources for use in forest planning and project implementation. The goal was to provide select material of direct relevance that would help land managers in their everyday responsibilities. The site would need to be as dynamic as the natural systems it described.

A Climate Change Web Site Concept

A challenge for those seeking an understanding of climate change today is the huge amounts of information on the Internet posted by journals, universities, federal research organizations, non-government organizations, and others. This information has been mostly downloadable versions of information that is essentially the same as that in traditional static repositories. Just a few decades ago, access to such information was most often through libraries where the volume of information grew relatively slowly over time. But the Internet has created a dynamic and ever expanding source of information. New forms of information are emerging to include not only static formats, such as PDF, video presentations, and podcasts, but continually changing formats such as updatable bibliographies, wikis, blogs, and others.

In working with web developers, scientists in the Pacific Northwest wanted to be sure that managers could get to the type of information they needed and that it was made available in compelling formats that could be kept current. Thus, the site would be designed to ensure that information would be readily available through commercial search engines.

The approach to placing information on web sites initiated in about 1998 by the U.S. Forest Service was by organizational unit. With climate change, the scientists determined that users of the site would be best served by a topical approach that crossed organizational boundaries, in this case three western research stations and the Western Wildland Environmental Threat Assessment Center. Scientists in these sub-units of the U.S. Forest Service organized themselves in a research steering committee to contribute strategic, conceptual, and scientific advice, develop critical content, and review material for posting.

Development of the Web Site

Work on the site began in the summer of 2007. A web developer and the scientists created the framework for information placement and determined the kinds of information to be posted. The effort initially stalled as scientists beyond the steering committee who were conducting climate related work were focusing their efforts on creating new scientific information on climate change and communicating it through traditional vehicles. Their contribution was essential to the site.

Research administrators stepped in to assign deadlines and a call for scientific information to be posted on the site. As information was pulled together, the compiling, rewriting, and editing emerged as major challenges. Staff and resources were assembled to support the effort and meet a deadline of abut 3 months.

The next challenge raised was quality control: new content (versus content that already been published in journals and elsewhere) needed technical and policy review and the quantity and types of information exceeded the capacity of the steering committee. A site administrator was assigned to organize the reviews as well as the content development, editing, and posting. A review process was developed that could accommodate the variety of content being gathered: updateable bibliography, short topic pages, case studies, video lectures, descriptions of current climate change research, sample maps of climate projections and impacts, frequently asked questions, and a series of primers.

Launching

Within three months, in March 2008, initial content was placed on-line and the URL (USFS 2008) went live and was shared with Congressional staffers and key Agency staff. Yet, at this time, scientists were still submitting some information, writers and editors were refining content, reviewers were reviewing it, and authors were reconciling reviews. So while the site was public, it was not publicized until the next set of content was placed on-line over the course of another two months. It was then that the Chief of the Forest Service provided the URL in a web video distributed throughout the Forest Service on a day designated to foster Agency learning about climate change. The site was now part of the Forest Service Web presence and becoming well known internally.

By July 2008, searches engines were picking the site up and, in some cases, the site was leading search lists, such as for: cumulative effects and climate change. In August, a press release and efforts to publicize the site will be undertaken and metrics collected on the use of the site. Some information continues to be placed on the site and plans are underway for major additions, including a revised set of video lectures and pod casts. The site cost is currently about US $50,000 plus the time of more than 20 scientific contributors and about 50 reviewers. The review process is being further developed and will be incorporated in other agency Web site development that uses new types of content and applications.

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Heritage Extension in Virginia:
Merging Tourism with Technical Forest Management Education via the LEAF Program

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Introduction

More and more, people seek experiences that include a connection to history (Kelleher 2004). This trend presents a considerable opportunity for forestry extension. In Virginia, extension professionals offer forest management education for diverse and sizeable audiences. And while an impressive number of the state's citizens regularly attend, the truth of the matter is that new audiences are difficult to reach. Nevertheless, engaging non-traditional participants is one of extension's most important challenges (Hughes et al. 2005). Virginia's Link to Education about Forestry (LEAF) program aims to improve extension capacity by combining forestry and natural resources management learning with heritage tourism.

The LEAF program offers a fresh approach for making positive strides among non-traditional audiences by integrating diverse forest management activities and dedicated demonstrations into outdoor classrooms at historically significant sites and couching associated education within both technical and historical contexts. The ultimate goal is to improve the visibility, appreciation, and understanding of forestry and natural resources management among the general public, and landowners more specifically, in Virginia and beyond. A series of outdoor LEAF classrooms and curriculum are in developmental stages at several key heritage sites in Virginia. These sites include James Madison's Montpelier, The Cyrus McCormick Farm, and the Powell River Project (PRP). Research is underway to assess the potential effects of heritage-based extension, capture relevant biological and social history at each site, and begin tracking the benefits of various management initiatives.

LEAF Classrooms

LEAF classrooms offer access to at least one permanent structure for indoor activities and are underpinned by a forest inventory system designed to monitor the effects of assorted resource management demonstrations and initiatives. Monitoring systems vary based on the nature and content of each classroom. Extension professionals are able to use this data to guide their educational programming and describe progress in terms of biological, economic, and social benefits. In addition, relevant biological and social histories are researched and used to help market and enrich educational programs. Lastly, classrooms include opportunities for incidental education via signs, kiosks, self-guided tours, and dedicated educational trails. Where possible, these passive tools are established in high-traffic areas to convey forestry and natural resources management information to passers-by.

To date, three classrooms are underway. The LEAF classroom at James Madison's Montpelier will showcase a variety of restoration and management tools and tie into an existing network of trails traversing the estate's old-growth Landmark Forest. At the Cyrus McCormick Farm, the LEAF classroom is combining longstanding beef management with sustainable forestry at a National Heritage Site. Lastly, at the PRP the LEAF Program is working to take the next step in coalfield reclamation by researching and demonstrating sustainable forest management in a setting profoundly affected by historical land use.

James Madison's Montpelier

Hundreds of hectares of second-growth forests at James Madison's 1,072-hectare Montpelier Estate are in need of restoration. These forests, like much of Virginia's 6.2 million hectares of forests, face health and sustainability threats, such as lack of oak regeneration, previous high-grade harvests, and exotic invasives. Restorative management practices are needed to reverse additional degradation. A LEAF classroom at Montpelier offers an extraordinary opportunity for informing many about the benefits of forestry and natural resources management.

A trail system will service the working demonstration forest and tie into an existing network of trails that traverse the estate's old-growth Landmark Forest. We envision implementing innovative restoration treatments along the trail to restore healthy forests,

mitigate invasive species, enhance wildlife habitat, maintain soil stability, improve water quality, and achieve economic productivity, as well as developing an interpretative plan that effectively incorporates the LEAF classroom into Montpelier's story. During the summer of 2008, field technicians began working towards these goals.

Cyrus McCormick Farm

Many working farms in Virginia include potentially productive forests, but owners regularly fail to take advantage of the associated opportunities. If trends persist, the productivity and health of these forests and the sustainability of working farms in Virginia will be at greater risk. A LEAF classroom at the Cyrus McCormick Farm – a National Heritage Site where the mechanical reaper was invented – will help to broadly communicate the benefits of farm and forest management and ultimately improve the situation.

About 232 of the farm's 364 hectares are dedicated to beef production and forage research guided by the Shenandoah Valley Agriculture Research and Extension Center, which is housed on the farm. By combining these livestock activities with sustainable forest management in the remaining 132 hectares, we will exhibit how working farms can enhance revenue and environmental quality using sustainable forest management. Additionally, wood harvested in the surrounding forests played a crucial role in the success of McCormick's reaper innovations. We would like to develop an interpretative plan clearly linking the Cyrus McCormick story and LEAF classroom demonstrations. During the summer of 2008, a field technician completed forest inventory work at the farm.

Powell River Project

Coal mining is a tradition in the mountains of deep Southwestern Virginia. Yet forestry and natural resources management are also a critical part of the region's character and economy. Over the past 25 years, scientists have worked with the mining community to re-establish forests on former coalfields at the PRP. The Project's LEAF classroom is now taking the next step in forest management on reclaimed coalfields.

The LEAF classroom at the PRP will offer research and education programs related to managing forested ecosystems on mining lands. Initial objectives include rehabilitating degraded natural forests and demonstrating the benefits to landowners, practitioners, and youth. Other aims are to explore the opportunities for managing forests planted after mining operations and to enhance the interpretive relevance of the classroom to the region's mining history.

Research

Research is ongoing to measure prospective effects of heritage-based extension. Visitors to James Madison's Montpelier are being randomly surveyed about their level of participation in forest management education, willingness to participate in forest management education at Montpelier, and forest management values. Data will provide insight into the potential for heritage-based extension to reach and influence non-traditional audiences.

Projects are also underway to measure biophysical and social aspects of interest at each LEAF classroom. Research plots are presently being established in a recently burned area at the PRP to assess effects on the vigour of invasives and compare herbaceous cover and tree regeneration with equivalent data from an unburned control. A project is also underway at Montpelier to measure and compare soil carbon in old growth and second growth forests on the estate. Efforts to research, synthesize, and incorporate historical aspects of forest use at Montpelier into interpretive materials are also in progress.

Conclusion

LEAF classrooms are designed to demonstrate diverse aspects of forestry and natural resources management in a unique historical setting, offer indoor/outdoor extension programs, create opportunities for biological and social research, and provide mechanisms for Virginians and others to learn while also enjoying the state's heritage. As such, these classrooms are not only of interest to citizens already involved in forestry extension, but also those who have not typically taken advantage of existing opportunities. Extension professionals in Virginia can take advantage of this additional aspect to better market and enrich their educational programming while also vastly expanding their reach.

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Forest Landcare: An Opportunity for Collaborative Forestry Extension

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Introduction

Landcare has captured the imagination of millions of people. Its goal of achieving social, economic, and ecological sustainability has generated considerable interest. Successful programs exist in Australia, New Zealand, South Africa, and the Philippines. Others are forming in a dozen additional countries, including the United States. “Forest Landcare” is a distinct component of Landcare that involves the banding together of local Landcare groups and businesses and other institutional partners to help communities improve their social, economic, and ecological sustainability through low-impact, long-term forest management.

The Headwaters Forest Landcare Partnership, a public-private partnership coordinated by the Department of Forestry at Virginia Tech, represents a diverse coalition of U.S.-based stakeholders working together to sustain the health and security of hardwood forests in the Chesapeake Bay, Albemarle Sound, and Mississippi River basins. Vast amounts of rural forests in these regions have been converted to settings comprising smaller exurban residential parcels. A key objective of the partnership is to formulate innovative forestry extension strategies in exurban landscapes where diverse owner objectives and smaller parcel sizes make traditional approaches increasingly obsolete. The research described here is being conducted in response to this objective.

Situation

Engaging exurban forest owners is a substantial challenge for forestry extension. Traditional linear methods are often inappropriate because the numbers of owners are simply too great and their variety too extensive. Local frameworks are needed to effectively transfer sustainable forest management technologies, but this requires that extension professionals collaborate with various partners to identify networking strategies more so than administer abstracted, one-size-fits-all educational programs. At the same time, however, they remain a much-needed and consistent source of sustainable forest management information.

Balancing collaborative work with more traditional extension in exurban settings is needed, yet techniques for doing this are not well articulated. Overuse of conventional, top-down methods will likely confine influences to traditional audiences, whereas too much time and energy spent exploring networks with various community interests could detract from an extension professional’s ability to provide valuable educational services and technical insight. Research through the Headwaters Forest Land Partnership and the Blue Ridge Forest Cooperative, a Headwaters partner, will test several collaborative approaches within the Forest Landcare framework and outline strategies for balancing traditional technology transfer initiatives and participation in local capacity-building processes.

Approach

The Headwaters Forest Landcare Partnership promotes an integrated approach to forestry extension in exurban landscapes. It entails local problem solving, shared strategic learning, and development of institutional efficacy. Envisioned is an extension system that facilitates cooperation among diverse groups towarsd those objectives in any variety of specific locales. The overarching belief, in the spirit of Landcare, is that when forestry extension professionals work with local interests as opposed to outside them they will become better integrated and thus more responsive to local needs. And when responding, their forest management expertise will be more warmly welcomed and effectively disseminated via interpersonal and institutional networks.

Our research seeks to evaluate Forest Landcare as a framework for balancing technical extension and community collaboration in forested landscapes characterized as exurban residential. For our evaluation, we will compare conventional, linear extension programming systems and collaborative educational programs coordinated through the Blue Ridge Forest Cooperative – a Forest Landcare business. These comparisons will occur across a series of similar educational events within both systems. Events will range from outdoor demonstrations to roundtable discussions.

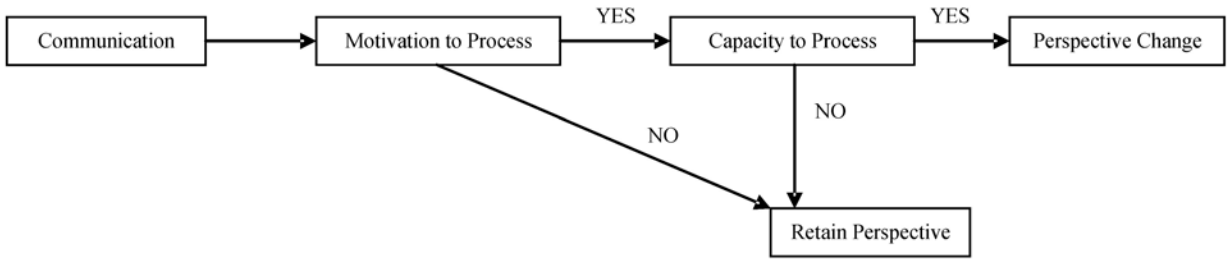

Figure 1. *The elaboration likelihood model.*

Methods

We will measure two primary variables at all events: (1) a participant's ability to process the educational content of an event as opposed to less-substantive programmatic aspects, and (2) the extent to which collaboration and networking were associated with each event.

To gauge the first variable, we will use pre- and post-event surveys and open-ended interviews based on the Elaboration Likelihood Model (ELM) design with a willing sub-sample of participants. In ELM, motivation and capacity to process influence an individual's ability to process messages (Petty 1995). Personal relevance drives motivation. Relevant facets include interest, a sense of personal responsibility, and credibility and trust of the speaker. Immediate situational factors influence capacity. If relevance and capacity are high, then an individual's ability to process content and experience a perspective change are strong. If one or both are diminished, then the individual is likely to focus on less-substantive aspects and retain or regain their initial perspective. Figure 1 illustrates basic ELM constructs and paths.

To asses the second variable, we will categorize the time and nature of collaboration involved in each system. We will then discuss our findings in the context of the resources allocated to technology transfer versus collaborative planning. We will also chart proximate diffusion networks, outline the potential social, economic, and environmental effects for both systems in exurban forests, and speak to Forest Landcare's ability to facilitate local problem solving, shared strategic learning, and development of institutional efficacy in exurban communities.

Conclusion

Results of this research will assist the Headwaters Forest Landcare Partnership in defining a balanced forestry extension approach for exurban landscapes. It will also help extension professionals gain a sense of how Forest Landcare can facilitate local collaboration efforts while enhancing their ability to transfer technology in these emerging forested landscapes. In exurban forests where diverse owner objectives and smaller parcel sizes render conventional extension methods shorthanded, Forest Landcare aims to foster a balanced educational effort to promote forest management as a springboard for improving the social, economic, and ecological sustainability of these communities. Forestry extension would be wise to more closely consider the role this emerging landscape-level management framework can play in efforts to provide exurban communities with substantive and effective programming.

Technology Development to Technology Transfer – A Continuum in R & D on Tree Plantation Development:

The Case of Eastern Visayas, Philippines

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Introduction

Much has been done to reinstate the forest of areas in the Philippines into "functional form" but efforts still fall short of the expected results in reforestation or tree plantation projects. There is a dearth of technical information about the performance of a variety of fast-growing tropical exotic and endemic tree species at various reforestation sites. Concomitantly, many reforestation efforts that have occurred in the country have relied heavily on trees selected from a very short list of internationally known species. With this, there is a need to develop sustainable management systems for the production of fast-growing tree species that have potential for reforestation and agroforestry especially in Region 8 or Eastern Visayas, Philippines where about 56,000 hectares are badly degraded timberland needing immediate rehabilitation.

Thus, generation of appropriate management practices related to nursery production and field planting are critically necessary because in general established tree plantations are not exhibiting the biomass productivity expected of the selected tree species, even with the use of genetically superior stock. Therefore, developing technologies in tree plantation and testing those on various sites is a step in the right direction in view of the fact that tree species have varied management requirements and responses. These efforts should not just end at generating techniques; instead, continued efforts to deliver the knowledge to end-users is also required. Disseminating research findings to a broad range of forestry stakeholders enhances the links between research and applications to increase effectiveness – particularly that on the ground (CIFOR 1998). Communication is the key. Technology dissemination has relied on the promotion of specific practices or technologies for adoption. This involves charting of a persuasive plan for providing farmers access to advice and information that will help them in their land management decisions (Garforth et al. 2003)

Materials and Methods

Site selection and characterization

Tree provenance trial plantations in San Salvador, Matalom, Leyte, Philippines was chosen as a site to demonstrate farmer participation in the establishment of a tree farm. Site dynamics was described in terms of soil, climate, vegetative cover, land use practices, etc.

Data collection and analysis

The data collected were height and diameter of trees in plantations, measured every six months, floral diversity dynamics, and costs and benefits. These were analyzed using appropriate experimental or statistical designs, graphs, and matrices.

Maintenance and protection

The demonstration farm has been maintained by conducting underbrushing of undesirable shrubs and vines with the cooperation of the Local Government Unit (LGU) of Matalom, Leyte, Philippines. Protection activities were carried out by the Department of Environment and Natural Resources, Local Government Unit and Philippines Army.

Transfer of technologies

Transfer of technologies was accomplished through:

a. Use of a demonstration farm
b. Visits and informal meetings with farmers
c. Presenting results in scientific fora
d. Hosting seminars and trainings
e. Producing information materials such as articles and a field guide

Establishment of linkages

The demonstration was not just an activity of the Ecosystems Research and Development Service, DENR Region 8.As well, other agencies and stakeholders were included in the project to assure sustainability of efforts

Results

This project is a collaborative undertaking with the intent to demonstrate and disseminate technologies geared towards development of biologically productive tree plantations. This is linked to a collaborative research and development (R&D) undertaking funded by the Australian

Centre for International Agricultural Research (ACIAR), with developing technologies related to increasing productivity of planted forest trees as its general objective. The previous project (1993-1999) had attained some level of success, evidenced by the outstanding growth performance of several species and provenances such as *Acacia mangium*, *A. leptocarpa*, and *Eucalyptus camaldulensis* based on height and diameter growth (i.e., average stand height of 13.0 m and diameters of 20.0 cm after 3 years) survival, health and vigour, and relative resistance to pests and diseases. This could be attributed to their responses to the improved cultural management practices that were introduced, which are modifications or enhancements of the traditional practices adopted in many reforestation projects (Nasayao et al. 1997).

To preserve the successes resulting from the project and to sustain the development and management efforts, the demonstration farms has evolved into regular business. Since 2002, the area has been managed as a pilot demonstration farm with stakeholder participation. The trials were replicated in various areas in Ormoc City by a private landowner, in Brgy. Bato, Naval, Biliran again by a private landowner, and in Brgy. Canila, Biliran by a tree plantation owner, with similar success. The technology was also adopted by a People's Organization in Brgy. Salvacion, Tacloban City. Results were shared in an international symposium, in two national congresses and two regional symposia and/or seminars. One national workshop, two regional seminars/trainings and two local trainings involving various stakeholders were organized and conducted. From this project, three articles were published in an International Symposium Proceedings and journals and one field guide was produced.

Discussion

The project began as species and provenance trials with funding support from the Australian Centre for International Research (ACIAR). At the end of its implementation, observations indicated that some degree of success had been attained. Decisions were made to maintain the trial site as a demonstrated farm to preserve the gains the project had achieved and to serve as window into what could be accomplished through proper tree plantation management. A demonstration farm can help to change negative perceptions by farmers about introduced technologies. The value and/or usefulness of demonstration farm cannot be overemphasized. Results from a study conducted by Zara et al. (2001) on the adoption of disseminated technologies revealed that one factor that most influenced technology adoption by farmers was the establishment of demonstration farm.

Such a farm is viewed or treated as a technology transfer strategy that requires a substantial amount of clientele participation and feedback. This could take the form of technical information sharing which, according to Sutherland et al. (1998), is an approach that links researchers with farmer-groups to promote experience-based learning. Related to this, Meera et al. (2004) stated that extension in the scenario of a rapidly changing world has been recognized as an essential mechanism for delivering knowledge and advice as an input for modern farming. The project has been managed with strong collaboration and/or active participation of various stakeholders/agencies. Experience has shown that the support institution takes on the role of facilitator and spends more time on the participatory process, which has led to making program implementation cost-effective in terms of use of resources and eventually leading villages to adopt related activities resulting in multiplier effects (Farrington 1998).

Conclusion

One of the main programs being undertaken by the Philippine government through the Department of Environment and Natural Resources is bringing back the lush green cover of the balding mountainsides through reforestation. Through the years, significant resources have been invested in this program in terms of both finances and manpower. To meet the desired biological, ecological, and economic requirements, reforestation approaches were fine-tuned through R&D. The ultimate measure of efficiency and effectiveness of an R&D project of this nature is ensuring that the clients understand and appreciate the information and technology, and the level of adoption of new approaches, which ultimately dictates success, is high.

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People and the Forest: Forestry Extension in Stimulating Times

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As the need to shift focus from purely economic growth to improving human well-being becomes obvious so does the importance of ensuring more effective communication among sectors of society. Developing successful processes and programs for the transfer of knowledge from the scientific community to the policy maker, the manager and the community-at-large in terms that are readily understood is essential.

The IUFRO Strategy 2006-2010 sets out three main goals, two of which are directly relevant here: one, strengthen research for the benefit of forests and people; and two, strengthen communication and links within the scientific community and with students as well as policymakers and society at large.

Globally, numerous examples exist of innovative strategies that effectively encompass forestry extension initiatives. These may be perceived as models of successful knowledge transfer programs that in turn can lead to wider adaptation at the local, national, and transnational levels.

Much of today's information base is highly technical. It is incumbent upon those responsible for the transfer of knowledge derived from that base to be cognizant of the challenges that lie between knowledge generation and knowledge application. It is equally important to remember that, at the community level, and throughout society generally, knowledge transfer is a two-way street. The "power of local genius" must never be underestimated.

Evolution of Forestry Extension and Technology Transfer: A Case Study from India

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Nature has endowed India with rich and diverse forest resources varying from moist tropical rain forests to temperate coniferous forests, mixed mountain forests, Himalayan alpine pastures, and arid desert vegetation. Millions of people depend directly or indirectly on these forests and forest lands for their livelihood. Scientific forest management and organized forestry research started in India around 1864 and since then different approaches for forestry extension and technology transfer have been evolved to meet the diverse and rapidly changing requirements.

India has a broad-based forestry research and extension set-up, supported by reputed institutes such as the Forest Research Institute, Dehradun, Indian Institute of Forest Management, Bhopal and many universities engaged in forestry research, education, and extension. Professional forest service is also well organized and is backed by a country-wide network of national, state, district, and village-level presence manned by trained personnel.

Over the years, the role of forests in the socio-economy of India has undergone rapid transformation. The importance of natural forests, which cover about 20 percent of the total geographical area of the country, has changed from production forests to protection forests, with restrictions now on commercial tree felling for timber. Today, natural forests are seen more as a provider of environmental goods and services than a source of timber. For many decades, extension and technology transfer remained focused on timber production, logging, and extraction on commercial basis before the shift from commercial to protection forestry.

In the seventies and eighties of the previous century, social and community forestry was adopted on a large scale in most parts of India for increasing the availability of forest products and supplementing the income of the rural people. Extension and technology strategies were then geared to meet the needs of this sector. Agro-forestry and community forestry extension evolved in many parts of India during this period.

At present, more than 22 million hectares of natural forests and their fringe areas are being managed under participatory management systems by the local communities who have organized themselves into more than 1,000,000 participatory forest management (PFM) committees. Forestry extension is oriented towards micro-planning: plantations on farm and wastelands and raising non-wood forest products including medicinal plants. Technology transfer for joint forest management (JFM) is directed towards low cost and ready to use approaches for harvest and post-harvest stages.

Recent enactment of the historic law recognizing the traditional rights of millions of forest-dwelling communities is another development that requires specific extension and technology transfer approach. Easily understandable knowledge and technology will have to be disseminated at the grass root level, often in forest villages for meeting the needs of this important part of the society.

Trees outside forests, raised by farmers are providing millions of cubic metres of commercial timber. Technology inputs are being provided in the form of silvicultural practices, harvesting technologies, and marketing research. Globalization has generated the demand for forest certification and sustainable forest management. As the Indian economy grows at a steady pace, the demand for high quality forest products is also increasing. Other issues that require focused extension and technology transfer approaches include bio fuels, eco-friendly products, livelihood support systems, and medicinal plants.

Forestry research and development has continued to support forests as a source of livelihood and for conservation of forest ecosystems and the biodiversity they support. Formal forestry research and development started with the founding of the Forest School at Dehradun in 1878 that led to the establishment of the Imperial Forest Research Institute. Today, eight institutes within the umbrella of the Indian Council of Forest Research and Education and many other organizations including universities are conducting forestry research and development. However, extension and technology transfer remains a major area of concern, as often research results do not reach the end users.

The rapidly changing scenario in the forestry sector in India has led to the evolution of need-based forestry extension and technology transfer approaches being adopted by researchers as well as practicing foresters. Each driver of change requires a specific extension and technology transfer approach.

This paper presents the evolution of forestry extension and technology transfer in India; highlights the evolving challenges and changing expectations and how these would be met particularly in view of emerging multi-stakeholder partnerships in an era of increased globalization. It also identifies the gaps in the present approaches and suggests ways to meet the challenges; the need for its re-orientation to correspond to the emerging importance of forestry in poverty alleviation, environmental security, and climate change mitigation. It is also aimed to provide insight into the approaches and adequacy of the forestry extension and technology transfer in India and to present ways and means of addressing the inadequacies therein.

Forestry Extension and Technology Transfer:
Approaches for Regional Networking in South Asia

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South Asia, comprising Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka is home to more than a fifth of the human race, millions of domestic animals, rich, diverse and extensive forests, and thousands of species of plants and animals. This region has aptly been referred to as a sub-continent. It has strong cultural affinities and there is direct or indirect dependence of a substantial percentage of the population on forests for their livelihood. The condition of forests and state of forestry also bear a considerable degree of similarity in this region.

Forestry in south Asia faces many issues of similar nature that require regional as well as local level solutions. Forests and their fringe areas, including grasslands, face severe biotic pressure due to grazing, removal of firewood for local use, logging, use of plants for medicinal and other purposes, illegal removals, encroachments on forest lands, diversion of forest land for non-forestry purposes, and degradation of forests in large tracts.

In an era of globalization and a fast changing world, forestry in this region is undergoing rapid transformation. Significant changes are taking place in forest products trade and as the economies of this region grow, the demand for different forest products including timber and industrial wood is increasing at a very fast rate. Biodiversity conservation, management of forest invasive species, climate change, bio-fuels, forest certification, agro forestry, community forest management, and policy issues are the emerging areas of forestry extension and technology transfer in south Asia.

Population growth, migration, urbanization, globalization, changes in technology, climate change, and emergence of new forestry agenda are transforming extension and technology transfer approaches. A large number of organizations, universities, institutes, and non-governmental organizations both inside and outside the traditional forestry sector in South Asia are now engaged in forestry extension and technology transfer.

These paradigm shifts have also influenced the present status of forestry extension and technology transfer, which has emerged as a major tool for managing natural as well as plantation forests for meeting the demand for ecosystem goods and services and needs of millions of people living in the region. There is a need to evolve common approaches for making optimal use of the available knowledge, technology, and expertise in forestry in this region and to assess if the existing approaches are adequate for the extension and technology transfer requirements of the forestry sector.

This paper presents approaches that may be adopted in the south Asian region for networking in forestry extension and technology transfer. These could include regional networking for sharing capacity, experience, resources, and infrastructure amongst the countries in the region and possibly resource mobilization.

Tools and Practices for a Healthy Forest

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Introduction

Insect, disease, and animal pests are among the most challenging issues facing family forestland ownerships in Oregon. In fact, landowner surveys typically show that forest owners and managers rate pests and forest health concerns as one of their highest priorities (Eva Bailey, pers. comm., 2006).

This interest and concern regarding forest health is not unfounded. Forest pest and fire losses in Oregon are enormous, especially in eastern Oregon where an estimated 43% of growth is lost annually on family forestland (Azuma et al. 2002) and 73% of eastern Oregon's forestland acres have trees with dwarf mistletoe, bark beetles, defoliators, or root disease (Campbell et al. 2003). Western Oregon forests are not exempt. Campbell et al. (2002) reported that these same pest groups affect 8-30% of forestland acres in the western Cascades and 3-17% in the Klamath Mountains. Climate change adds an unknown driver that could increase forest susceptibility to pests.

Forest pest information is largely scattered as individual pest notes or leaflets either through agency offices or on the web. The U.S. Forest Service recently published a comprehensive insect and disease guide for Oregon and Washington (Goheen and Willhite 2006); however, it lacks management recommendations. Our forest health education objectives are to:

1. Write a comprehensive forest pest pocket manual focused on management.
2. Design and deliver one-day, hands-on, field-oriented pest scene investigator (PSI) training.
3. Write on-line publications that are "tree species"-oriented fact sheets.
4. Develop an exit PSI training evaluation and longer-term impact survey.

Methods

This is a group project within Oregon's forestry extension program. Such group efforts follow a systematic process that identifies audience needs/issues and establishes programmatic priorities (Reed et al. 1996). The target audience is primarily Master Woodland Managers within the state of Oregon. Pilot PSI training and the pest pocket manual are funded in part by a $26,000 grant from the Oregon Forest Resources Institute.

Results

Forest pest pocket manual

Available soon, this 11 chapter pocket field guide is rich with illustrations and features management strategies for each major pest group. It is written as a companion to Goheen and Willhite (2006).

Pest Scene Investigator Training

Pest scene investigator training uses Goheen and Willhite (2006) and the new pest pocket guide as educational materials. This is a field-oriented class with the goal of training participants to become volunteers who can (a) survey the scene (forest type, condition, and stand health); (b) check for clues (signs and symptoms); (c) identify the culprits (is it an insect, disease, abiotic, or combination); (d) punish the offenders (management recommendations); and (e) rehabilitate (landowner resources for help and follow-up). These trained volunteers will act as a cadre of assistants for local extension agents, reaching out to their neighbours to solve forest health problems.

Although training concepts are evolving, our vision includes a string of PSI offerings statewide that focus on specific pest management topics important at the local level. For example, we envision training on dwarf mistletoe, root diseases and stem rots, and bark beetles. Three "pilot" training sessions have been completed with exit evaluations (as summarized below).

On-line publications

A series of publications is planned that will provide detailed tree species-specific information and be available on-line. To date, a publication on the pests associated with tanoak has been completed.

Evaluations

Exit evaluations from participants completing the three 2008 PSI trainings showed that on a scale of 1-5 (where 1 = poor and 5 =excellent), overall PSI experiences were rated 5 for the three locations (n= 28). Table 1 summarizes key comments provided by participants and Table 2 quantifies the relative gains in knowledge and confidence in assisting others. Of the 28 participants who responded to the exit evaluation, 25 indicated that they would like to participate in additional PSI trainings.

Table 1. *Selected pest science investigator exit evaluation comments from participants.*

What did you like most?	What could we improve?
• Asking questions and diagnosis interaction groups • Field orientation of training • Interacting with instructors/field identification • Hands on, learning in context allows participant to actually learn	• Emphasize systematic approach to diagnosing a landowner's problem • Bring examples of pathogens not found on training field site • Offer additional classes for reinforcement • Ask the students more questions about their diagnosis of the problem and management solutions

Table 2. *Summary of how the pest scene investigator training improved knowledge and prepared participants to assist others.*

Location	How much did your knowledge improve? (1 = little, 5 = greatly)	How ready are you to help your neighbour with their forest health issues? (1= no confidence, 5 = highly confident)
Eugene (n = 12)	3.9	3.7
LaGrande (n = 8)	4.0	3.2
Baker City (n = 8)	3.8	3.5

Discussion

The PSI training is designed to add value to Oregon's successful Master Woodland Manager Program (Fletcher and Reed 1996), which has graduated over 300 volunteers statewide (Strong 2006). These motivated, already well trained volunteers are given the opportunity to develop better forest health knowledge and skills by attending this advanced training, which they can then rapidly apply when assisting local extension foresters and their neighbours. The interactive, hands-on, and field-oriented training was highly praised by participants for its learning effectiveness (Table 1).

As a package, the new forest pest pocket manual and Goheen and Willhite's (2006) guide provide effective educational tools for PSI training sessions. They also provide landowners and managers easy access to information essential for identifying and managing forest health problems. On-line publications will further strengthen our forest health education efforts.

Many challenges face forest landowners as they work to keep our nation's forests sustainable. Smith and Smith (2006) address some of these challenges and describe three key forces of change in North America: land cover and ownership patterns, biological and physical disturbances, and a forest industry struggling to remain competitive. The PSI volunteer concept and accompanying teaching/educational materials could have broad application to other states and countries that are dealing important biological disturbances, such as the mountain pine beetle in Colorado and Canada, the southern pine beetle in the southeastern United States, and exotic pests.

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Modernizing Knowledge Transfer to Promote Understanding and Influence Forest Policy: The Canadian Institute of Forestry

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Introduction

The Canadian Institute of Forestry – Institut forestier du Canada (CIF/IFC) is one of Canada's oldest forest conservation organizations. It was established in 1908 to ensure that forest professionals could readily network and share their experiences, recognize excellence in professional forestry, and improve public awareness of forestry issues and solutions. The Institute's membership comprises 2,400 individuals organized into 18 regional sections across Canada. CIF/IFC members work in government, industry, and academia, and include foresters, technicians, biologists, ecologists, educators and economists, all with an interest and passion for forests and the complex ecosystems that they support. CIF/IFC members are dedicated to sound forest stewardship and sustainability across Canada and throughout the world.

Methods

In 2008, the CIF/IFC celebrated its centenary. At this significant milestone, members paused to learn from the past and refocus for the future. Over the past 100 years, the CIF/IFC has had an important role in the development of provincial and national forest policy through direct involvement. For example, in its first 3 decades of existence, the Institute, which at that time was called the Canadian Society of Forest Engineers (CSFE 1940), had:

1) Played a major role in the development of forest policy in New Brunswick.

2) Significantly changed public opinion on forest fire management and enabled public and private enterprise to develop an effective and efficient forest fire prevention program.

3) Instigated and led the development of forest research and education in Canada.

More recently, working with other like-minded organizations the CIF/IFC enabled a change to Canada's Income Tax Act in the 1990s. The change enables private forest land to be transferred without triggering capital gains taxes, thereby reducing the chance that the new landowner would clear the merchantable timber from the property to pay these taxes.

The changes to forest policy and practice enabled by the CIF/IFC were a result of communicating key messages and facilitating solutions to issues pertinent to the public, forest practitioners, and other key individuals such as elected members of federal and provincial parliaments. The methods used in the past are still relevant today. We need to inform and provide a clear and complete description of the issues and solutions related to forests to the public and elected representatives. We also need to use modern methods to enable forest practitioners to communicate and cooperate with one another.

The Institute is in the process of relearning how to efficiently capture and harness its human resources capital and to transfer the resulting knowledge in a modern and hopefully effective manner. Timely, relevant, credible and science-based forest information produced by the CIF/IFC is promoting understanding and is having an impact, resulting in a number of significant and demonstrable positive effects on national and international forest policy.

Specific examples of how the Institute is promoting understanding and influencing forest policy through its membership and modernization include:

Influencing public policy through an informed public

In the past, the CIF/IFC rarely used media releases to communicate the ideas and knowledge of forest professionals to the public. Efforts to engage the public included primarily the development of position

papers and policy statements. Both of these types of documents often took several years to develop, review, and approve, and the lack of timeliness severely reduced the organization's effectiveness in communicating its position on important environmental and forest matters.

Today, the approach is different. Rather than developing a position on a particular issue, the tact is to describe the issue and present the implications of various policy options. That way, the public has clear and concise information that mirrors that which is made available to institute members and can form their own conclusions. In the past two years, media releases on topics as diverse as climate change, bio-energy, forest carbon sequestration, species at risk, afforestation in Afghanistan, forestry as a development tool, and herbicide use have been produced by small groups of Institute members who specialize in these areas and are brought together in small teams. These teams develop the key messages, then write and edit the media releases. The releases are submitted to selected reviewers and the Institute's National Executive for final approval. A typical release can take three to four days to develop, produce, translate (all CIF/IFC releases are distributed in both English and French), and distribute via e-mail. An inexpensive communications service provides up to 3,000 e-mail addresses for newspaper, radio, and television stations across Canada. To date, two of Canada's three national television stations have covered the Institute and many newspapers including Le Devoir in Montreal have featured articles using information from the releases. The Afghanistan Afforestation release generated much interest, including the attention of the Afghanistan ambassador to Canada and the Canadian International Development Agency, which is now seriously considering a major afforestation project for Afghanistan, led by Institute members.

Influencing public policy through competent forest professionals

Forestry professional have many interactions with the public and are key to ensuring citizens have access to current and correct information. Continuing education is essential to the maintenance of professional competence which would then play a role in the spread of new ideas in forest policy and practice. Canada's vast geography and the remoteness of forest-dependent communities, where many of our members reside, limit their access to new information.

To counter this problem, a number of strategies have been used. The earliest were the use of conferences and "smokers," i.e., informal meetings in a relaxed setting and as the name suggests where cigars and cigarettes were smoked. More recently, local events were held as the Institute divided Canada into smaller regional sections. Sections have played an important role in hosting locally relevant events that provided interested individuals with access to information on topics of relevance. A professional journal was introduced in 1925. This journal was complemented by Section newsletters and, more recently, a web site, e-lectures, and e-newsletters.

The Forestry Chronicle

The Institute produces and distributes six issues per year of *The Forestry Chronicle*, a well-respected journal, published since 1925. The recent addition of more practical and applied science and information for use in forest management planning and operations has been well received. The Chronicle is now also available in digital format and all issues are now available on-line.

National Electronic Lecture Series

The Institute's national electronic lecture series has been a huge success since its implementation in January 2007. The lectures provide convenient and up-to-date information to professionals and practitioners, with presentations by forest scientists and specialists from across Canada. These lecture series overcome the distance and remoteness that is a real limit to forest professionals in Canada. Recent lecture series have covered topics of immediate concern such as woodland caribou, climate change, and bio-energy.

Discussion Forum

An on-line discussion forum has been created to allow effective networking and engagement of members on forestry-related topics across Canada and around the world. This forum also bridges the physical distance amongst forestry professionals in Canada. It features key forest sector subjects such as those covered in the e-lectures and often catalyzes lively and thought-provoking discussion and debate amongst forest professionals. The forum also allows the sharing of ideas and approaches to forest management issues and challenges.

The CIF/IFC E-newsletter

Issues of the Institute's national and regional electronic newsletters have become much-

anticipated by members as they are generally seen as an entertaining, informative, and relevant. The national newsletter, e-mailed to all members six times per year, provides a teaser linked to more detailed background information on web sites or other digital material.

Web Site

The CIF/IFC has invested in the development of a dynamic and comprehensive web site focused on useful information, resources, and tools for its members: www.cif-ifc.org. Such materials and items are vital for members to maintain competency through continuing education and professional development. The web site is also gradually becoming a focal point for public interest.

Influencing public policy through partnerships

The Institute is investing in new partnerships with industry, government, and other organizations to advance the dissemination of forest information, resources, and tools to its membership and beyond. This includes alliances that enhance CIF/IFC value for all members. A good example of a recent successful partnership is that with Canadian Silviculture Magazine, which is distributed free to CIF/IFC members across Canada. It is a practical and informative publication focusing on forest regeneration. A second example is the National Forest Program Recruitment Committee, which is led by the Institute and includes members from like-minded organizations across Canada. The intent of the group is to promote the advantages of enrolling in university and college resource management-related programs to offset recent declines in enrolment to these programs.

Discussion

During the Institute's early years, 1908 to 1950, its membership was highly effective at influencing national and provincial forest policy and practice throughout Canada. Much of the forest governmental policy, regulation, and guidelines now in use can trace their origins and early development to the efforts of the Institute and its members. This influence has waned in recent decades due to a number of factors such as the ever-increasing workload (and thus time constraints) of its members (since it is very dependent on volunteer time), and a general increase in policy process and personnel both within government and forest industry. Other reasons for this reduced influence were internal to the CIF/IFC, such as a general lack of timeliness in the production of policy and position papers (two to three years to develop and approve), and also a general failure to recognize and adapt to certain societal changes and changes associated with the evolution of more complex and comprehensive processes. The recent modernization of the Institute and changes in approach to use more electronic media, including news releases, has fundamentally altered how the Institute is perceived as well its level of influence at national and international levels.

Conclusions

The CIF/IFC has recognized and reasserted itself as an effective national network of individuals who form part of an organization that believes in and promotes the application of sound science into forest management practice and facilitates continuing education and professional development for its members. To accomplish this, the CIF/IFC has embraced modern communications media to reestablish its influence on forest policy in Canada, and other pressing related issues and challenges facing the nation and the world. The Institute is a venerable organization with a rich history and many accomplishments, providing value to its members, as well as the opportunity to effectively network and communicate with fellow forest professionals and to the Canadian public through modern media.

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An Operations-Oriented Approach to Informing and Influencing Forest Policy in Ontario - The Forestry Research Partnership

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Introduction

Since its inception in 2000, the Canadian Ecology Centre - Forestry Research Partnership (FRP) has effectively pooled government, industry, and academic resources, both human and financial, to build the capacity to develop, implement, and deliver a broad array of relevant and practical forest research projects to support the implementation of intensive forest management on licensed forests in Ontario. The partnership's extension program has used a variety of traditional and innovative tools and approaches to effectively convey FRP project outputs and results to forest professionals, practitioners, and policymakers (Smith and Pineau 2003) to increase adoption and implementation of results.

In Ontario, the province sets the policies and regulations and ensures compliance but forest industry is responsible for forest management planning and operational implementation. Thus, successful transfer and implementation of new approaches and technologies requires that all stakeholders – from policymakers to planners to operations staff – be informed and convinced of the value and it must occur within the legal context of existing policies and regulations surrounding forest management. In many cases, adoption and the eventual application of new science, knowledge, and technology generated by FRP projects has been successfully achieved within provincial forest management planning and operational contexts. In this paper, three of the partnership's approaches to catalyzing and ultimately achieving policy change and approval are described and illustrated with examples.

General Approach

With certain FRP projects, the need to inform and influence existing government and forest industry policy, regulations, and guidelines was recognized from the outset as both an important consideration and a challenge. The FRP adopted a number of innovative approaches to facilitate knowledge transfer concurrently with policy development or change to allow for more timely integration of relevant science into active forest management plans. By starting with the foundations, base data (such as a LiDAR-derived forest inventory and yield curves incorporating the cumulative effects of tree improvement) have been updated, improved, and now incorporated into the primary models used by forest management professionals. Although not always formalized, the partnership relied on a 'trial-adoption' strategy, particularly for projects that would require policy change for operational implementation at larger scales.

The direct networking of researchers with foresters, planners, analysts, and policy specialists through the partnership's core team approach has been a highly effective method for evaluating and improving new approaches and technologies and also for streamlining the integration of project results and outputs in forest management plans (Pineau and Smith 2006). Changes in operational practice brought about by implementing results from FRP projects were first embraced and eventually promoted by field practitioners after which decisionmakers were informed/influenced and the approval process for policy changes initiated; i.e., even though all of the stakeholders worked together on the core teams, field practitioners initiated the adoption process.

Examples of Knowledge Transfer Approaches Applied Within the FRP

Base-Level Data and Model Integration

The foundations of forest management plans are the inventories of forest resources and benchmark yield curves built from data from a provincial network of permanent sample plots that together are used to predict the province's wood supply. The FRP initiated a project to enhance the current forest resource inventory using radar technology (LiDAR; Light Detection and Ranging) along with digital imagery as well as a project to update the standard yield curves used in the province of Ontario. As new and improved data are essentially useless without a framework within which to apply them, the results of both of these studies have been integrated into various models ranging from individual tree classification

software to models that simulate forest succession and spatial landscape analysis.

Until about 2004, the standard yield curves used by Ontario's forest sector were those developed by Plonski in 1981, using data collected prior to 1960 (with few to no updates since that time). The goal of the FRP project was to produce more scientifically based, up-to-date benchmark yield curves using data from a much larger set of both new and existing permanent sample plots from across the province. These curves were originally provided to prospective users in MSExcel spreadsheets, but later were incorporated into widely used forest management models, such as the Forest Vegetation Simulator (FVS) and Modelling Ontario's Stand Succession and Yield (MOSSY) succession models, as well as the Strategic Forest Management Model (SFMM) and Patchworks strategic planning models. Numerous evaluative and hands-on training sessions for these models and curves, along with peer review by Ontario Ministry of Natural Resources staff supported their use in planning and operations, and their eventual acceptance in policy. The curves were quickly recognized as a new standard, providing much improved predictions for growth and yield in Ontario.

Until recently, forest resource inventories used in management planning in much of Ontario were developed using data collection, interpretation, and analysis techniques that have seen little change in over 60 years, despite the wealth of new technology available. Current demands on the inventory are much more precise in detail and broad in scope than the purpose for which it was originally intended; as timber and wildlife habitat supply and other forest and operational values come under much closer scrutiny than ever before, the need for an Enhanced Forest Resource Inventory becomes abundantly clear. In 2005, the FRP became actively involved in the testing of high resolution digital imagery and LiDAR to produce such an inventory. From the outset, significant effort was made to engage Ontario Ministry of Natural Resources inventory specialists in all aspects of the inventory technology research, as they determine the associated policies and guidelines. Numerous workshops and seminars were held to promote understanding of the data collection technology, as well as the computer automated processes that were possible for the interpretation of inventory data. The use of high resolution imagery along with much-improved LiDAR-derived digital elevation models (DEM) demonstrated significant improvements in planning and operations, as well as cost savings, and thus were an easy sell to planning, operations, and policy staff. A number of Ontario's forests and even municipalities (including Hearst, Ontario) are now using inventories produced using LiDAR technology and some of the automated processes that were developed through the FRP's inital study. By providing model users with hands-on training and opportunities to evaluate and fine-tune the models and involving key stakeholders from the outset, the FRP has facilitated knowledge transfer and incorporation of the new approaches and technologies into policy.

Trial Adoption Approach for New Technology

After five years of research involving more than 120 projects, the FRP initiated a series of demonstration areas to showcase partnership products in an operation setting. These demonstration areas were the first on-the-ground manifestation of the FRP's goal to increase wood supply in an ecologically sustainable context and within an adaptive management framework. With the aim of maximizing productivity on these carefully selected sites – i.e., productive and close to mills, FRP products have been incorporated and implemented with existing state-of-the-art knowledge and tools as harvest-to-harvest sequences of silvicultural best practices (from Pitt et al. 2005).

Possibly the best single example of the FRP's trial-adoption approach and its influence on forest practices and policy, is the Romeo Malette Enhanced Forest Productivity Pilot project near Timmins, Ontario (Pitt et al. 2005). This 500 ha trial integrates over ten different research studies on an operational scale to more fully determine the interconnections and cumulative effects of intensive forest management methods and operations, particularly on sites near mills. A number of the operations within this demonstration push the limits of current forest policies, showing that intensive, aggressive management can be both sustainable and economically viable in the long run. As a result, policies are gradually and hopefully will continue to be adapted, thereby broadening the scope and suite of management options available to foresters.

One of the trials within the Romeo Malette EFP site, and possibly one of the most rapidly implemented into forest policy, is the herbicide application technology project, also known as the SprayAdvisor Decision Support System (or AgNav), which integrated global positioning systems and geographic information systems (GPS, GIS) and booms-off/booms-on technology to increase the precision of aerial

spray application. The demonstration allowed policymakers, forest planners, operators, and pilots to directly experience the benefits of intensive forest management, e.g., by clumping the residual trees on the site rather than spreading them out, pilots could safely fly lower, greatly improving the accuracy of the herbicide application. Not only did the technology improve overall accuracy and precision of herbicide application, protecting ecosystems from potential overspray, significant financial savings for the company were demonstrated. Policymakers in both industry and government, who were exposed to the results of this project through a combination of core teams, site tours, and access to FRP multi-media transfer and communications efforts, quite quickly endorsed the use of SprayAdvisor technology. In fact, the very first 'roll-out' of this technology in Canada was at an internationally attended hands-on training and model evaluation session hosted by the Canadian Forest Service and the FRP in Mattawa in 2008.

Core Team Approach to Influence Operational and Policy Change

The core team approach, put together early in the FRP's development, brings researchers, policy and management specialists, analysts, and forest practitioners together to incorporate the results of specific projects into forest management plans. The FRP facilitates the education of the team members in the use of the products of research by providing the expert support of the principle investigators or model developers. Throughout the planning period, the challenges encountered and successful strategies used by the group are documented in a best management practices report that serves as a guide for future planning teams. The current focus of the core teams is the implementation of the Patchworks spatial planning model.

From the inception of the FRP, spatial modelling of wood fibre supply and other non-timber values was seen as a pressing need. The existing standard for Ontario, the Strategic Forest Management Model (SFMM) is aspatial and, although highly effective and helpful to forest managers, does not allow geographical and trade-off analyses. With the establishment of the core teams in 2001, which included the participation of both a modelling and a policy specialist on each team, the trial-adoption approach was used to integrate FRP science and research and subsequently analyze an array of scenarios and their implications for wood supply.

The Patchworks spatial model was embraced and promoted by core team members, particularly those involved in the Romeo Malette Forest. That combined with the direct involvement by provincial policy specialists in the process resulted in Patchworks being added to the list of analytical tools approved for use in forest management planning in Ontario in 2007.

Conclusions

To date, the FRP has achieved a number of successes with respect to informing, influencing, and ultimately changing policy. This has been accomplished by a combination of improving base data and integrating it into widely used models, using operational trials to demonstrate outcomes of multiple projects or management techniques, and networking appropriate individuals through the FRP's unique core team approach. Particular successes have included widespread use of improved yield curves as well as the strategic planning models into which they've been assimilated, significant progress in the acceptance and use of spatial modelling, application of enhanced forest resource inventory technology and herbicide application technology, and a general focus on more intensive forest management. The relatively rapid acceptance and approval of new approaches within the context of the province's policies and regulations was facilitated by having all stakeholders – researchers, practitioners, policymakers, and transfer specialists – working together to adopt, test, implement, integrate, and incrementally improve the adopted knowledge and technologies.

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Need for Forestry Extension Services for Proper Utilization of Forest Privileges in Western Ghats

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Introduction

The Western Ghat forests of India which occur all along Western Ghats of the country, are among the most ecologically rich and biologically diverse in the area. However, these forests have several ecological and environmental problems that include increasing pressure of population on land and vegetation, submergence of forest areas under river valley projects, encroachment, felling of forests to establish tea, coffee, and rubber plantations as well as rice paddies, and to extract biomass.

The arecanut cultivators of this area have enjoyed certain unique forest privileges for a long time (given to them during British rule in India in 1878). Among these, the foremost is Soppina Betta lands privileges at the ratio of nine acres of betta/forest land to one acre of arecanut garden (Soppina means leaf litter, Betta means forest in local language) to gather leaf litter (both green and dry) for mulching arecanut trees, fuelwood, and other biomass. Now the farmers are unwilling to give up this privilege to Forest Department. The forest lands were given on the legal condition that the cultivator cannot use the land for any other purpose. These forest lands can be passed to his descendents or divided between brothers and the cultivator can build a home on it for his own use. Unfortunately, these betta lands are now degraded because of extraction of leaf litter, fuelwood, soil, overgrazing of cattle, overlopping of crowns and branches, and fire, all of which are also limiting the establishment of secondary forests. Apart from extracting biomass, the betta holders also construct homes and connect roads to it further affecting these betta lands.

Significant controversy exists as to whether the soppina betta forests have been used sustainably or degraded by the cultivators. Hence, a study was conducted in selected blocks of North Canara district (Karnataka, India) with 60 arecanut cultivators to assess the present status of betta lands and the relationship between betta land status and betta utilization and management practices. The intent was to elicit the opinion of betta holders about policies that could be adopted to facilitate better management of these lands and to identify indigenous technologies developed by these land holders.

Methods

The study was conducted in selected blocks (talukas in local language) of North Canara district of Karnataka comprising evergreen forests. The major portion of arecanut cultivation and soppina betta lands of the districts are located in the central hill zone and mostly in Siddapur, Sirsi and Yellapur blocks. In all, ten villages were selected with six betta holders from each block using a stratified random sampling procedure. To collect the necessary information, an interview questionnaire was prepared by conducting a pre-test study in consultation with scientists at the University of Agricultural Sciences, Dharwad, Karnataka; Karnataka Forest Department; Indian Institute of Science, Sirsi and Institute for Socio-economic Change, Bangalore. Information was collected in two ways: by direct interview using the questionnaire and by direct observations of what has been done and assessing the condition the betta. Frequency, percentages and correlation tests were used to analyze the data.

Results

The results indicate that the betta lands had 37% of area under dense trees, while trees + grasslands + shrubs, only grassland and barren land constituted 51.6%, 9.5% and 2.0%, respectively. Among the respondents, 65% were lopping secondary branches and 16.66 tertiary branches, 9.5% both in the same patch of betta land and in selected portions alternatively. Whereas 9% were not lopping on betta land, 31.6% and 33.3% were in the habit of lopping once in two years and once in three years, respectively, and 3.35% and 16.66% were lopping once in a year and once in four years, respectively.

Table 1. *Distribution of vegetation types across the betta landscape.*

Site	Vegetation types	Area (%)
1	Dense tree area	37.0
2	Trees + grass land + shrubs	51.6
3	Grass land	9.5
4	Barron land	2.0

Table 2. *Correlations between utilization practices and betta conditions (Significant at 5% level).*

Site	Utilization practice	Correlation (r values)
1	Frequency of lopping	-0.2063
2	Method of lopping	-0.913
3	Firing betta	-0.093
4	Grazing local cattle	-0.1312
5	Removal of green leaves	-0.1786
6	Removal of fuel wood	-0.355

To collect green leafy matter, the whole betta land will be divided into different parts (2 to 4 portions). During alternative years, different portions will be selected to collect the required products. This is followed by burning of the betta to get good quality grasses for cattle by 20% of respondents, while others were not in a habit of setting fires. Cattle have been found invariably with all farmers with local buffaloes (85%) dependent on betta forest lands while rearing exotic cattle occurred with no dependency on betta land.

The betta lands were fenced with trench + live fencing (46.5%), thorn fencing (16.5%), bamboo fencing (10.00%), wire fencing (6.65%), IBX fencing (3.5%) and no fencing (12.00%). All betta holders except one were removing soil from betta land and applying to arecanut garden and planting new arecanut saplings in the area opened after removing soil. This practice improves the garden and negatively affects betta land in the long run. Most (93.33%) have planted trees such as cashew, acacia, Terminalia, coconut, and mango in their betta lands The betta holder also collects some of the important non-timber forest products such as *Garcinia gammygutta, Garania indica, Artocarpus lacucha, Vateria indica, Sapindus laurifoliam* for household and sale purpose. The results have also shown that the abundance of dense forest is negatively correlated with the intensity of removing fuelwood, green leaves, and with lopping frequency. The lopping cycle is positively correlated with the cooking technology, i.e. gas or kerosene.

Discussion

The opinion of betta holders about need for an organizational structure to manage betta lands has been collected and 70% of them expressed that their preference is to manage soppina betta land though an organization that includes only soppina betta land holders. They are emphatic about not wanting the participation of non betta holders. They also expressed that if betta land is degraded due to improper management, four to five years should be allowed for its rehabilitation and the betta holder should be trained and educated about how to maintain this land.

Conclusions

The present investigation concluded that there is a need for appropriate extension services and linkages between the Forest Department, non-government organizations, betta holder, and progressive farmers with indigenous technology (developed by betta holders). Hence, appropriate extension strategies to educate and train the betta holder are sorely needed to ensure the rehabilitation and restoration of degraded forests under forest privileges in the Western Ghats of India.

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Implementing a Model of Sustainable Forestry Development in Argentina and Uruguay

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Introduction

The forestry sector in the province of Entre Ríos, Argentina, is based on 95,000 ha of fast growing plantation forest (mostly *Eucalyptus spp*.) belonging to 1500 private forest producers. The forest industry includes two board mills (one MDF panelling line and three particle board lines) and more than 200 sawmills producing 3,000 to 30,000 board feet per day.

The sector is neither vertically nor horizontally integrated. Most of the small and medium plantation owners are investors, without traditional linkages to or knowledge about forestry production. Problems such as lack of scale and scarce adoption of technology are frequently mentioned. The lack of trained and skilled workers and the existence of an informal labour market are other factors that constrain the development of the sector.

For the industrial segment the main problems are scarce of quality sawn wood for higher value solid products (actual supply conformed mostly by small diameters and knotty wood), lack of grading rules for kiln-dried lumber and scarce diffusion of the advantages of eucalyptus lumber for solid uses.

The Agricultural Experimental Station Concordia of INTA (National Institute of Agricultural Technology) in Entre Ríos, Argentina, works to integrate the forest chain in the region. Through INTA, research and extension projects and articulating with the Program "Cambio Rural" of the SAGPyA (Secretariat for Agriculture, Cattle, Fishes and Food) actions have been undertaken to facilitate the organization of small and medium forest producers in the northeast of the Entre Ríos province.

In 2004, the Project "Installation of a Sustainable Forestry development Model in Argentina and Uruguay" was launched. The objectives of the project were:

- To contribute to the development of a regional forest economy that offers socioeconomic benefits to the communities involved
- To promote the sustainable forestry development of Uruguay and Argentina linking the those in the production chain (forest owners, forest workers, and industry) and transferring knowledge and technologies to them

The project has been implemented through an agreement between INTA and the non-government organization SOCODEVI (Society of Cooperation for the International Development) based in Quebec, Canada.

Methods

A concept model, based on a Canadian example (1), has been agreed to by those involved in the local sector: forest owners, forest workers, and forest industry managers. The goal of the model was to develop a regional forest economy that offers socioeconomic benefits for the communities involved.

The model (Figure 1) relies on four strategic actions:

- An associative management of the roundwood production that allows the forest owners to achieve a significant volume of wood supply and to enter in the forest business with best performance.
- A specialization of the forest workers and the formation of cooperatives that allows them to offer qualified technical services at competitive prices.
- A strategic alliance between the forests owners and the cooperatives of forest workers to implement established annual forest plana, assuring the quality of the applied silvicultural practices and adapting management to the requirements of the forest certification.
- A joint venture among forests owners, forest workers, and forest industry managers for processing the wood supplied by the forest owners.

The technology transfer process was carried out through the INTA-SAGPyA extension program "Cambio Rural" that promotes association among farmers, and in this case among forest owners. The same associative methodology was applied to support the horizontal integration among those involved in the sector. The training in technical as well as in management topics was key to the process.

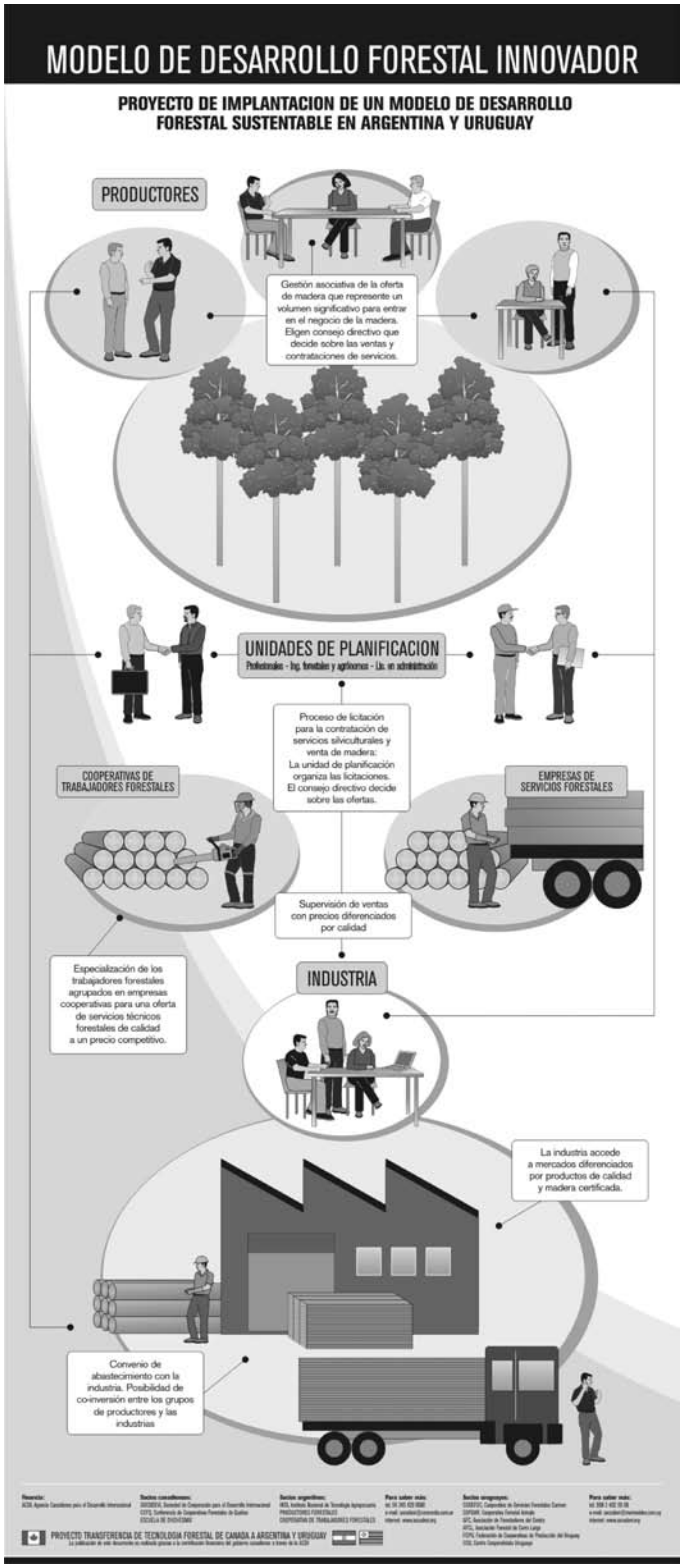

Figure 1. *A conceptual model for implementing sustainable forestry in Argentina and Uruguay.*

Finally, the vertical integration of the different groups through strategic alliances, as shown in the model, allows the sustainable development of the forest sector in the region.

Results

The forests owners achieved significant advances in the associative administration of their forests. Every forest owner has a forestry management plan (FMP) for their plantations or a general management plan (GMP), which describes the silvicultural activities to be implemented during the following years. Both planning tools are required for the sustainable management of the plantations belonging to one forest producer (FMP) or to the associated producers (GMP). The number of associated forest owners assessed through the program “Cambio Rural” has increased. Furthermore, the formal and informal communication among those involved in the sector as a whole has and continues to improve as a result of the project.

The industrial sector has been able to increase their productivity and the quality of the lumber produced, fundamentally by training their workers. Firms that produce impregnated poles and posts also formed an association to improve the quality of their products. As well, new applications for eucalypt lumber have been developed. A prototype wooden house, applying Canadian technology but using *Eucalyptus grandis* lumber, has been constructed. A standard for kiln-dried lumber for appearance applications has been developed and presented to sawmill managers.

In June 2007, at the end of the project, a cooperative made up of well qualified forest workers was operating in the region. As part of the project, these forest workers were trained in silvicultural practices as well as business administration. Now, the forest workers cooperative presents different managerial problems.

Discussion

The applied concept model supported by the experience in cooperative management in the forest sector of Quebec, Canada, has been successful for the development of the forest sector of the county (1).

In Argentina, and in the study region specifically, while a long tradition of cooperation exists,

individualism prevails in most of the small and medium producers (2). In this context, the Program "Cambio Rural" has been demonstrated as a suitable approach for promoting the association of forest owners (3).

The project has validated the usefulness of associative management in most segments of the forest chain. However, in case of the forest workers, cultural issues make the associative process slower and more difficult. On the other hand, changes in the productive sector cannot be carried out within the timeframe of an individual project term; therefore, it is fundamental that local organizations assume the responsibility of continuing the process that has been successfully initiated.

Conclusions

The model adopted from the experience in Quebec, Canada, adapts wells to the forest context of several countries of the South Cone, such as Argentina.

Through the program "Cambio Rural," the horizontal integration of those involved in the forest sector is possible. The experience of applying this program with land and forest producers could be extended to other segments of the production chain (e.g., forest workers, carpenters, etc.).

Cooperatives of forest workers, or any formal company, cannot compete in a non-formal labour market. To promote such formal work and to generate better standards of living, the State should promote fair competitiveness.

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Woodland Owner Networks:

Assessing Outcomes From Several Models Used in the United States (Part II) Methodological considerations and preliminary findings

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Introduction

Peer-to-peer learning through social networks, although not entirely new in natural resources, are a less widely used alternative approach to extension and transfer. Under this model, extension educators or others serve primarily to organize the learning space and mediate the experience, while participants learn together based on a variety of information sources including their own personal experiences as well as information from content specialists and practitioners.

This is in contrast to a more traditional one-way information model where the expert imparts information while the learners passively absorb it. Research and experience show that when people need to make a decision about their land, they often turn to a trusted friend, neighbour, or family member. Thus, peer-to-peer learning offers an excellent opportunity to efficiently inform landowner decisions.

Family Forest Owners

Family forests – those owned by individuals, married couples, family estates and trusts – comprise 56% of the nation's forestland (USDA 2008). Family forests provide a vast array of important public benefits, including carbon sequestration, wood products, clean water, biodiversity, and rural tourism. The cumulative impacts of the land management and protection decisions of America's 10 million family forest owners will significantly affect these public benefits.

Traditional approaches to reaching family forest landowners – including one-on-one technical assistance, current use programs, forest management planning, and cost-share of forest practices – have engaged a small segment of landowners. National statistics indicate that only about 3% of family forest owners nationwide have professionally prepared management plans (Butler and Leatherberry 2004). Those with written plans are relatively well positioned to make informed decisions when the need arises. However, new approaches are needed to reach the vast majority of landowners who remain unengaged.

Benefits of peer-to-peer learning

People are more likely to hear and internalize messages, and thus to change their attitudes and behaviours, if they view the messenger as being similar to them and facing the same concerns and pressures. Peer-to-peer learning provides locally relevant information when landowners need to make a decision about their land, delivered by the people they naturally turn to for information. Peer-to-peer learning is effective because peers:

- Understand the goals, issues, and pressures faced by landowners
- Have direct experience with forest management and protection
- Are seen as credible, unbiased, and trusted sources of information
- Have specific local knowledge, such as recommendations for trusted professional service providers or sources of assistance
- Speak the same language and can help each other distill information to the critical pieces needed to make a decision, and
- Are easy to contact when important decisions need to be made.

Role of the Resource Professional

Development and support of self-sustaining peer networks by agencies, non-profit organizations, extension professionals, and others can be an efficient and effective way to engage landowners and inform family forest decisions. This can occur either through development of new networks or support of existing, independent networks.

Resource and outreach professionals have important roles as conveners, facilitators, and sources of information. Professionals can create learning spaces where landowners can meet, exchange ideas, and share experiences and information. Alternatively, professionals can tap into existing, independent networks to offer information as requested.

Outcomes

What outcomes can be expected from investments in support of peer-to-peer learning? This study presents preliminary data from several independent peer-to-peer learning programs in the United States. Case studies include a variety of program models. Program outcome data are collected by methods that include surveys, case studies, and interviews. In the presentation, we will also address methodological considerations, given the complexity of the learning and decision systems at play.

The first study is focused on the network characteristics, type of information exchanged, and behavioural outcomes associated with the Master Forest Owner Volunteer network in New York. We surveyed forest landowners that had participated in an on-site visit with a Master Forest Owner Volunteer over the period of 1999-2007 (n=608). We administered a four-wave mail survey for forest landowners that were subject to an on-site ("woods walk") peer interaction with a Master Forest Owner Volunteer. Topics covered in the survey were ownership motivations, the nature of the peer interaction, information exchanged, behaviour that resulted from the peer interaction, attitudes about landowner cooperation and communication, and demographics.

Secondly, we will present findings from four different cases of organizations with a large component of peer-to-peer outreach. These cases include one extension master volunteer program, one grassroots organization, and Landcare groups in Australia and the United States. Preliminary data are presented from document analysis, interviews, and focus groups with leaders and members of these four organizations.

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Increasing the Value of Forest Fibre to Industry – Knowledge Exchange to Accelerate Forest Sector Transformation in Canada

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Canada's forest industry is experiencing significant difficulties remaining competitive in global markets, with unprecedented mill closures and job losses over the past five years. It is becoming widely accepted that the Canadian forest sector needs to fundamentally transform the way it uses its forest lands and associated wood fibre supply to regain a position of global leadership. Innovation is a key to making the transformation, through the creation and application of knowledge to expand economic opportunities to derive new and greater benefits from wood fibre. Reforms to Canada's innovation system resulted in the formation of FPInnovations in 2007, a national public-private partnership that aims to provide innovative solutions along the full value chain, from products and markets all the way back to the genetics of trees growing in the forest.

The paper will present the development of a knowledge exchange strategy for one division of FPInnovations, the Canadian Wood Fibre Centre (CWFC). The strategy charts a course for the centre within the Canadian knowledge exchange milieu, towards the goal of becoming a vital knowledge resource to the Canadian forest sector. The strategy presents a knowledge exchange cycle as a model for balancing consultation and response activities with external and internal stakeholders. Through a continuous cycle of knowledge exchange, mutual learning and knowledge adoption is achieved. The strategy profiles knowledge exchange capacity within Canada – including government, non-government organizations, and private-public partnerships – and identifies a range of best practices drawn from experiences across North America. The strategy provides guidance for the CWFC on how to partner regionally and nationally to influence forest value chain integration at the executive, management, and project levels of partner and client organizations.

Kandahar Afforestation Project Proposal – Intercontinental Forest Extension?

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Traditional forest extension (FE) is applied locally or regionally. This flows from centres of expertise to areas lacking expertise but with interest and resources to justify FE. What about areas where expertise is absent, resources lacking, and yet need is desperate? Commercially, there may be no justification. However, considering all forest values – tangible and intangible – forest extension may be the most reasonable and effective social service that can be provided by expert nations or groups to impoverished areas.

A case in point – Afghanistan. Over 40 years, war, drug cultivation, social instability, burgeoning population growth, poverty, and desperate demand for fuel and building wood, have reduced the forested area of the country from 30% to 1.5%. Consequences to the environment are catastrophic. The human population has been severely damaged. The $1,500 per capita gross domestic product, abysmal environmental quality, continuing conflict, and hopelessness for improvement without outside help, are consequences.

What can forestry do? Lots. It can provide employment, thereby alleviating some of the poverty. It can provide a valuable and essential commodity – wood for fuel and building, and so, displace some drug cultivation. It can help restore a destroyed environment, improving air, soil and water qualities immeasurably while improving quality of life for thousands, or at larger scales, for millions of people. Best of all, it can provide hope, and with it peace and stability. Globally, FE can be a significant factor to make the world better.

How can this be done? A number of ways. Where national/regional interests prevail, well-resourced international forest extension programs can work. Where national interests are absent, ambivalent or inimical, a forest extension organization, Foresters Without Borders should be established to perform these services. The net beneficiaries are not just local residents, but nations, regions, and ultimately, the world.

Scenario and Reality of Community-Based Forest Management From an Indonesian Case

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Today, climate change is an important international and national policy arena. Deforestation is a primary cause of greenhouse gas emissions and is a serious concern in the international community. Much of the world's forest cover has been lost due to human interventions, where agriculture expansion and changes in land use have been identified as the major causes of deforestation and forest degradation (FAO 2005). Meanwhile, forest certification is viewed as one of the most effective means of verifying the legality of wood products to curb forest degradation. Forest certification was developed in 1993 to conserve tropical forests; yet, few case studies exist on the implementation of these programs, the challenges facing them, and their effects in developing countries.

This paper has two goals. The first is to examine community-based forest management (CBFM) and analyze challenges of CBFM practices linked with the forest certification scheme of the Indonesian Ecolabelling Institute (LEI), based on a CBFM-certified village case study (Takahashi 2008). The second is to discuss discrepancies between the scenarios and on the ground realities and to propose ways of bringing present CBFM or sustainable forest management strategies in line with those realities. In this paper, sustainable forest management means that local forests are reserved and managed for local use and that timber production meets demands from outside the village in a way that balances economic growth and forest conservation.

Methods

Wonogiri District, adjacent to Yogyakarta District in Central Java, is known for its dry and barren areas and its chronic water shortages. Water management is a serious concern because of the region's dependence on agriculture. A case study of CBFM-certified Indonesian villages was conducted in the villages of Wonogiri examining the multifaceted challenges of community-based forest management, linked with a forest certification scheme (Takahashi 2008). The field information was collected through rapid rural appraisal, interviews, and focus group discussions. Combined with the rapid rural appraisal approach, interviewees were asked how the forest certification process was introduced into the villages. These opinions would reveal the influence of the certification system on small-scale farmers and foresters and explain support for and resistance against the integration of forest certification into local forest management.

Results

Forest Certification

Wonogiri ("mountain forest") is one of Central Java's poorest districts (Dharmawan 2002). Agriculture alone cannot provide a sufficient livelihood in this chronically dry region, and agroforestry and livestock farming are a safety net for rural livelihood. Before forest certification was introduced, community-based forest management in the villages was practiced based on long-standing community rules such as obligatory planting and limitations on cutting size. These practices enabled the villages to enjoy the primary production of teak and mahogany while mitigating the problem of water security.

When a development non-governmental organization broached the idea of forest certification in 2001, the villagers were not interested because they did not understand the linkage between their forests and forest certification. Some villagers were worried about the expense and the complicated application process. However, they recognized the importance of sustainable forest management because the local people had a long tradition of sustainable use of forest resources and the certification had the potential to improve their livelihood. Finally, CBFM certification was granted to the villages in 2004.

Challenges

Immediately after certification was granted, local people began reaping the economic benefits of certified wood materials and fully expected the positive economic situation to continue; it did not. Most orders were from overseas companies wanting large quantities of wood and the villagers had to decline these orders or place them on a year-long waiting list. Such orders were declined because CBFM practice did not allow the community to produce a large amount of timber on a regular basis. Indeed, the size restriction has been a pillar of the villagers' community-based

forest management. Another reason the large orders were denied to the detriment of the initial economic upswing was that the villages' small production capacity was unable to satisfy overseas demand.

Discussion

The inability to handle large quantities of backlogged and prospective overseas orders suggests sustainable success could be found by meeting the smaller domestic demand while simultaneously raising domestic supply. Another option is to locate partner villages and districts to establish and run a Java consortium to fill small but regular orders, eventually tapping new markets for new enterprises.

The villagers are pleased with the certification experience but doubts linger about who will buy their certified woods and what the market flow will be. This shows that full consideration of systematic flow from producers to end-users is required. With the rapid growth of certified-CBFM in Java, the hope is that the stock of certified wood will increase due to the competition for certified wood.

Still, a discrepancy exists between the local realities and the ambitious scenario of tapping the market and building a business model, possibly based on the village experience. Lessons can be deduced from forest law enforcement and the same argument holds for the gap between theory and local realities. In theory, forest law enforcement should halt illegal logging. In reality, however, law and regulation systems will function only within homogenous entities, in which no layer and distinction of poorer and weaker is to be seen. In many countries and cases, forestry legislation focuses more on administrative requirements, fees, and taxes rather than how forests are actually managed (Kaimowitz 2007). Eventually, forest laws and regulations that require paperwork discriminate against small-scale farmers, foresters, and local communities: those who know more about forest resources and sustainable forest management on the ground but are unaccustomed to burdensome administrative procedures. It is noteworthy that forest law enforcement is not the same as sustainable forest management, and often the connection between what a piece of paper says and what happens in the forest is lost (Kaimowitz 2007).

Conclusions

Both forest laws and regulations and the international forestry debate have excluded local people and vulnerable groups. Therefore, a more realistic and feasible approach should be taken to promote CBFM in a sustainable manner on a global scale. To this end, three possibilities are proposed. The first is a financial mechanism that provides subsidies for the most vulnerable groups in remote areas to make timber production more profitable. To cushion power influences and imbalances that might result from government financial assistance, importing and consumptive countries could play a larger role. In response to climate change and deforestation, the Cooperative Social Responsibility (CSR) activities of the private sector have emerged and expanded in the global business community. Therefore, according similar priority and subsidies as current environmental studies to the more resilient CBFM communities will compliment existing CSR activities such as environmental and policy research. The second approach, undertaken initially on a pilot basis, would be to restrict the marketing range of certified wood to neighbouring regions in Java. Demand for Wonogiri certified woods within Java would not be beyond current production capacity and might help limit transportation costs between production and end-users. A small village in Japan has adopted a similar marketing policy and experienced sustainable forest management with modest economic gain. The third approach is to consider the integration of sustainable financing for conservation: notably, the payments for environmental services (PES) system (Wunder 2006). Although this new conservation paradigm has remained incipient in tropical conservation, the possibility of trade-offs between landowners and other beneficiaries through compensation payments should be considered.

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Technology Transfer and Extension on Environment and Natural Resources:

Reclaiming the Skills of the Indigenous People in the Cordillera Region, Philippines

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For many years the Cordillera indigenous people have preserved silently but deeply and seriously their environment. In the light of their culture, the elderly or *mambunong* who are makers of their own local policies have also continuously sustained these practices to conserve their environment. Unadulterated rituals kept completely away from any commercial influences are done in simple ceremonies. The “rain dance”, chanting of environmental songs before planting and harvest, music using indigenous materials such as bamboo among others, is part of their culture. All these folk activities have their place in the upland communities. It worked in the past but with the changing times, can these strategies be applied in the future?

In this paper, I will present the technology transfer and extension strategies of the elderly to the younger generation within the community relative to the preservation of their environment. Similarly, the merging initiatives of the local government units, academes, and government institutions regarding education and extension strategies based on research and development that complement the local indigenous practices will also be presented.

Challenges of Sustainable Forest Management –

Can We Maintain Ecological, Economic and Social Sustainability of Boreal Forest Ecosystems?

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Introduction

Today it is widely accepted that forests should be utilized along principles of sustainable forest management (SFM). In Finland, the aim is to ensure multiple use of forests by linking cultural, social, ecological, and economic sustainable values. One key principle is to maintain biodiversity in managed forests (Ministry of Agriculture and Forestry 2000).

Biological science has an important role in defining ecologically sustainable forest management, i.e., ecological forestry (Simberloff 1999). The belief is that without research, decisionmakers would fail to develop sustainable forest policies (Suter 1998). Therefore, policymakers usually claim that forest researchers and ecologists should recognize changes in the preferences of the society so that they can apply their research to developing sustainable forest management practices.

When considering the ecological sustainability of Finnish forests, we cannot ignore disputes and conflicts that have been common over the last decade in Finland. Forest managers participating in public discussion (political discourse) over sustainability of forests seem to disagree on whether the Finnish model for ecologically sustainable forest management is sound (e.g., Vierikko and Niemelä 2006, Jalonen et al. 2006). Additionally, there are epistemological and moral uncertainties about the model for sustainable forest management (Funtowicz and Ravetz 1993). Researchers, forest workers, and other forest groups disagree on the best strategy for improving ecological sustainability in Finnish forests, as well as who is in charge and who has the responsibility to manage forests in an ecologically sustainable way (Vierikko and Niemelä 2006).

Our intention was to conduct interdisciplinary analyses at a regional scale to study the Finnish model of SFM and socio-economic sustainability of regional communities. Our aim was to (1) explore possible indications of ecologically and socio-economic sustainable forest management of boreal forests, (2) to identify spatial patterns among socio-economic of communities and ecological components of SFM, and finally (3) to interpret whether Finnish forest are managed in an ecologically sustainable way.

Materials and methods

The study area consists of 39 observation units, i.e., regional municipality complex located in cetnral Finland (Figure 1). The amount of forest land in observation units varied from 61,514 to 698,196 hectares. Proportion of productive forest land varied between 79.52 and 99.24%, and was lowest in western part of the study area.

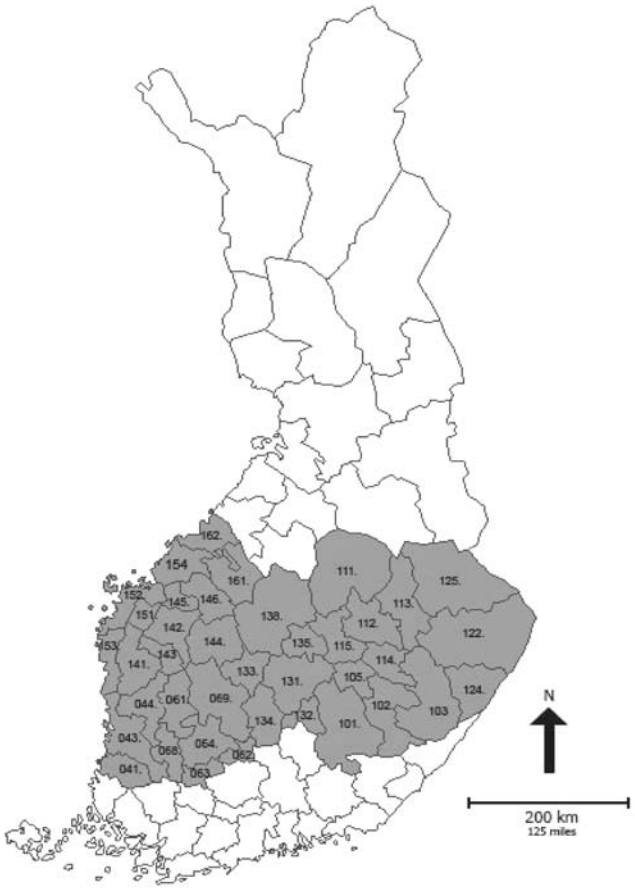

***Figure 1**. The study area consists of 39 observation units called regional municipality complex.*

To explain variability in the data and to aggregate the few latent variables,

factor analysis based on principal axes with varimax-rotation was chosen as a study method. Factor analyses were performed separately for biological, structural, socio-economic, and land-use variables. Factor analyses were performed by using Statgraphics professional version plus for Windows 4.0. Finally, principal component analyses (PCA) for latent variables was chosen to visualize patterns among latent variables and between observation regions. The PCA analyses were performed using R version 2.6.1 with the package Vegan.

The first factor analysis included following seven biological variables: longhorn beetles, (2) Siberian flying squirrel, (3) wildlife richness index (WRI) - grouse, (4) WRI - large predators, (5) WRI - small predators, (6) WRI - ungulates, (7) WRI - others. The second analysis included 16 variables of tree structure data: (1-4) proportion of pine, spruce, birches and other deciduous tree species, (5-7) proportion of three forest land subclasses: productive forest land, low productive forest land, and previously was forest land, and finally (8-16) proportions of nine tree age classes: open areas, 1-20, 21-40, 41-60, 61-80, 81-100, 101-120, 121-140, and >140 years. The third analysis included six land use variables: proportion of (1) agrarian forest ownership, (2) private forest ownership, (3) industrial and other organizational forest ownership, (4) nature and national parks, (5) other protected areas owned by government, (6) privately owned protected areas. Finally, the fourth factor analysis included six social and two economic variables: (1) unemployment rates, (2) pensioners, (3), proportion of people working in agriculture and forestry, (4) live births, (5) proportion of children between 0-14 years, and (6) gross migration and economic variables, which were total productivity (7) and productivity of forestry (8).

Results

We interpreted four regional patterns based on PCA results of latent variables from four factor analyses. They are visualized in Figure 2. The first region (1) was one of mature forests and agrarian land. Typical in this region was a high proportion of mature forests (80 to 120 years) and high abundance of Siberian flying squirrel. This region included traditional agrarian areas with relatively dense populations and economically sustainable regions.

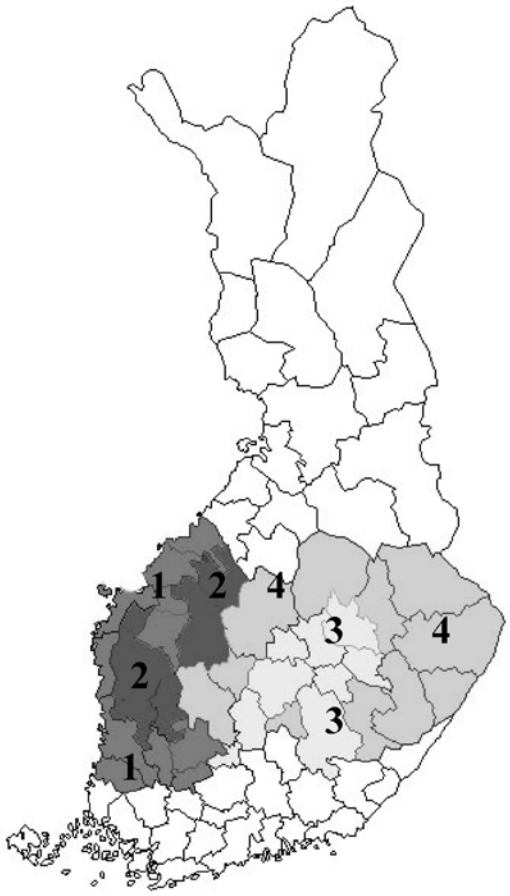

Figure 2. *Regional patters of socio-economic and ecological variables.*

The second region (2) was one of open and semi-open mires and old-growth forests. Open and semi-open pine mires dominate the landscape and the proportion of old-growth forest (>140 years) is high. Birch is a relatively common tree species and grouse richness is relatively high. The third region (3) was one of primarily young forests. The landscape is dominated by open forest stands (0-20 years). Small predators are abundant. Additionally, non-industrial private forest (NIPF) owners are common. The fourth region (4) was called a region of forestry and large preserve areas. Typical for this region is that forest productivity is an important source of income for communities. Forests are owned by government and industry. Government-owned protected areas are more common than small privately owned protected areas. Large predators are abundant.

Conclusions

Latent variables (*abundance of flying squirrels, proportions of old-growth forests and mature forests*) that can be interpreted to indicate ecological sustainability of boreal forests were associated with regions where forest biodiversity is relatively low (1 and 2). In these regions, the number of valuable key habitats was lower and threatened forest species less common compared to the eastern part of the study area (3 and 4). On the other hand, latent variables indicating intensive forestry (*proportions of open forest areas, abundance of small predators*) were concentrated in the regions with relatively high proportion of productive forest land and number of key habitats. Also, abundance of rare and threatened forest species were higher in these areas. Additionally, social welfare seemed to concentrate to agrarian regions when forestry dominated regions were poorer and socially more unstable. To conclude, some regions (3) seemed to be under intense harvesting pressure. In these regions, trade-offs between socio-economic and ecological components of SFM can be strong.

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Succession Planning: The *Ties to the Land* Educational Curriculum for Family Forest Landowners

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Over the next couple decades, a substantial portion of family forest lands in the United States will likely pass on to new owners. Frequently the next generation is largely unprepared for the transition and many families lack the skills needed to manage the coming changes, leaving many properties open to changes in land use. US Forest Service projections indicate 23.2 million acres of forest land will pass out of forest and into another land use in the next 50 years. This will have a significant impact both on families trying to sustain their forest heritage and on the communities in which these families live across a broad landscape.

Education can and should play a role not just in building awareness of the succession issue but also to help families transfer management of their forest land to the next generation.

We developed the *Ties to the Land* succession planning curriculum to help family forest landowners prepare to transfer stewardship to the next generation, and presented it across the state of Oregon. The curriculum includes:

- A DVD-based Ties to the Land facilitated workshop
- Supporting materials for local facilitators
- A companion Ties to the Land workbook (with another DVD)
- The Ties to the Land website http://www.familybusinessonline.org/resources/ttl/home.htm
- An integrated impacts assessment

The curriculum has already been adopted for use in a variety of situations by other extension programs and landowner groups, but we need a robust delivery mechanism to help carry this information to interested communities beyond Oregon. The American Forest Foundation will fund the expansion of the program nationwide. We have formed a non-profit institute to facilitate delivery of the program with local partners in other regions and are pilot testing a collaborative regional delivery model in Washington in 2008.

Science and Community Change:
Technology Transfer, Urban Forestry, and Local Government Policy

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Recent research has significantly expanded our knowledge base regarding the environmental, social, and economic benefits and functions of urban forests. This knowledge has been translated into an abundance of technology transfer products, distributed across many U.S. cities.

Certain products are intended to inform, and then convince local decisionmakers about the need to commit resources to urban forest management and green infrastructure. Anecdotal feedback from across the United States is that adoption of urban forestry programs in cities is at point “B” on the adoption curve (Figure 1). We know little about the actual influence of technology transfer products on local elected leaders or the professional staff of municipal government (such as planners or public works directors). We also have little knowledge about technology transfer impact on urban forest policy and actions at the local government level.

This presentation will report results from an ongoing research program. As the research proceeds, three domains of theory are proving relevant: innovation diffusion and adoption (from both organizational and policy perspectives), communities of practice, and open source materials.

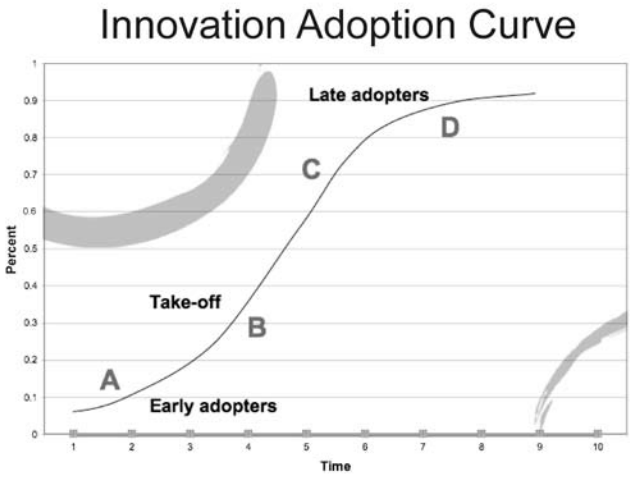

Figure 1. *Innovation adoption curve (from Rogers 2003).*

Adoption of Innovation

Innovation adoption at the individual level is well understood but organizational innovation adoption, particularly in the public sector, involves additional layers of social interactions. Some general principles apply. Rogers’ model of innovation diffusion (2003) reported five variables that influence the rate at which new ideas or products are adopted by individuals or organizations: (1) the perceived attributes of innovations, (2) the type of innovation decision (i.e., optional, collective or authoritative), (3) the communication channels used, (4) the nature of the social system that is adopting the innovation, and (5) the extent of the change agents’ promotion efforts.

The perceived attributes of innovations are the most researched variable and are thought to account for half of the variability in rate of adoption. Five distinct traits are thought to contribute to the favourable perception of an innovation (Rogers 2003), and may be particularly important in organizational innovation adoption: (1) relative advantage, (2) compatibility, (3) low complexity, (4) trialability, and (5) observability.

Rogers (2003) also identified five sequential stages that organizations move through to adopt new innovations: (1) agenda-setting, (2) need matching, (3) redefining/restructuring, (4) clarifying, and (5) routinizing.

It is likely that social dynamics play out significantly with regard to both innovation trait perception and the stages of organizational innovation adoption. In both instances organizational behaviour is based on the cumulative perceptions and actions of many individuals across a particular organization, such as a municipal government.

Communities of Practice

Communities of practice (CoP) theory offers insight on how distinct subgroups within a larger organization operate, and the potential dynamics of innovation within and between such subgroups. Communities of practice are social structures that lead to social learning, and are formed by people who engage in a process of collective learning in a shared domain of human endeavour (Wenger 1998). They are groups of people who share a concern or a passion for something they do, and learn how to do it better as they interact regularly. Three characteristics are crucial: commitment to a shared domain of interest, community relationships built through the pursuit of their interest in the domain, and development of a shared practice or set of resources.

Two important aspects of social learning are reification and participation (Wenger 1998). Reification is the process of giving form to experience and creating something that reflects learning. Active participation is also necessary to the group learning process: it requires both action and connection to others in the group.

Brokers enable knowledge movement (Wenger 1998), being people who belong to more than one community of practice, and act as agents of transfer between communities. Successful brokering involves translation, coordination, and alignment between the perspectives of two or more communities. Boundary encounters also facilitate knowledge transfer, and are bridging events that provide connection between two communities. The success of these encounters, in terms of the transfer and adoption of knowledge, depends on the relationships of the people involved in the encounter (Wenger 1998).

Open Source Authoring

Finally, the transmission of scientific information appears to be an *Open Source* dynamic, in that stakeholders and champions customize the format and relevance of evidence-based sources. Open source software has taken hold in the technology industry over the past decade. It was originally developed as a means to address a "software crisis" – namely that software systems were taking too long to develop, cost too much, and did not work well.

The open source model has been applied to fields other than software (such as a high-performance windsurfing community). The transfer of urban forestry research may be viewed as another application of the open source model. Urban forestry knowledge tools are often developed by teams or individuals with the same goals in minds as the developers of open source software: to create products that are free, redistributable, modifiable, and non-discriminatory (Feller and Fitzgerald 2000). Many urban forestry tools are freely distributed and are meant to be modified by communities to fit their unique needs and uses, in much the same way that open source software is modifiable. The final version of such products is not determined by their originator; they are adapted for use in an organizational context in order to be more meaningful to a target audience. In the case of urban forestry, target audiences are often professional staff or local policymakers.

Theory Connections

Rogers described the linkages between technology transfer and the diffusion of innovations. Both "deal with causes of *social change*, the process through which the structure and functioning of systems are altered" (Rogers 2002, p 328). Key differences that Rogers noted between the diffusion of innovations and technology transfer are:

- Diffusion is user oriented; technology transfer is producer oriented.
- Diffusion emphasizes individuals and social networks; technology transfer emphasizes organizations.
- Diffusion is spontaneous in nature; technology transfer is planned.
- Diffusion focuses on how innovations, once available in a system, spread among system members and become adopted. Technology transfer focuses on how research results become applied or commercialized.

All three theory sets – diffusion of innovations, communities of practice, and open source – offer insights concerning more effective technology transfer to local government decision makers.

The adoption of urban forestry in response to scientific information is dependent on perceptions of an urban forestry program as a "product," and appears to proceed along the stages of organizational innovation adoption. Technology transfer may be better served if the social processes of organizations are given as much attention as the natural resource-oriented goals and objectives proposed by urban forestry research.

For instance, communities of practice could play an important role in urban forestry technology transfer. Engaging members of professional communities within cities (beyond natural resources) expands the diffusion and adoption potential. Reification and participation may be processes through which technology tools are developed in an open source fashion. The social learning that occurs through these processes may lead to the adoption of new technologies. Brokers and boundary encounters may promote the transfer of ideas and tools from one internal municipal community to another.

The open source model suggests that urban forestry technology transfer tools can be developed within the context of a community setting, with individuals and organizations taking a basic idea and adapting it to their local needs. Similar to successful open source software projects, urban forestry technology tools that are developed in this manner are more likely to be successful if professional staff are involved, an effective project leader is overseeing the effort, and a strong hierarchy is in place.

A technology transfer assessment is underway to evaluate the effectiveness of urbancforestry outreach, in order to provide practical guidelines for adapting existing technology transfer products, and developing and distributing future products. In addition, a community trace analysis will track how science moves within local government and comes to bear on policy decisionmaking. While the research focus is urban forestry, this presentation will translate key theories and findings to a broader set of forestry policy situations.

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