Comments

Tree Planters' Notes
is published quarterly by State and Private Forestry Forest Service, United States Department of Agriculture, Washington, DC 20250. The Secretary of Agriculture has determined that the publication of this periodical is necessary in the transaction of public business required by law of this Department.

Editor-in-chief: Rebecca Nisley
Advisory editors: James Barnett, Steven Grossnickle, Robert Karrfalt, Thomas Landis, Clark Lantz, Robert Mangold, John Mexal, Kenneth Munson, and Ronald Overton

Cover: Stand of *Pinus greggii* at La Tapona, Nuevo Leon, Mexico, see page 86 (photograph by Jeffery K. Donahue, CAMCORE, North Carolina State University, Raleigh, NC).

Establish Plantations on Pastureland Now To Protect Native Forests in the Future

The world's population will likely approach 10 billion in just 55 years. A population of this size could easily consume more than 7 billion cubic meters ($m^{3)}$ of wood annually. There is no doubt that in the future, wood will be harvested from both plantations and natural stands. However, how much wood is harvested from natural forests in the year 2050 will depend largely on how many plantations we establish today. The following word problem demonstrates how important it is for fastgrowing societies to plan for the future by establishing tree plantations.

Word problem. Three hypothetical islands are identical in natural resources but each is inhabited by a different society. Each island has a 5-ha pasture and 5-ha wood. Initially, each society has 4 people at year 0. Each society follows a strict ethic regarding population growth and therefore growth on each island is limited to only 2 persons per year.

The inhabitants can obtain all the food they need from the ocean. They rely on a renewable energy source for cooking and heating, using firewood at a rate of 1 m^3/person/yr. The native woods produce about 2 m^3/ha/yr and this wood can be collected on a sustainable basis without reducing the growing stock. However, the native trees are small and therefore the standing volume of the forest never exceeds 2 m^3/ha. To clarify, the 5-acre wood has 10 m^3 of standing volume on January 1st and during the year, 10 m^3 of firewood (dead branches, etc.) can be collected. On December 31, the standing volume of the forest is still 10 m^3. If the firewood is not collected, the branches fall off the trees and either decay or are occasionally washed off the island. However, firewood can be collected and stored indefinitely without wood decay. Each society has the same major objectives: to continue cooking food and to protect the 5-ha woods.

The three societies differ in the way they manage their land. The society on island A decides to keep sheep on the 5-ha pasture. The people there collect firewood from the woods and store any unused firewood for future needs. On January 1st (year 1), they have 6 m^3 of firewood in storage.

The society on island B establishes an exotic tree plantation on the pastureland. The plantation produces 10 m^3 of firewood/ha/yr. On January 1st (year 1), there are 56 m^3 of firewood in storage (50 m^3 from the plantation and 6 m^3 of extra firewood collected form the woods).

The society on island C does the same as the society on island B. On January 1st (year 1), the inhabitants also have 56 m^3 of stored firewood. However, they decide to invest time and effort into research. Although they

make some mistakes, new ways are discovered to increase the volume production from the plantation. Amazingly, each year the researchers figure out a way to increase production by 0.2 m^3/ha/yr. For example, the first crop was 50 m^3, the second was 51 m^3, the third was 52 m^3, etc.

With the information given, how long does it take before each society depletes the storage of wood? Which society protects its 5 ha of native woods for the longest period of time?

Answer. Island A can only sustain a population of 10 people. The supply of stored wood runs out during year 6. On January 1, year 7, there are 18 people on the island and during the year they end up cutting down all of the woods for firewood.

The society on island B uses an exotic tree plantation to increase the production of firewood. With both wood form the plantation and the native woods, this society is able to produce 60 m^3/yr. Therefore, island B can sustain a population of 60 people (six times more than island A). The society lasts for 56 years before the firewood supply runs out. The native woods were protected for 5 decades longer than on island A.

The society on island C was able to discover new ways to increase volume growth. As a result, they protected the woods for more than a century. By conducting research aimed at improving plantation yields, this society was able to have 5 ha of native woods and sustain at least 160 people (a yield of 160 m^3/yr was obtained on year 100). However, at the end of year 112 the population is 228 and there is no more wood in storage. They decided that, for the next year, some of the native woods would have to be harvested.

The ability to protect the native woods varied with the land management regimes. The two societies that relied on fast-growing exotic plantations were able to protect the native woods for much longer than the society that preferred pastureland to tree plantations. One could conclude that highly productive plantations can help protect native forests by meeting the day-to-day consumption needs of the population. I conclude that planting trees on pastureland is one way to protect wilderness or non-utilized lands from exploitation.

None of the societies can sustain a population growth of 2 persons/yr. Therefore, the real problem for all three societies is population growth. Adoption of new technology can only delay the inevitable. However, for areas with limited resources, societies must adopt appropriate ethics about population growth if the society hopes to be sustainable during the next several millennia. It also can be concluded that for any of the three islands to have a sustainable ecosystem and an unconstrained population growth either (1) per-capita wood consumption must decline in direct proportion to

the population growth (through recycling, product substitution, or reduced standard of living) or (2) technology must devise ways to continually improve yields.

A global program for planting trees on pastureland. In the past, the world's societies have encouraged the establishment of pastures. In just 4 decades, pastureland increased globally from 18% of the world's landbase in 1955 to about 26% today. The increase in pastureland was about 25 million ha/yr. Although it seems unlikely the world's society will favor a similar rapid expansion of tree plantations, perhaps a target of 5% of the world's landbase by the year 2050 would be acceptable if plantations were established on abandoned pastureland. I propose that nongovernmental organizations of the world promote large afforestation programs with the goal of planting trees on more that 8 million ha of pastures each year for the next 55 years. This would reduce the amount of pastureland to about 22% of the world's landbase. This effort would go a long way toward removing some of the expected over-harvesting pressure from natural stands in the year 2050.

David B. South
Professor
Auburn University
School of Forestry and Alabama Agricultural Experiment Station

[Editor's note: The history of Easter Island, a real-life island in the east central Pacific Ocean, is a telling example of the relationship between a culture and its trees and forests. The thriving culture of the Polynesians who colonized the island in their canoes about 1500 years ago (that is, around 400 A.D.) reached its peak around 1500 A.D., when about 9,000 people lived on the island. This culture carved those huge stone heads and moved them to sites all over the island. But the statue culture declined and had nearly vanished from memory by the time that Dutch Admiral Jacob Rogeveen first saw the treeless island on Easter Sunday 1722. Archaeologists trying to discern reasons for the population crash and cultural degeneration found several clues. Pollen studies showed that trees began disappearing in large numbers around 980 A.D., and the preserved nuts of a now-extinct native palm related to the Chilean wine palm (*Jubaea chilensis)* were found. The Easter Islanders used slash and burn agriculture and went to sea in their wooden canoes to catch fish for protein. When the last palm was cut down and they had to subsist on farming alone, the large population could no longer survive, warfare broke out, and the culture degenerated. Now there are barely any trees and only 36 families that can claim descent from the old people. This story was told in a 1989 NOVA program entitled "The Secrets of Easter Island" (© WGBH, Boston, Massachusetts). -RN]

A New Feature

The *Tree Planters' Notes* team is continuing to improve our product. With this issue, we introduce a new section— the **"Species Spotlight."** John Kuser and George Zimmerman's informative and enjoyable review of Atlantic white-cedar is our first "Species Spotlight." ***Tree Planters' Notes*** has a dual purpose— we want to provide interesting and informative how-to's, tips, and such for the working nursery manager as well as provide a peerreviewed and refereed outlet for nursery and outplanting-related scientific research results. **We want your articles!** Write about your favorite tree or conservation plant. Tell us about that gizmo you invented or that nifty new way you figured out to solve a nursery problem. Call and talk over any of your ideas with me or buttonhole any member of the editorial team at a meeting.

Rebecca Nisley
editor-in-chief
Northeastern Forest Experiment Station
Hamden, Connecticut
203-230-4304