AN INTEGRATED MARKET-BASED METHODOLOGY FOR VALUE-ADDED SOLID WOOD PRODUCTS SECTOR ECONOMIC DEVELOPMENT

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ABSTRACT

This paper discusses an innovative approach to stimulating economic development through value-added wood product industry expansion. The methodology, which is premised on matching production capabilities to market demand, goes beyond simply examining forest resources, current industry capabilities, and market forces. In addition to these important components, the methodology includes analyses of regional economic effects of value-added industry growth, socio-economic and demographic factors, work readiness of the potential employee base, required employee skills, and employee training program development. The research approach is flexible and can be adapted for different objectives.

Many states in the United States are diversifying rural economic opportunities through forest resource-based industry sector development. Kentucky, Oregon and Pennsylvania are examples of states that have developed successful statewide initiatives that add value to their forest resources while improving economic conditions (19).

As is the case with most economic development efforts, forest sector strategies rely on either retention and expansion of existing companies, or attracting new industrial investment or recruitment. Solid wood forest products (as opposed to pulp and paper products) can be broadly characterized as primary or secondary products. This classification is not always clear, but most industry observers agree on general definitions of the groups. Primary products are those that are produced directly from raw timber input. Examples include chips, lumber, veneer, plywood, and their by-products. Secondary products use primary products as inputs for remanufacturing into semi-finished and finished products. Examples include various types of panels, engineered composites, millwork, and hardwood components. Secondary products can also include final consumer products such as furniture and cabinets. Many industry development efforts, as is the focus of the methodology discussed in this paper, focus on value-added secondary processing as opposed to primary production.

Value-added, an important indicator of industry health and success, is defined as "a measure of manufacturing activity derived by subtracting the costs of materials, supplies, containers, fuel, purchased electricity, and contract work from the value of shipments for the products manufactured" (16). Thus, value-added equals value of shipments minus intermediate production inputs, and represents the amount available for wages, salaries, and profits in an industry. Value-added is a better indicator of industry activity than value of shipments because value-added excludes the costs of inputs of other industries (16).

Part of a broader planning process, the methodology addresses markets for existing and new products, labor skill requirements of existing employees, as well as capabilities and training needs for new hires as market driven job-creation occurs. The goal is to create sustainable employment opportunities with transferable skills while maintaining stewardship of renewable forest resources. In addition to value-added sector development, this methodology has been used to stimulate economic development in chronically depressed regions. The intention in this application is to identify ways

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to successfully implement efforts aimed at alleviating chronic long-term economic deterioration in rural resource-based regions.

The methodology is the foundation for recommendations generated by a Louisiana Governor's Task Force on Forest Products Industry Development (6) and has been applied in three research studies in Louisiana (32-34). It is also being considered for applications in other U.S. states and in other countries.

THE NEED FOR VALUE-ADDED WOOD PRODUCT ECONOMIC DEVELOPMENT

In locales where jobs are in short supply, locally generated secondary forest products industry jobs may offer a viable alternative to forced migration or the need to commute long distances for employment (27). Further, secondary forest products wages often exceed average wages of other jobs in rural areas, adding incentives for company recruitment and industry development efforts. Export oriented value-added forest product companies may also offer rural communities added benefits, as exports often increase economic multipliers (9,27).

Development planners often target value-added secondary wood processing because this sector can offer increased profitability through higher margins and greater profit (28). Employment is typically encouraged through establishment of a large number of smaller local companies instead of a few large primary-processing plants. In addition, higher economic multipliers are often realized in secondary manufacturing compared to primary conversion. Making finished products instead of commodities allows a company to take better advantage of new markets and market trends, and secondary products also can earn higher profits by adding value and meeting specific customer needs. One advantage of secondary processing is that lower-grade lumber can be used to produce higher value wood products. For example, short clear boards can be edge-glued into furniture components and other value-added wood products.

A MODEL OF VALUE-ADDED FOREST SECTOR INDUSTRY DEVELOPMENT

Figure 1 shows the elements of an approach developed by the authors to promote value-added forest products sector driven economic development. Concurrent sustainability of resources, industry development, markets, and other model components is the overriding foundation of the model and research approach. All components need to move in tandem and in a coordinated fashion for successful forest sector development to occur. The balance of this paper discusses each model element and selected application examples.

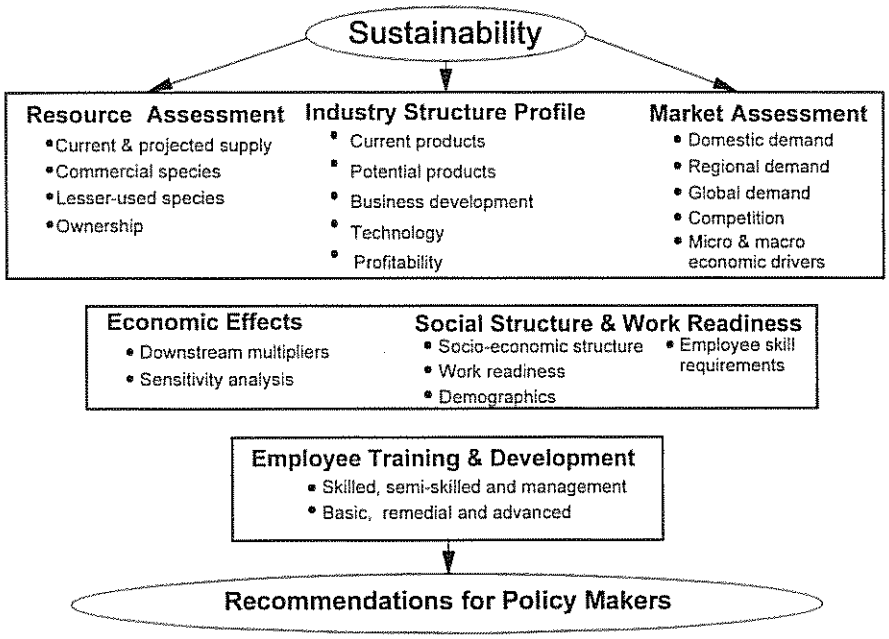

Figure 1.— Integrated market-based value-added forest sector economic development.

RESOURCE ASSESSMENT

The initial step in forest sector development is to discern the current and potential availability of raw materials, both at the forest resource, and intermediate product levels. In this methodology, we examine over 25 forest resource variables including forest types, current and projected timberland area by county, timberland area by ownership, growing stock volume by species, sawtimber volume by grade, diameter class, and species and sawtimber growth/removal ratios by species. In addition to resource data collection for the study region, comparable information is gathered for adjacent counties within 100 miles of the region boundary. The reason for doing this is that forest-based industry may be viable in an area even if it is not considered a "wood basket". Research has found that effective transportation and haul distances from manufacturing facilities are often up to 150 miles (29,31,32).

The data that constitute the basis for the resources of the methodology are derived from numerous sources. In an application of the methodology in Louisiana, the primary sources were the 1984 and 1991 Forest Inventory Analyses (FIA) conducted by the USDA Forest Service. The FIA survey for these time periods was a three-phase process that began with the use of aerial photos of the area of analysis. Forest-nonforest classification of land use was based on identified points of about 230 acres each. This classification was then adjusted through on-the-ground observations at sample locations. Field data were gathered for per-acre estimates in a grid with points located at 3-mile intervals. To increase compatibility among FIA units nationwide, streamline FIA operations, and accommodate a broader range of forest ecosystem analysis, Forest Service research changed the plot design from horizontal point sampling (or variable-radius plot sampling) to a standard fixed-radius plot in 1995. This new plot design consists of four 1/24-acre plots spread out over 1.5 acres. Field crews map any changes in land use or distinct changes within forest conditions on the sample plot (5).

In addition, other sources of information included the USFS bulletin series for forest statistics of Louisiana published by

the Southern Forest Experiment Station (26); the 1990 Census of the United States (29); Forests of the South, Southern Forest Based Economic Development Council (11); and Woods of Louisiana (13).

Industry Structure Profile

Another core component of the methodology is the collection of baseline data on the value-added wood products industry. Elements of an industry analysis are varied and include raw material types and supply status, current and potential products that could be produced, business development plans, technology applications, distribution channels, and impediments to growth and development. Examples of questions that need to be answered are:

- What is the structure of the established primary and secondary forest products industry base?
- What types of manufacturing processes and equipment do current companies use?
- Do sawmills, dry kilns, millwork plants, particleboard, hardwood lumber, etc. exist that could support significant secondary development?
- Are current and potential future companies able to compete in the markets they do/will serve?
- How have those companies that have grown and prospered done so (exploiting specialty niches, cutting costs, etc.)?

In application, developing measures to empirically test these issues at the industry level in the region operationalizes a number of factors. Examples of such factors included: raw material purchase decision criteria (12), species availability for raw material inputs (22), product and supplier attributes (8), markets and market trends (4), criteria for geographic location selection (23), and export activity.

Market Assessment

A major factor in determining the probability of industry success is the market structure for current or potential value-added solid wood products. In this part of the methodology, a market analysis is conducted in order to identify products with a high potential for successful expansion or development (**Fig. 2**). Beyond identifying attractive segments for development at the industry level, **Figure 2** indicates (on the right of the arrow) corporate-level issues that should be examined before investment and growth should take place.

In order to examine the attractiveness of participating in the forest products industry, it is important to understand the overall macro- and micro-drivers of product supply and demand. Accordingly, an analysis is conducted of the drivers (housing starts, repair and remodeling, interest rates, global supply and demand, demographics, etc.) for wood product demand and the outlook for major raw materials that serve as inputs for the secondary wood products industry. In addition to demand influences, an analysis of the competitive environment is conducted. This analysis can identify niche market opportunities, as well as areas to avoid due to high levels of competitive pressure.

In the context of the methodology, a number of questions are posed:

- What is the product mix of the existing companies?
- What are current markets and customer bases (both domestic and export)?
- What is the quality and level of acceptance in current markets?
- What is the effective distribution reach of current companies?
- What species currently are, and potentially could be, used by the industry?
- What are the information and management needs of the industry to facilitate growth?

Corporate-level market strategy tools, such as the Product-Market Matrix and the Directional Policy Matrix (DPM), are adapted and applied in the research for both identification of competitive factors that can stimulate industry sector growth and to identify domestic and export opportunities. In addition to the DPM and product/market analysis, there are many other market strategy tools available for industry sector opportunities analysis. To serve as examples, these two tools are described in the context of the research structure.

The Product-Market Matrix

The product-market matrix categorizes company or industry sector growth strategies as follows: 1) market penetration (market the existing product to additional members of the existing market); 2) market development (market the existing product to new markets); 3) product development (market a new product to the existing market); and 4) diversification (market a new product to a new market). Multiple approaches are available to pursue each strategy (20). Product-market matrix growth analyses are applied to the area marketing and economic development component of the research.

Directional Policy Matrix

The DPM is another marketing strategic planning tool that assesses an organization's or industry's sector potential involvement in markets along two di-

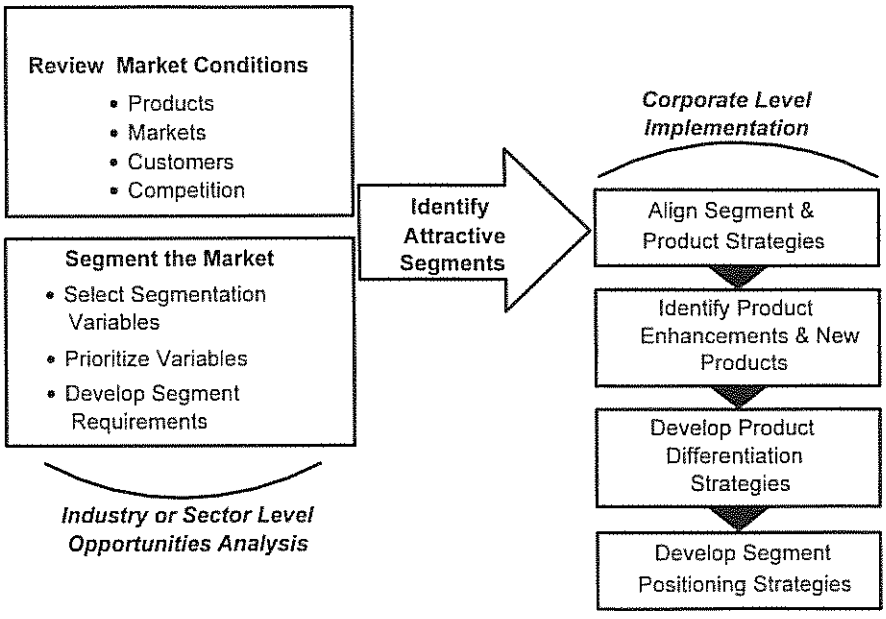

Figure 2. — Market opportunities analysis. Adapted from Kotler (21).

TABLE 1. — Examples of industry development assessment criteria.

Ability to provide employment opportunities
Available markets (local, regional, national, or global)
Capital requirements
Competitive factors
Complements existing businesses
Consistency with manufacturing network strategy
Consistency with overall economic development plans
Distribution infrastructure-does it exist or can it be developed?
Environmental effects
Manufacturing facility requirements
Market growth rates
Other economic benefits
Pollution concerns (air, water, and noise)
Raw material availability
Waste facilities requirements (sewers, landfills)
Workforce skill requirements

mensions: competitive position and market attractiveness. For detailed reviews of the DPM, see Hofer and Schendel (14), Hussey (15), Robinson et al. (25), and Wind and Mahajan (35).

A desirable feature of the DPM is the flexibility it offers in selecting factors relevant to the specific industry to assess business sector prospects and competitive position. The DPM approach employs four sets of factors to assess business sector prospects: market growth rate, market quality, industry situation, and environmental aspects. Competitive position is assessed based on market position, product research and development, and production capability. The industry context in which the matrix is employed plays a major role in the choice of subfactors employed to relate business sector prospects and competitive position (20).

Using these adaptations of generic market strategies, market-based criteria are developed to assess long-term development potential (**Table 1**).

In application, these methods are used to produce a "Comparative Product Sector Analysis." In order to identify those market segments that hold the greatest promise for development, a comparison of criteria discussed earlier is conducted. For each of the criteria, a weight from 1 to 10 is assigned. This weighting scheme, which is consistent for all market segments analyzed, is developed from information gathered in the resource assessment, industry structure, and market analysis sections of the research project, as well as interviews with industry representatives.

Given relative attractiveness of expansion or investment in different forest sector market segments, a logical next step is to discuss possible market strategies. Based on development of generic company-level market strategy options (1, 10,24), **Figure 3** depicts the characteristics of each cell in the generic market strategy matrix.

This marketing strategic characteristic matrix is applied to the forest products industry in the targeted region. For example, in an application to the Louisiana forest products industry, architectural millwork and ready-to-assemble (RTA) furniture (the two segments with the greatest level of market attractiveness) were recommended for new investment (*Invest to Build*, **Fig. 3**). On a more limited geographical market basis, household furniture manufacturers had a moderate competitive environment and market attractiveness, particularly in niche markets. Accordingly, it was suggested that these segments be targeted for selective investment where risk is minimized (*Invest Selectively*, **Fig. 3**). Cabinets and pallets, because of limited geographic markets and applications, were also recommended for targeted limited expansion (*Limit Expansion*, **Fig. 3**). The goal for these sectors was to expand without incurring risk. Areas of high manufacturing (for pallets) and a high rate of new construction (for cabinets) were suggested areas of opportunity for these segments.

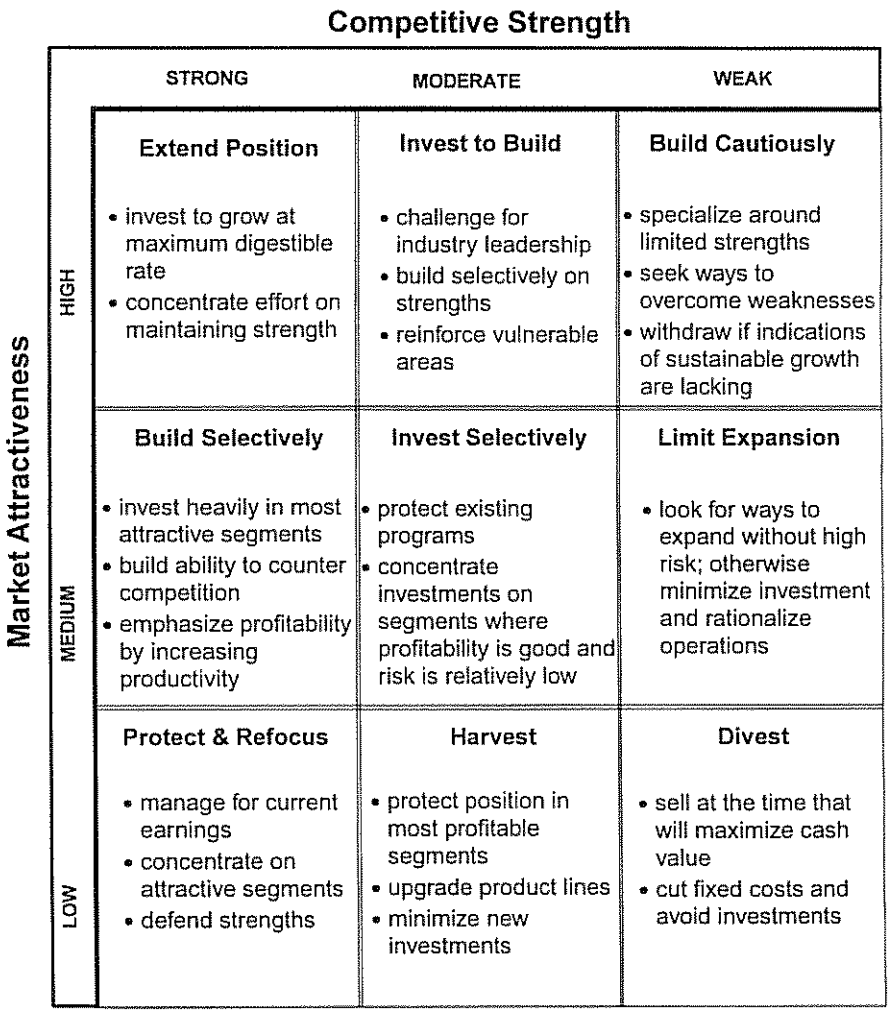

Figure 3. — Generic market strategy characteristics. From: Abell and Hammond (1), Ohmae (24), and Day (10).

Economic effects of forest sector development

Often, an important impact of overall value-added wood product development is to create new jobs and income sources for rural residents. A regional economic model provides estimates of income and job creation throughout the regional economy inclusive of and beyond the wood products sector (**Fig. 4**). This component of the methodology focuses on estimating the impacts of feasible growth in the value-added forest products industry on the economy of the target region. The expectation is to provide policy makers with an idea of the sector's possible contribution to total economic activity and to income distribution in the region. Specific questions are:

- What economic impacts result from forest-based industry development?
- What are the ramifications at community, regional, and state levels?

Inter-industry models are a well-established procedure for examining the effects of the development of a particular industry on a regional economy. These sets of models include the more traditional input-output (I-O) model (17), the social accounting matrix (SAM) (2), and price flexible computable equilibrium models (CGE) (7). A recent advance in I-O models has been the development of so-called ready-made I-O models. Ready-made I-O modeling systems facilitate construction of non-survey I-O models for a given region or community by providing access to databases and model construction techniques within a single computer software package. One of the most widely used ready-made model-building procedures is the IMPact Planning (IMPLAN) system, developed by researchers at the USDA Forest Service (3).

Adapting ready-made models to a variety of uses has given rise to a group of I-O models known as "hybrids" (18). Hybrid models are I-O models that have been constructed for a specific purpose or economy by verifying, and when necessary changing the information in a ready-made model based on secondary and primary data sources. The process of verification is particularly important to those concerned with sub-state or rural economies because ready-made modeling systems draw on nationally developed coefficients.

In this methodology, a model is developed for the study area using IMPLAN.

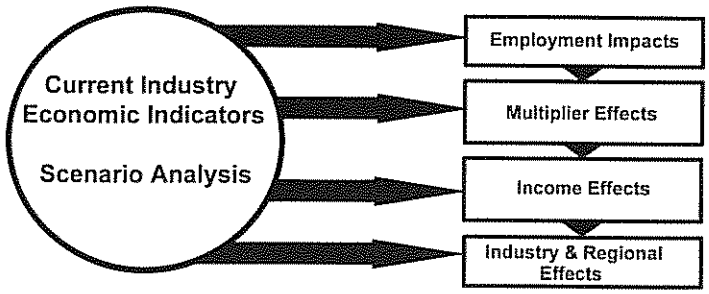

Figure 4. — Economic impacts of value-added wood products industry development.

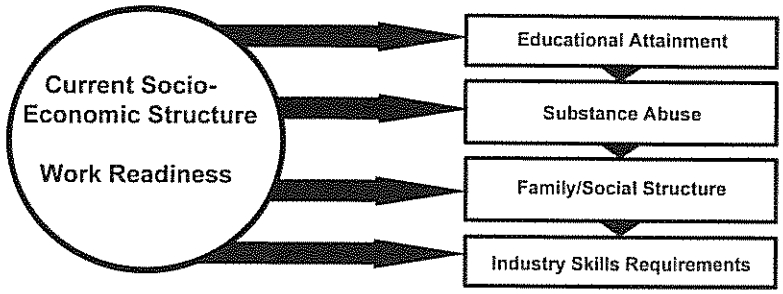

Figure 5. — Social structure and work readiness.

This model forms the basis for a hybrid I-O model. The latter model is based on unpublished state employment data, the regional information system (REIS) data provided by the Bureau of Economic Analysis, U.S. Bureau of the Census, other published information sources concerning the wood products industry, and possible survey information collected in research studies. The hybrid I-O model will then form the basis for a regional SAM. The regional SAM and I-O models are, in turn, used in evaluating the impact of feasible growth scenarios in forest products sectors on the regional economy.

Social structure and work readiness

In any industry development strategy, it is important to examine the social structure of a community where jobs may be created. The social structure of a community allows for an understanding of education constraints, social stratification, economy, and the knowledge base that already exists in this community. The decision to locate an industry in a particular location may not be based as much on the quality of the labor pool, but on the natural resources within the particular area. Industries new to a region are concerned with the quality of the pool of potential workers. Often, when "high tech" industries are introduced in a new location, the competence level of the residents is not adequate. In these instances, the industry is forced to look outside the immediate area and community for skilled workers during the early phases of development. Employee quality is affected by the social conditions that exist in the surrounding area.

This component of the research methodology describes the pool of eligible workers for the proposed value-added forest products industry in the target area. In addition, any uniqueness in the social structure or social institutions that exists and any potential problems with workers that could influence the success of the value-added forest products industry are researched (**Fig. 5**). Specific objectives in the context of social structure are:

- Determine social and economic profiles for the study region.
- Describe the pool of eligible workers in the area, including possible success rates.
- Identify labor skill needs of existing companies as well as labor skill needs of companies operating in the high value-added secondary forest products industry.

• Assist local policy makers in formulating strategies for implementation of rural economic development efforts designed to capitalize on defensible market-driven opportunities in forest products industry sectors.

• Assist local policy makers in developing a methodology for measuring the success of the local implementation of the rural economic development strategies formulated in the project.

• Assess the suitability of introducing value-added industries to economically depressed areas.

Using a micro-level approach, labor skill needs of existing companies as well as labor skill needs of companies operating in the forest products industry sector under study are identified. An inventory or profiling of the available labor pool, combined with an examination of industry skill requirements, leads to development of employee training and development programs.

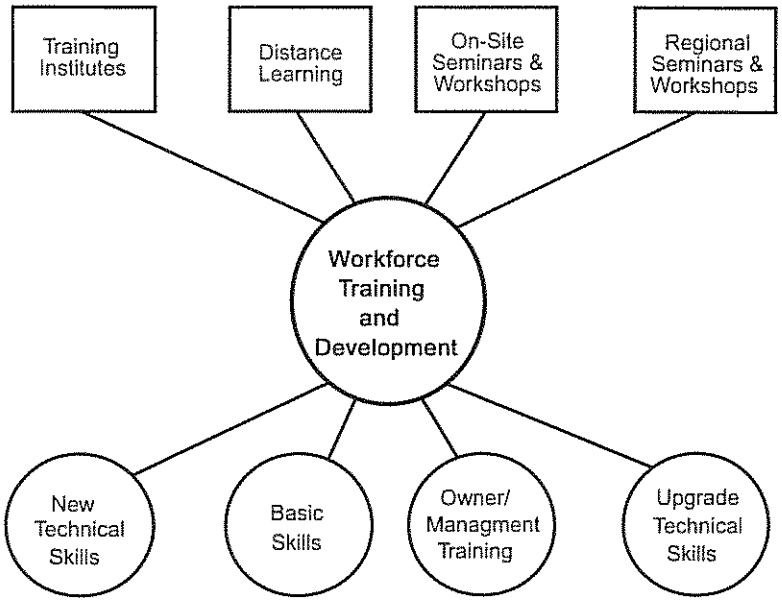

Figure 6. — Workforce training and development structure.

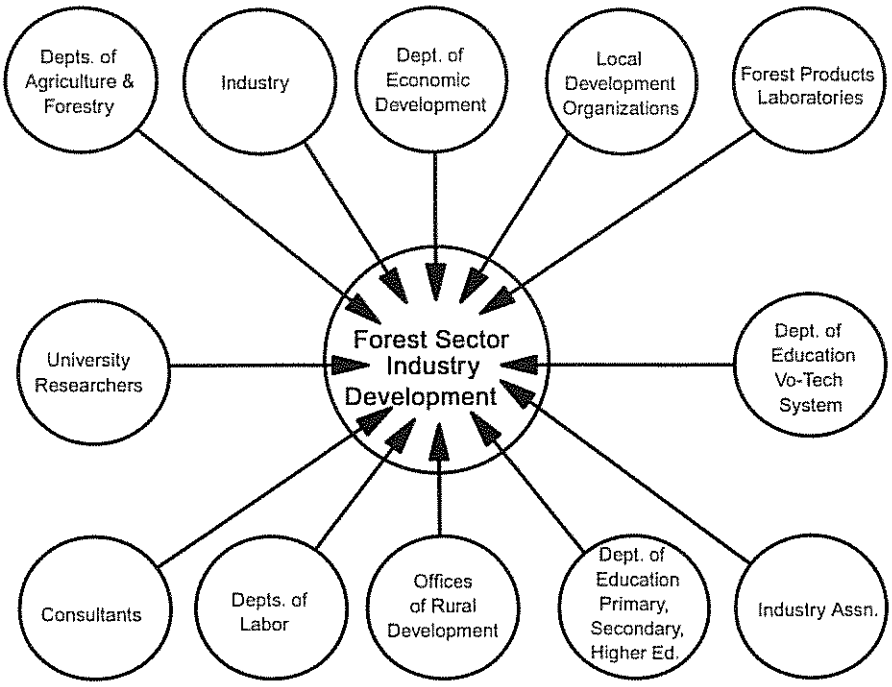

Figure 7. — Value-added forest sector development collaborative implementation structure.

Employee Training and Development

Traditional educational systems often do not provide workforce training and development specific to value-added forest products industries. For example, while there are programs under development in select locations in Louisiana for the pulp and paper industry, largely developed by the industry for implementation in the technical college system, there remains a major gap in the skills needed by value-added wood products industry companies (4). Where secondary industry is to occur, there is a need to focus a sustainable educational effort on upgrading skills for existing employees, developing management programs for owner/managers, and developing entry-level training for new industry employees. **Figure 6** shows one possible structure for a value-added wood products industry-training program. The main point is that such a program would be comprehensive and would draw upon the expertise and support that currently exists.

In order to reach as many owner/managers as possible, the methodology examines educational and training services utilizing varied media including formal classroom instruction, certificate courses, seminars and workshops, computer-aided long distance learning, and technical videos. In addition, outside expertise may provide specialized machine and process training. Training needs identified in current research include skilled, semi-skilled, business and production management, as well as basic skills and remedial support.

Recommendations for Policy Makers

Although this methodology typically ends where policy maker implementation starts, the authors recommend that a collaborative structure for value-added forest sector development be established (**Fig. 7**). Research has shown that the most successful value-added wood products industry initiatives have had support from the top levels of government and

collaboration and cooperation from a multitude of entities (30,31).

SUMMARY

In this paper, we have laid out a blueprint for sustainable value-added wood products industry development. The methodology incorporates a holistic and flexible approach that emphasizes long-term sustainable industry development. The goal is to develop the wood products industry while adding value to existing resources, creating employment opportunities with transferable skills, and maintaining the stewardship of renewable resources.

The nature of the methodology is such that, during implementation, continued analysis and systematic follow-up can accommodate changes in demand, supply, market conditions, economic conditions, etc. Driven by markets and demand and not production, any new jobs created are likely to be maintained. This approach can assist local policy makers in formulating strategies for implementation of economic development efforts designed to capitalize on defensible market-driven opportunities in forest products industry sectors.

Regardless of the underlying motivation (rural development, adding value, employment enhancement, etc.), the methodology described in this paper is a planning tool that can help develop sustainable strategies for forest products industry development. Such development can add value to existing resources and create employment opportunities with transferable skills. For success to be achieved, the authors suggest that many stakeholders, including local development organizations, industry members, academic institutions, and state and local economic development agencies must be involved to move from baseline analysis to program implementation.

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