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Interior of FPInnovations – Forintek Division's Quebec laboratory

Forest Products Research and Development Organizations

Organization, Governance, and Measures of Performance in a Worldwide Setting

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Research Organizations Examined

The ability of forest products research and development organizations to contribute to a nation's well-being requires that they be well organized, effectively managed, and held to high standards of performance. In order to obtain a better understanding of how such organizations are structured and administered, and how they judge organizational performance, a review of forest products and related research organizations beyond the boundaries of the United States was undertaken in 2004-2005.[1] Ninety-three research organizations were initially identified for review, 40 of which were selected for in-depth examination (located in 23 countries) (**Table 1**). They were selected in order to: (a) provide a sampling of organizations operating in various countries worldwide, (b) enable review of publicly and privately sponsored organizations, and (c) permit access to a diversity of organizational structures and administrative procedures. The lead administrator of each organization was given an opportunity to review the draft narrative describing the organization. In addition, each lead administrator was asked to provide advice about structural, managerial, and performance conditions that are considered necessary if a forest products research and development organization is to accomplish its mission. Thirty administrators of the 40 organizations reviewed willingly provided commentaries.

Identifying themselves in a variety of ways (institute, center, laboratory), 25 of the 40 organizations operated as independent private research entities (e.g., Norwegian Paper and Fiber Research Institute [PFI]), although approximately half of the 25 were independent of, but legally authorized by, government (e.g., Technical Research Center of Finland [VTT]) (**Table 2**). The remainders were either agencies or institutes of government (e.g., Forestry and Forest Products Research Institute of Japan [FFPRI]), partnerships or joint ventures (e.g., Forestry and Forest Products Research Center of South Africa [FFP]), or government organizations operating as independent entities (e.g., Swedish Institute for Wood Technology [SP-TRATEK]).

Mission, Governance, and Organization

The organizations' mission statements were dominated by an interest in promoting industry competitiveness ("help wood industry remain globally competitive," "improve members' competitive position") and advancing the frontiers of science ("strengthen innovation through research," "promote world-class science") (**Table 2**). Although less common, mission statements also directed organizational attention to national economic and social needs ("develop technology that advances resource conservation and sustainability," "through research, serve society by improving quality of life"), supporting the technical and managerial needs of clients ("promote company profitability through research," "satisfy the technical needs of owner companies"), and advancing resource utilization and sustainability ("advance utilization of renewable materials"). Most organizations avoided sharp distinctions between public- and private-sector responsibility for research. Mission statements were frequently reviewed and updated, processes that enabled many of the organizations to respond to important (often threatening) changes in national and worldwide social and economic conditions.

Organizational governance was exercised in a variety of ways, although dominated by independently empowered panels (e.g., Board of Directors of the Pulp and Paper Research Institute of Canada [PAPRICAN]), direction from a larger parent organization (e.g., Council of Agriculture, Taiwan Forestry Research Institute), and authorities exercised independently by a chief executive (e.g., Head of Institute, Holzforschung Austria) (**Table 2**). Although a surprising number (23 of 40) of the organizations did not have external advisory committees, those that did used the committees to obtain important advice about an organization's internal management, research program direction, and technical research activities (**Table 2**). As an example of the latter, Forintek Canada Corporation (FORINTEK) in 2003–2004 had four technical advisory committees—resource assessment (54 members), lumber manufacturing (160 members), composite products manufacturing (67 members), and building systems (54 members)—plus a value-added research advisory committee (24 members), and a hardwood manufacturing working (advisory) group.

Traditional hierarchies were the most common organizational structure for the organizations reviewed here (e.g., China Research Institute of Wood Chemistry [CRIW]), although many found favor with horizontal structures that involved few organizational layers (e.g., Finland European Forest Institute [EFI]). Other structures included orientation around client demand for skills and information (e.g., Technical Research Center of Finland [VTT]), units of strategic alliances such as partnerships and joint ventures (e.g., Australia ENSIS), and forest products research entities located within a larger diversified (multisector) research organization (e.g., New Zealand Wood Technologies Research Sector, Industrial Research Limited [IRL]). In some cases, the administrative segments of organizations appear scattered and broken up (e.g., Swedish Wood Ultrastructure Research Center [WURC]), a condition suggesting rapid growth in response to new and important problems needing of research—with little attention given to organizational formality. Common were organizations that had formal connections with the education and research programs of universities (e.g., German Federal Research Center for Forestry and Forest Products [BHF], and Australian Cooperative Research Center for Wood Innovations [CRC]).

When queried about what organizational and governance characteristics make for a successful forest products research and development organization, executives provided the following responses (paraphrased examples):

[1] Forest Products Research and Development Organizations in a Worldwide Setting: A Review of Structure, Governance, and Measures of Performance by P. V. Ellefson, M. A. Kilgore, K. E. Skog, and C. D. Risbrudt. 2006. Staff Paper Number 187. Dept. of Forest Resources. Univ. of Minnesota. St. Paul, Minnesota. 187 pp. Available at: http://fr.cfans.umn.edu/publications/staffpapers/index.html (Date accessed: July 2006).

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Norway's Paper and Fiber Research Institute (PFI), founded in 1923, was one of the 40 research organizations studied by the authors. — Photo courtesy of PFI.

- *public-private positioning* — our organization's strength lies in combined public-private ownership and subsequent financing by all ownerships; private ownership provides us with the highest degree of liberty to plan, structure, and coordinate our research activities;
- *organizational governance* — important to our institute are committed owners who set clear objectives and exacting expectations of performance; being a member driven organization, decision-making is very democratic and stems from member needs and expectations; although our institute is run by two directors, its effectiveness rests primarily on our system of decentralized decision-making;
- *program planning and implementation* — our organization's board establishes general research directions and annual operating plans and budgets, which are pulled together by a regularly updated long-range business plan; as part of a larger parent research organization, we can avail ourselves of competencies in a whole range of topics and technologies necessary to promote our research mission; and
- *partnering and collaboration* — partnering is extremely important, simply because it is impossible to have a full range of specialized research expertise within our own organization; our organization has very well developed partnerships in which member company employees participate as observers and short-term guides for our research projects; being located on a university campus means that education and research involving forest products go hand-in-hand.

Clients, Programs, Budgets, and Staff

Providing services to a broad array of public and private clients was the expressed intent of more than half the organizations reviewed here (**Table 3**). Only 14 organizations sought to favor their owners or members (whether public or private), and very few emphasized government (none regarded government as their only client). Maintaining a positive working relationship with clients appears to be especially important, as one organization's annual report stated, "in today's markets, relevance to clients is crucial; client needs drive not only the way in which we deliver services and solutions, but also our science planning and investment." In a similar vein, the 2003 Annual Report of the Pulp and Paper Research Institute of Canada (PAPRICAN) asserts ". . . the driving belief is that if we deliver real value to our customers, the funding to support our organization will be a natural outcome of this business success."

Clients for the services provided by many of the organizations reviewed here are often beyond the boundaries of the nation within which a research organization happens to be formally chartered and headquartered. Those with a publicly stated worldwide interest in clients include Australia's ENSIS, the French Pulp and Paper Research and Technical Center (CTP), and the Swiss Federal Laboratories for Material Science and Testing (EMPA). Approximately 25 percent of revenue generated by the Norwegian Institute of Wood Technology (NTI) comes from projects and services performed for foreign clients. And the Paper and Fiber Research Institute (PFI) of Norway specifically states its intent is to "carry out research and contract work for customers worldwide."

Clients seeking the research service of some research organizations often require that the information generated in response to their request be given proprietary status. Such arrangements can adversely affect the extent to which the results of research enter the public domain. In this respect, the 2004 Annual Research Review of South Africa's Institute for Commercial Forestry Research (ICFR) is very forthright, namely ". . . since the ICFR is fully funded by private companies, our research outputs are not always placed in the public domain, rather classified as proprietary to the contributing members of the ICFR." Similarly, the Forest Engineering and Research Institute of Canada (FERIC) listed 46 FERIC publications in 2004, 26 (56 %) of which were restricted in their distribution.

The services provided to clients by the 40 sample organizations are diverse (**Table 3**). Although all 40 provided research services, also common were furnishing clients access to expert advice and counsel (36 organizations), synthesis of information and access to existing reports (35), sponsorship of conferences and continuing education programs (27), testing product and process performance and reliability (12), provision of basic college-level courses and experiences (5), documentation and certification of products and processes (4), and guidance with prototype products and production processes (1). None of

Table 1. — Forest Products and Related Research and Development Organizations, by Country, Budget, and Program Focus. 2004-2005.

Organization	Country	Date Established	Budget-Income (million US$)	Program Focus
• CooperativeResearch Center for Sustainable Production Forestry (CRC)[a]	Australia	1997	2.2	Forestry
• CooperativeResearch Center for Wood Innovations (CRC)	Australia	2001	8.1	Forest products
• ENSIS	Australia	1949	NA	Forest products & forestry
• HolzforschungAustria (HFA)	Austria	1953	4.4	Forest products
• ForestEngineering Research Institute of Canada (FERIC)[b]	Canada	1975	10.2	Forestry
• ForintekCanada Corporation (FORINTEK) [b]	Canada	1979	24.4	Forest products
• Pulpand Paper Research Institute of Canada (PAPRICAN)[b]	Canada	1930	34.0	Forest products, modest forestry
• ResearchInstitute of Wood Industry (CRIWI)	China	1957	NA	Forest products
• EuropeanForest Institute (EFI)	Finland	1993	3.0	Forestry, modest forest products
• FinnishForest Research Institute (METLA)	Finland	1917	58.9	Forestry, modest forest products
• KCL(Oy Keskuslaboratorium-Centralboratorium Ab)	Finland	1916	28.6	Forest products, emphasis pulp and paper
• TechnicalResearch Center of Finland (VTT)	Finland	1942	NA	Forest products, modest forestry
• AssociationForest Cellulose (AFOCEL)	France	1962	7.8	Forestry and forest products
• FrenchPulp and Paper Research and Technical Center (CTP)	France	NA	13.6	Forest products, emphasis pulp and paper
• FederalResearch Center for Forestry and Forest Products (BFH)	Germany	NA	NA	Forest products and forestry
• Instituteof Wood Technology (IWT)	Germany	1952	6.0	Forest products
• NationalCouncil for Forest Research and Development (COFORD)	Ireland	1993	2.1	Forest products and forestry
• ForestProducts and Forestry Socio-Economic Research and Development Center	Indonesia	1983	NA	Forest products
• Forestryand Forest Products Research Institute of Japan (FFPRI)	Japan	1905	90.0	Forest products and forestry
• HokkaidoForest Products Research Institute	Japan	1950	NA	Forest products
• ForestryResearch Institute (SILAVA)	Latvia	1946	NA	Forestry, modest forest products
• ForestResearch Institute Malaysia (FIRM)	Malaysia	1985	7.5	Forest products and forestry
• SHRTimber Research	Netherlands	1991	2.9	Forest products
• SCIONCrown Research Institute	New Zealand	1947	26.2	Forestry and forest products
• WoodTechnologies Research Sector, Industrial Research Limited (IRL)	New Zealand	1992	NA	Forest products
• NorwegianForest Research Institute (SKOGFORSK) [c]	Norway	1917	11.4	Forest products and forestry
• NorwegianInstitute of Wood Technology (NTI)	Norway	1949	4.6	Forest products
• Paperand Fiber Research Institute (PFI)	Norway	1923	4.1	Forest products, emphasis pulp and paper
• ForestProducts Research and Development Institute (FPRDI)	Philippines	1954	NA	Forest products
• Researchand Development Center for Wood-Based Panels	Poland	1974	NA	Forest products, emphasis on panels
• ForestResearch Institute (FRIS)	Slovak	1948	1.8	Forestry, modest forest products
• Forestryand Forest Products Research Center (FFP)	Republic South Africa	NA	NA	Forest products and forestry
• Institutefor Commercial Forestry Research (ICFR)	South Africa	1984	2.0	Forestry
• ForestryResearch Institute of Sweden (SKOGFORSK)	Sweden	1992	14.0	Forestry
• SwedishInstitute for Wood Technology (SP-TRATEK)	Sweden	2004	8.3	Forest products, emphasis on milling, housing, furniture, board
• Pulpand Paper Research Institute-Institute for Packaging and Logistics (STFI-PACKFORSK)	Sweden	2003	31.3	Forest products, emphasis packaging, pulp and paper
• SwedishWood Ultrastructure Research Center (WURC)	Sweden	1996	2.3	Forest products
• SwissFederal Laboratories for Material Science and Testing (EMPA)	Switzerland	1938	2.0	Forest products
• TaiwanForestry Research Institute	Taiwan	1945	NA	Forestry and forest products
• TimberResearch and Development Association (TRADA)	United Kingdom	1962	1.1	Forest products, emphasis engineered products

[a] In 2005, reorganized to become the Cooperative Research Center for Forestry.
[b] In 2007, FERIC, FORINTEK, and PAPRICAN merged to form FPInnovations.
[c] In 2006, reorganized to become the Norwegian Forest and Landscape Institute after merging with the Norwegian Institute for Land Inventory.

Table 2. — Governance of Forest Products and Related Research and Development Organizations, by Type of Governance and Number of Organizations. 2005.

Public-Private Sector Position

Private Independent, Government Authorized – 13 Organizations
Private Independent – 12 Organizations
Public Government – 11 Organizations
Private-public Independent, Joint Venture – 2 Organizations
Public Government, Independent – 2 Organizations

Purpose or Mission

Promote Competitiveness of Industry – 14 Organizations
Advance Science and New Technologies – 9 Organizations
Promote Resource Utilization and Sustainability – 5 Organizations
Support Technical Needs of Clients – 5 Organizations
Contribute to National Needs and Concerns – 4 Organizations
Support Economic and Managerial Needs of Clients – 3 Organizations

Management of Operations

Independent Governing Board and Executive Director– 18 Organizations
Beholden to Directives of Larger Parent Organization – 18 Organizations
Independent Managing Director – 4 Organizations

External Advisory Committees

Various Advisory Committees (technical, program, operations) – 17 Organizations
No Advisory Committees – 23 Organizations

the organizations provided services in all eight of the aforementioned categories. One organization provided six of the services, 16 provided five, 11 provided four, 8 provided three, 3 provided two, and 1 provided services in only a single category.

The primary research focus of 21 of the organizations was forest products, while an additional 10 organizations carried out research involving both forestry and forest products (**Table 3**). Only four organizations considered forestry as their major area of research. Those organizations engaged in forest products research were inclined to focus on one or more of the following areas: *pulp and paper* (e.g., the French Pulp and Paper Research Technical Center [CTP]), *wood composites* (e.g., Poland's Research and Development Center for Wood-based Panels), *furniture* (e.g., Germany's Institute of Wood Technology [IWT]), *engineered structures and mechanics* (e.g., United Kingdom's Timber Research and Development Association [TRADA]), and *wood processing and preservation* (e.g., the Taiwan Forestry Research Institute). As for those with an interest in forestry and forest management, they tend to focus on *fiber production* (e.g., South Africa's Institute for Commercial Forestry Research [ICFR]), *forest protection* (e.g., Slovak Forest Research Institute [FRIS]), *marketing and economics* (e.g., Finland's European Forest Institute [EFI]), *harvest systems* (e.g., the Forest Engineering Research Institute of Canada [FERIC]), and *fish and wildlife* (e.g., the Latvia Forestry Research Institute [SILVA]). Of the organizations engaged in forest products research, fewer than six appeared to be engaged in both solid wood products research and in pulp and paper research.

The financial investments made by the 40 sample organizations in 2004 were substantial, although information about their investments is uneven in quality and often not publicly available. Recognizing such limitations, the 2004 combined investment in forest products and related research made by 28 of the reviewed organizations was in the range of US$385 to US$425 million (**Table 1**), with 40 to 50 percent of this total being made by private research organizations. About half of the 28 organizations have incomes less than US$5 million each, only four had incomes exceeding US$30 million each (**Table 3**). As for the source of income, such can be meaningfully grouped into five categories, namely government funding, membership fees, payments for services, investment income, and in-kind support. For private independent research organi-

zations, 35 to 40 percent of their income came from payments for services, 20 to 25 percent from member fees, 15 to 20 percent from government, and 15 to 20 percent from a variety of other sources. For private independent, government authorized organizations, the proportions are 45 to 50 percent government, 25 to 30 percent payments for services, 15 to 20 percent other revenue sources, and five to 10 percent member fees. Because information describing other major income categories was very limited, generalizations about their magnitude are of little value.

Some research organizations rely on a stable long-term core of funding that is provided by government (e.g., European Forest Institute [EFI], 40% federally funded). This core funding is used for various purposes, including support of research unlikely to be undertaken by the private sector (e.g., university support of the Swedish Wood Ultrastructure Research Center [WURC]), support of research programs generally, or support of various administrative and operational activities (e.g., the Norwegian Forest Research Institute [SKOGFORSK], and the Forest Research Institute of Malaysia [FRIM]). Some research organizations rely on a national consortium of companies for financial support (e.g., South Africa Institute for Commercial Forestry Research [ICFR]). Facing increasing uncertainty of government as a stable source of income, some organizations have sought to become financially self-sufficient, an example being the Forest Research Institute of Malaysia (FRIM), which has a stated policy of ". . . achieving 70 percent self financing by year 2008."

Scientists and staff are viewed by the organizations as among their most important resources. An estimated 6,000 to 6,500 scientists and supporting staff were employed by the organizations reviewed here. Although more than half employed 100 or fewer staff, the four organizations with 301 or more staff accounted for nearly 40 percent of the 6,000 to 6,500 total (**Table 3**). On average, 65 percent of an organization's staff were scientists or researchers, while the remaining portion is regarded as administrative and supporting staff. Some organizations claim that their clients can access more than 6,000 staff worldwide (Australia's Commonwealth Scientific and Industrial Research Organization [CSIRO]).

When queried about what client and administrative conditions make for a successful forest products research and development organization, executives responded as follows (paraphrased examples):

- *clients and patrons* — being client-focused means we understand the needs and priorities of our members, including their need to see value from our research and development activities; having satisfied customers is a must, so we now ask our customers to evaluate our performance;
- *blend of services* — success for us means a clear focus on both basic and applied research; important is a balance of research and application, since without research we have no product to sell, and without application we have no customer to pay for research;
- *employees and leadership* — quality managerial leadership is critical to ensuring that our organization is relevant to the industry; maintaining a talented research and supporting staff is an absolute must (people make the difference, it's true and as simple as that); we seek to expand the scientific background of our staff away from exclusively wood specialists toward chemists, physicists, and material scientists;
- *financing and budgets* — our financing model is one of being jointly funded by government and the private sector, a model that safeguards continuity in our program and provides the ability to address long-term research and development needs; we are a healthy private organization with no public funding, as such we can make allocation decisions quickly and efficiently; since industry is subject to a range of ever changing economic pressures that have a direct effect on our institute's financing, we have to very carefully design our financial strategies.

Photo courtesy of: FPInnovations–Forintek Division

World's largest CT scanner dedicated to wood products research is in FPInnovations – Forintek Division's Vancouver laboratory.

Performance and Outcome Measures

Sophisticated financial analyses of returns on investments made by the organizations reviewed here were not

possible. However, the organizations did present a number of important measures of performance in their annual reports, planning documents, or on their web sites. The measures publicly reported the most were (a) listings of publications describing the results of research (28 organizations) and (b) presentations of highlights (usually in annual reports) describing special products or processes developed by research (16 organizations) (**Table 3**). The number of educational opportunities offered (conferences, workshops), number and satisfaction of clients served, and statements describing assets and liabilities were also common performance measures.

Detailed asset-liability information was published by seven of the research organizations. The annual report of the United Kingdom's Timber Research and Development Association (TRADA) presents detailed income and expenditure accounts (income, expenditures, operational deficit) and an association balance sheet (fixed assets, current assets, creditors, capital and reserves, member funds). Likewise, the Technical Research Center of Finland (VTT) annually publishes an internal statement of profitability that presents information (current and preceding years) about operating income (external income, government funding, adjustments), expenses (e.g., personnel, travel, materials, rents, external research services), operating margins (depreciation, financial expenses, extraordinary expenses), and financial year results (profit, net income). Similarly, the annual report of FORINTEK Canada Corporation sets forth similar information in a consolidated balance sheet (assets, liabilities, balance) and in consolidated statements describing cash flows, changes in net assets, and in operations and fund balances. The financial statements for New Zealand's Wood Technologies Research Sector, Industrial Research Limited (IRL) are especially detailed. Not only do they set forth typical accounting details (financial performance, movements of equity, financial position, cash flows), they also present statements of actual versus expected financial performance (revenue, return on equity, return on assets, equity ratios).

The extent to which established plans or targets are met is also used as a performance measure by some of the research organizations. Noteworthy in this respect is Indonesia's Forest Products and Forestry Socio-Economic Research and Development Center which documents progress in accomplishing each of the Center's five year plans. Similarly, the Forest Research Institute of Malaysia (FIRM) reports progress in accomplishing each of the 35 objectives specified within each of its seven plan-of-action strategies. As a Crown Research Institute, New Zealand's SCION annually provides significant detail about corporate intent and the actual accomplishment of established targets. For SCION, actual versus intent information is provided for more than 36 target areas, including gross revenue, return on assets, patented inventions, research papers in journals, seminars and field days sponsored, and staff time in training. Also a Crown Research Institute, the Wood Technologies Research Sector of New Zealand's Industrial Research Limited (IRL) reports on accomplishment of targets established for key indicators of performance (such as capital expenditures, permanent staff turnover, joint ventures established, and speaking invitations to scientists).

Organizations also report standards of social responsibility and organizational health. New Zealand's SCION annually reports measures such as avoidance of accidents, student scholarships granted, contributions to community well-being (volunteer support of nonprofits), and protection of national interest in biosecurity and indigenous forests. The Forest Engineering Research Institute of Canada (FERIC) uses recruitment and retention of members as a measure of organizational success, and prominently identifies new members in its annual reports. As a measure of organizational health, the Wood Technologies Research Sector of New Zealand's Industrial Research Limited (IRL) annually reports turnover of permanent staff as a percentage of total staff, the rationality being that the rate at which employees leave an organization's workforce may be an indication of employee dissatisfaction with working conditions.

When queried about what measures of performance make for a successful forest products research and development organization, executives responded as follows (paraphrased examples):

- *client satisfaction* — satisfied clients are the most important measurement of how we carry out our mission; a key performance indicator is delivery of successful research products that produce positive economic impacts for our clients;
- *recognition and appreciation* — success means wide acknowledgment of our research-based products; success is embodied in our organization's achievements being recognized by high-level policy-makers and by policy-making processes;
- *economic and scientific contributions* — most important measure of success is creation of new technology and its application to current problems; critical to our success is scientific output as measured by the number of patents and licenses granted, scientific papers produced and reviewed, and the number of advanced degrees granted;
- *operational success* — our organization is built on key values, namely confidentiality, neutrality, and top quality professional products and services; success is embodied in our mix of being a business company and an academic institution; no research can be carried out without money, successfully securing adequate financing is a constant challenge and a measure of our success; ensuring that a high portion of our budget comes from external sources demonstrates how well our products and services are received in the marketplace.

Summary Observations

Although at times hindered by gaps in the type and amount of publicly available information describing structure, governance, and performance, this review of 40 forest products and related research organizations located in 23 countries suggests the following. These organizations often, but not in all cases:

- *Organization and Governance*: Identify themselves with various labels (institute, center, laboratory); commonly are authorized by, but independent of, government; are guided by missions that seek to promote the competitive

Table 3. — Administration and Management of Forest Products and Related Research and Development Organizations, by Administrative Characteristic and Number of Organizations. 2005.

Program Focus

Forest Products – 21 Organizations
Forest Products and Forestry – 10 Organizations
Forestry and Modest Forest Products – 4 Organizations
Forestry – 4 Organizations.
Forest Products and Modest Forestry – 1 Organization

Primary Clients Served

Public and Private Clients – 21 Organizations
Public and Private Clients, Owner-member Emphasis – 14 Organizations
Private Clients, Owner-member Emphasis – 3 Organizations
Public and Private Clients, Government Emphasis – 2 Organizations
Public (government) Clients Only – No Organizations

Services Provided

(multiple services possible)
Research (products, processes) – 40 Organizations
Consultation (expert advice, guidance) – 36 Organizations
Information (reports, synthesize information) – 35 Organizations
Training (conferences, workshops) – 27 Organizations
Testing (quality, performance, reliability) – 12 Organizations
Education (basic college-level experiences) – 5 Organizations
Certification (achievements, documentation of facts) – 4 Organizations
Pilot Scale Production (prototype guidance) – 1 Organization

Budget-Income (US$)

(information available for 28 organizations)
1 to 5 Million – 12 Organizations
5 to 10 Million – 5 Organizations
10 to 20 Million – 4 Organizations
20 to 30 Million – 3 Organizations
30 or More Million – 4 Organizations

Scientists and Staff

1 to 100 Staff – 21 Organizations
101 to 200 Staff – 10 Organizations
201 to 300 Staff – 5 Organizations
301 to 400 Staff – 2 Organizations
401 or More Staff – 2 Organizations

Performance Measures

(multiple measures possible)
List of Research Publications – 28 Organizations
Highlights of Research Outcomes– 16 Organizations
Educational Offerings – 11 Organizations
Number and Satisfaction of Clients – 7 Organizations
Statement of Assets-liabilities, Profits-losses – 7 Organizations
Patents Granted – 4 Organizations
Product and Process Adoption Rates – 4 Organizations
Accountable to a Parent Organization – 3 Organizations

position of industry; avoid sharp distinctions between public and private sector responsibility for research; are governed by independently operating boards and advisory committees; accept subunit positioning within larger parent research organizations; organize in traditional hierarchal fashion but willingly accept scrambled organizational structures; make extensive use of subsidiaries and joint ventures; see real advantages in the multiple location of physical facilities.

- *Administration and Management*: Cater to a wide array of public and private clients with an intense desire to meet client needs; seek to serve clients located throughout the world; in addition to research, offer an extensive menu of services; consider synthesis and reporting of existing information as an important service; limit the distribution of information in the interest of a client's proprietary interests; focus forest products research on either pulp and paper or on solid wood products, but seldom both; see great advantage in having many ways of generating income from many different sources; willingly charge fees for services and products provided; comfortably engage in educational and degree-granting activities.
- *Performance and Outcomes*: Use a variety of standards for measuring performance, including reporting results of programs, asset-liability statements, accomplishment of targets, and benchmarks of social responsibility and organization health; and adeptly reassess mission statements so as to maintain organizational relevancy given changing national and worldwide conditions affecting the wood-based industry.

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