Table 1. Real rate of change in pine stumpage prices (%/yr).

	1980s–2000s	1990s–2010s
IIASA Base	3.4	2.3
USDA Forest Service		
1979 assessment	5.3	2.2
1983 assessment	3.9	1.7
Southern Timber Study	2.5	2.5
RISI Southern Timber Study	2.1	1.5
Resources for the Future		
Base	0.5	0.4
High demand	1.9	1.9
Median of all studies	2.5	1.9

Source: Computed from data presented in Figure 2.

ment on the rate of price increase, there is less agreement on the level of expected future prices.

The historical and forecasted changes in prices are consistent with the broad outline of adjustments in the forest sector that would be anticipated by economic theory. Early on, the forest sector operates much like a mine. The stock of old growth timber grows only slowly if at all, and prices rise at the interest rate. These price increases eventually induce substitution away from wood products and investment in forest management activities. Additional supplies are developed from the management of natural second-growth forests and from plantations. These additional supplies slow the rate of increase in timber prices. Finally prices reach a level where forestry is profitable because of forest growth alone. Once this situation has been reached, real prices can stabilize.

The differences in projected price levels reflect the fact that the seven forecasts, like all forecasts, depend on many assumptions about the future. They are based on different interpretations of poorly understood supply and demand adjustments that occur as prices rise. Therefore, it is not surprising that the levels of the forecasts are not identical, or that more recent forecasts differ markedly from ones that are based on similar methodologies but are only a few years older. ☐

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Effect of Short-Term Storage of Triadimefon-Treated Loblolly Pine Seed on Incidence of Fusiform Rust

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ABSTRACT. Protection from fusiform rust, caused by Cronartium quercuum *(Berk.) Miyabe ex Shirai f. sp.* fusiforme *Burdsall and Snow, on emerging seedlings of loblolly pine (*Pinus taeda *L.) was not diminished by storing the treated seeds up to 24 days before sowing. Young seedlings were inoculated with basidiospores of* C quercuum *f. sp.* fusiforme *31 days after seeds were sown, and seedlings were examined for rust galls 7 months later. No galls were found on seedlings from seed dressed with triadimefon, regardless of length of storage. Percentages of seedlings with galls from seeds subjected to the triadimefon seed soak ranged from 12% (0 days storage) to 2% (24 days storage). Sixty-three percent of the seedlings from nontreated control seeds had galls.*

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Control of fusiform rust, caused by *Cronartium quercuum* (Berk) Miyabe ex Shirai f. sp. *fusiforme* Burdsall and Snow, in southern forest tree nurseries is accomplished with the fungicide triadi-

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[1] This research was supported by the Auburn University Southern Forest Nursery Management Cooperative and Research Project Alabama 5-875. Alabama Agricultural Experiment Station Journal Series 9-871249.

mefon (Bayleton). As a part of the overall program to control this disease, it is recommended that seeds of loblolly pine (*Pinus taeda* L.) and slash pine (*P. elliottii* var. *elliottii* Engelm.) be treated with triadimefon either by the seed soak procedure (Mexal and Snow 1978) or the seed dressing procedure (Kelley 1985). Seed treatment using either method provides protection to the young seedlings during the emergence period when risk of rust infection is high.

Triadimefon-treated seeds usually are sown within two days after treatment; however, inclement weather or other factors frequently result in delay. No information has been available concerning effects of short-term storage on the efficacy of triadimefon-treated seeds. The purpose of this study is to provide that information.

METHODS

Loblolly pine seeds used in this study were furnished by the USDA Forest Service Rust Resistance Screening Center, Asheville, NC, and were from a family (10-8[3]) known to be highly susceptible to fusiform rust. Seeds were soaked for 24 hr in tap water, stored moist at 5°C for 6 wk, and soaked for 10 min in 20% (V/V) hydrogen peroxide before receiving seed treatments. Containers used were Ray Leech Super Cell "Conetainers," and the planting medium was a 5:4:1 mixture of peat moss, vermiculite, and perlite. Twenty containers with planting medium were placed in each rack (4 rows of 5 containers).

Tests

Fungicide treatments were (1) control, thiram (Gustafson 42S, Gustafson, Dallas, TX) at 15.0 g a.i./kg of seeds, (2) triadimefon (Bayleton 50 WP, Mobay, Kansas City, MO) seed soak for 24 hr (1.6 g Bayleton 50 WP/liter of water) plus thiram, and (3) triadimefon seed dressing (2.5 g Bayleton 50 WP/kg of seed) plus thiram. Storage times between seed treatment date and sowing date were 0, 3, 10, 17, and 24 days. Treatment dates were timed so that the sowing date was the same for all treatments. Except for the seed soak, fungicide treatments were applied with a Gustafson Batch Laboratory Treater modified to handle small (10–50 g) quantities of seed. The seed soak treatment involved the equivalent of 600 g of seeds per l of triadimefon solution.

Three seeds were placed in each container, and each treatment was represented by five replicate racks. Seeds were covered lightly with additional planting medium and racks were placed on a greenhouse bench in a completely random manner. After emergence was complete, seedlings were thinned to one seedling per container.

Thirty days after seeds were sown, the racks of seedlings were transported to the Rust Resistance Screening Center for inoculation with a virulent isolate (L-6) of *C. quercuum* f. sp. *fusiforme* on day 31. Inoculation was performed using established procedures (Anderson et al. 1983). Following inoculation, seedlings were returned to Auburn University, where they were maintained in a greenhouse throughout the test.

Evaluations

Seedlings were examined individually for fusiform rust galls seven months after inoculation. Data were subjected to analysis of variance, and orthogonal contrasts were used to contrast controls vs. treatments and seed dressing vs. seed soak. Linear and quadratic effects of storage times for the seed soak and seed dressing treatments also were determined by orthogonal contrasts.

RESULTS AND DISCUSSION

Both the seed soak and the seed dressing treatments significantly decreased ($P < 0.001$) the percentage of seedlings with fusiform rust (Table 1) without affecting seed germination. The seed dressing treatment provided complete protection regardless of the length of time the seeds were stored, and was significantly ($P < 0.001$) more effective than the seed soak. No linear or quadratic effects of storage time were observed for the seed dressing treatment (data were all zeros); however, a significant linear effect of storage time ($P = 0.006$) was observed for the seed soak procedure.

Table 1. Effect of various storage times of triadimefon-treated loblolly pine seeds on the incidence of fusiform rust on emerged seedlings.

Treatment	Storage time (days)	Fusiform rust (%)
Control	—	62.6
Seed dressing[1]	0	0
Seed dressing	3	0
Seed dressing	10	0
Seed dressing	17	0
Seed dressing	24	0
Seed soak[2]	0	12.2
Seed soak	3	5.0
Seed soak	10	6.2
Seed soak	17	3.0
Seed soak	24	2.0

[1] 2.5 g of Bayleton 50 WP/kg of seed.

[2] 1.6 g of Bayleton 50 WP/liter of water, 24-hr soak.

The greater efficacy of the seed dressing probably resulted from a higher concentration of triadimefon per seed. The 2.5 gm of Bayleton 50 WP were applied directly to the seeds, thus 1.25 mg of triadimefon was distributed over the seed coats of each gram of seeds.

The seed soak treatment utilized approximately the same amount of triadimefon per gram of seeds (1.33 mg) as did the seed dressing; however, the amount retained per gram of seeds probably was considerably less. Some of the triadimefon was discarded when the solution was drained off. The slight increase in efficacy of the seed soak treatment observed following storage suggests that during the storage period either the concentration of triadimefon in the embryo was increased by diffusion from the seed coats or the triadimefon already present in the embryo was converted to a more active molecule, such as triadimenol. A more sophisticated study is necessary to explain the observed differences.

Results of this study indicate two important points. First, triadimefon-treated seeds can be stored at 5°C for up to 24 days without affecting either fungicide efficacy or germination percentage. This provides forest tree nurserymen with much-needed flexibility during the spring sowing season. Second, the seed dressing technique is equal to or better than the seed soak procedure. In addition, the seed dressing technique is more efficient logistically.

The seed soak procedure has been used for several years. Recently, the seed dressing procedure was also granted an EPA registration. □

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Adoption of Silvicultural Practices by Opinion Leaders Who Own Nonindustrial Private Forestland[1]

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ABSTRACT. Sixty-three opinion leaders who are nonindustrial private forestland owners in eight rural South Carolina Piedmont counties were interviewed. The number of silvicultural practices used depended on the size of forestland ownership but not on present age, income, or management tenure of owners. The number of practices used was related positively to the owner's professed importance of the value of improving the forest for uses other than timber production. Neither the importance of cost in adopting a practice nor the ease of application were related statistically to silvicultural activity.

South. J. Appl. For. 12(1):20–23.

The purpose of this study was to begin investigating the applicability of diffusion-of-innovations research findings to the nonindustrial private forestland owners. It has been suggested (Muth and Hendee 1980, Doolittle and Straka 1987) that the same decision-making process occurs in the social system of nonindustrial private forestland owners as in social systems that have been extensively researched (Rogers and Shoemaker 1971). However, since owner attitudes may differ toward farmland and forestland, the decision-making process also may be different.

Current technology transfer efforts are often designed to appeal to owners of large tracts. This emphasis is partially based on the fact that half of the private forestland in the United States is in holdings of more than 500 ac, and the owners constitute only 1% of the total of over 4 million private owners (Kaiser et al. 1982). In addition, it is conjectured that financial reward is the crucial requirement for increasing silvicultural activity—an adequate return on the investment—and that such will not be the case on smaller forestland ownerships. But no critical minimum size of forestland ownership has been discovered analogous to the 140-ac size that was the critical minimum size for adoption of some farm innovations in a Missouri study reported by Lionberger (1960). Also, there is reason to believe that many private owners may not consider financial rewards the primary objective for owning forestland (Pomeroy and Yoho 1964, cited in Royer et al. 1981).

SOCIOLOGICAL BACKGROUND

Extensive research has shown that a relatively small group (13.5%) of adopters of innovations can be classified as early adopters (Rogers and Shoemaker 1971). The early adopters are opinion leaders who influence other people in the community who are seeking information and advice when considering making changes. Sociologists refer to early adopters as opinion leaders, key communicators, influentials, or information gatekeepers. Diffusion-of-innovations research about other social systems (especially that of farmers) has shown that efficient change programs are directed initially to early adopters (Rogers 1983). The present study was based on the conjecture that the same may be true for nonindustrial private forestland owners, even though there are obvious dif-

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[1] Partial support was provided by the McIntire-Stennis Cooperative Forestry Research Program.