Research and Technology Transfer In Southwest Oregon

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ABSTRACT—A cooperative program designed to intensify research and technology transfer has developed as a result of local demand to address severe reforestation problems in southwest Oregon. The Forestry Intensified Research (FIR) Program, begun in 1978, has two distinct, interrelated phases: (1) Fundamental FIR, in which scientists conduct basic research at off-site research centers, and (2) Adaptive FIR, in which forestry specialists conduct adaptive research and education programs as an interdisciplinary team in the problem area. Establishing the local team has done more to ensure effective technology transfer than any other single factor.

The forest industry in southwest Oregon is vital to local economies. About 33 percent of the state's timber and nearly 5 percent of the nation's lumber and 20 percent of its veneer and plywood were produced in southwest Oregon from 1970 to 1974 (Bassett 1979). Ultimately, maintaining the health of the local timber-products industry depends on an ample long-term timber supply. But many harvested lands have been unsatisfactorily restocked, largely because of plantation failure.

Before 1978, regeneration research in southwest Oregon was inadequate in scope and intensity. Although basic research was required, there was still strong need to test the applicability of existing technology to local site conditions. Moreover, technology transfer was not intense enough to produce rapid changes in reforestation practices. Local foresters argued that this failure occurred because research and education centers were too far away from the problem area. In any event, poor communications between researchers and foresters slowed the development and implementation of applicable technology.

Traditionally, new research facilities or branch stations of existing facilities are built in problem areas. In southwest Oregon, we have taken a different approach by increasing basic research at existing centers and simultaneously boosting efforts in the problem area to adapt results to local conditions, thereby intensifying technology transfer. We describe here the approach of southwest Oregon's Forestry Intensified Research (FIR) Program in the hope that other regions may benefit from our experience.

The Reforestation Problem

Southwest Oregon has a land area of 8,147,000 acres—about 6,129,000 of which are considered commercial forestland (Bassett 1979). Most is in the Mixed-Evergreen and Mixed-Conifer Forest Zones (Franklin and Dyrness 1973). Douglas-fir *(Pseudotsuga menziesii)* is the most abundant conifer species, but others, including true firs (*Abies* spp.), ponderosa pine *(Pinus ponderosa)*, and sugar pine *(Pinus lambertiana)*, also are commercially important. Except in the narrow coastal belt, the climate is Mediterranean, with mild, wet winters and hot, dry summers. The western half of the landscape is dominated by the steep Siskiyou Mountains, where shallow soils are common; the southern reaches of the Cascade Mountains, to the east, have more moderate terrain and generally deeper soils.

According to many local forest managers, about 12 percent—or some 762,350 acres—of the commercial forestland is difficult to regenerate. Brush and grass species quickly occupy prepared sites and deplete limited moisture and nutrient reserves. In some areas, ravel (unstable surface rock fragments and gravel) forms a downward-moving mantle over the underlying mineral soil, burying young seedlings. Animal and frost damage also reduces growth and causes significant seedling mortality. Effects of these environmental factors are often amplified by use of poor quality nursery stock, inadequate site preparation, and planting during unfavorable weather. The overall result is that large declines in the southwest Oregon timber harvest from public lands have recently been projected.

FIR Initiated

During winter 1977–1978, representatives of county government, the timber industry, the USDI Bureau of Land Management, and the USDA Forest Service approached Oregon State University (OSU) and the Forest Service's Pacific Northwest Forest and Range Experiment Station (PNW) for assistance. Local groups in southwest Oregon not only identified the problems but offered to become part of the solution by helping to procure funding. Subsequent meetings produced the FIR Program.

FIR is administered by the dean of the OSU School of Forestry and the director of PNW *(fig. 1)*. An advisory council of representatives from cooperating organizations provides long-range planning advice and evaluates progress. Financial support stems from southwestern counties and wood products companies, three national forests, five Bureau of Land Management districts, and federal research appropriations. The objective of this ambitious 10-year project is to improve reforestation success in southwest Oregon by combining fundamental and adaptive research with an aggressive technology transfer program. To do this, the program was conceived as two simultaneous phases: (1) Fundamental FIR, to address basic biological questions through research at OSU and by PNW in Corvallis, and (2)

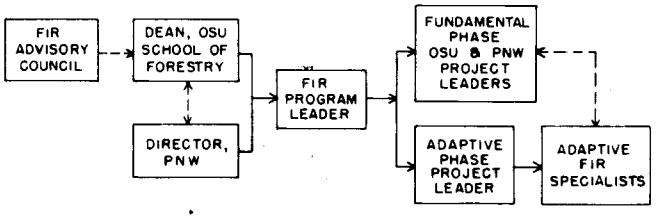

Figure 1. Organizational structure of the FIR Program.

Adaptive FIR, to improve the research and technology transfer. While intensifying the research directed at developing new information is a vital component of the overall program, it is Adaptive FIR around which innovation and technology transfer have centered.

The Adaptive FIR group is an on-site team of five OSU staff members, two from the Department of Forest Engineering and three from the Department of Forest Science. These forestry specialists conduct adaptive research, disseminate information to local cooperators, and form the communications link between the area and Corvallis-based research organizations. Each specialist's time is equally divided between adaptive research and technology transfer, with most projects involving several specialists. To clearly define problems and set priorities at the outset, the Adaptive FIR team held a series of workshops at several locations with key cooperators. The early participation of local opinion leaders and managers gave credibility to the program and eased its acceptance (Muth and Hendee 1980).

Improving Technology Transfer

Adaptive research is characterized by field-oriented studies that apply existing information in uncomplicated, statistically sound, experimental designs. Such research usually does not require large expenditures for sophisticated equipment or the services or a large support staff. Cooperating organizations provide field crews to install and maintain research plots. Typically, such operations may include site preparation, tree planting, and control of competing vegetation. Results from these studies can usually be translated into immediate operational procedures as they do not involve the development of new technology.

Examples of adaptive research include studies of the survival and growth of Douglas-fir stock types on skeletal soils *(fig. 2)* and the effect of various nursery practices on seedling performance. Such studies facilitate technology transfer because local research sites are readily accessible and because involvement of local managers adds credibility to research results. Adaptive FIR specialists also participate in fundamental phase research, further enhancing technology transfer by strengthening ties between researchers and practitioners.

Technology transfer in southwest Oregon includes the publication of a quarterly newsletter, designed for the professional forest-resource manager, which summarizes preliminary research results, discusses technical topics of interest, provides abstracts of recent publications, and lists upcoming workshops, symposia, and short courses. Through the newsletter, readers can now be informed about research results within four months. Contacts with area foresters are made through office consultations and field trips to difficult sites. Workshops and half-day seminars on local problems are held often, with Adaptive and Fundamental FIR personnel, local forest managers, and other speakers from the region as instructors. In total, clients are exposed to a wide variety of forestry subjects and their interests repeatedly stimulated—a point which cannot be overemphasized. This intensification was unknown before FIR—and could not have been realized had all program personnel been based outside the problem area.

Although FIR is now only four years old, progress has been significant, particularly on lands withdrawn from the allowable cut base. Research is already demonstrating how small changes in reforestation prescriptions can substantially increase seedling survival on commercial sites previously judged "nonreforestable." This information is especially useful for droughty sites whose soils contain high percentages of coarse fragments *(fig. 2)*—a problem relatively untouched by past research, even though 59 percent of the lands withdrawn from production fall into this category! Procedures for removing shelterwood overstories have been improved and multispan logging introduced to minimize damage to understory regeneration. These early successes have given foresters renewed optimism in their own abilities to manage difficult lands.

Figure 2. Douglas-fir seedling three years after being planted on a rocky, droughty site regarded as "nonreforestable."

In studying 81 USDA Forest Service research case histories, Moeller and Shafer (1981) identified 22 factors important to the innovation process. Not surprisingly, the most important one was adaptation of existing technology, often by special teams that concentrate on practical problems. There is little doubt that the decision to establish this local group of specialists has done more to ensure effective technology transfer than any other single factor.

The concept of the FIR Program could be applied to other areas where specific problems remain unsolved. We conclude, from our experiences so far, that the success of such a program depends on three major factors:

- Commitment and financial support of local forestry organizations and government
- Willingness of educational and research institutions to apply their resources toward solving specific problems

- Establishment of an interdisciplinary team of specialists, skilled in both research and technology transfer, in the problem area.

The gap between researchers and foresters dealing with day-to-day problems in the field can be narrowed by programs such as FIR. Local cooperators must aid in the planning and decision-making, appropriate research and educational programs must be rapidly initiated, and useful results must be produced and disseminated to maintain support. ■

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