An ecological plus

The principle of slash-and-burn has been considered generally to be an outmoded way to turn forest and brush into arable land. Besides the danger that such burning can get out of hand, it often has led to ecological disaster by destroying the basis for the regeneration.

However, forest scientists are coming around to a more balanced attitude toward burning. They realize that in some areas it has been as much a part of the environment as rainfall, and that local plant life has evolved to withstand it and actually to benefit from it. In some cases human prevention of potentially beneficial naturally occurring fires has led to worse fires later that have damaged the land.

Much of the current research on burning is being done in California, an area where natural fires are common and where slash-and-burn methods of converting brush land to pasture are traditional. An effort is being made to put such traditional methods on a less dangerous scientific basis.

Confirmation that burning can indeed be a valuable land-management practice has been provided by Dr. Paul J. Zinke of the school of forestry of the University of California at Berkeley. Dr. Zinke and anthropologist Peter Kunstadter of the University of Washington lived for several months with the Lua people in the hills of Thailand about 20 miles from the Burma border.

The Lua have burning down to a science, though a science empirically arrived at and one which involves the sacrifice of a red dog to insure a good fire. The village Dr. Zinke and his colleague studied farms some 3,000 acres in a 10-year cycle.

Some time before the monsoon rains the forest on about 300 acres is cut and dried. Bare-earth fire lines are prepared around the cut area and, just as is done in the most scientific California burn, the fire is started at the top of a hill. This creates an updraft which promotes the fires the villagers then set around the edges of the cut area.

Erosion control measures include laying cut tree trunks across the slopes before the burn; not entirely consumed in the fire, these trunks prevent damaging runoff by too-early rains. Rice then is planted directly in the ashes. The first gentle rains of the monsoon sprouts the rice and the crop roots take over most of the job of holding the soil against erosion.

Dr. Zinke says it is quite a race to harvest the rice crop before the regrowth of the forest takes over. After one crop is taken the ground is left fallow, with the villagers moving on to the next 300 acres the next year. By the time they are back to the same plot there is a nine-year, dense growth of forest again.

The important point in the Lua studies is that these people have been farming in this way for more than 1,000 years. The soil is stable, fertile and uneroded.

Forests are not simple collections of trees but symbioses of plant roots and soil fungi. A burn that is too hot can damage such a system beyond repair. It can also bake the soil so it is as water-repellent as a raincoat.

Erosion is the most startling result of a very hot fire. Great heat kills rootlets to some depth and of course burns off forest litter. The exposed soil, lacking either protective cover or binding roots, washes away. Even if it doesn't wash away, such over-heated soil may be deprived of its vital nitrates and organic matter down to several inches below the surface.

The Lua experience shows that all these dangers can be avoided, even in the very long run. Dr. Zinke says the burn temperatures are around 1,200 degrees F. At this temperature, he says, soil permeability is not affected and the fungi-root symbiosis is not destroyed. Furthermore, the organic phase of the soil survives.

Such fires as the Lua set have been occurring naturally in California for thousands of years, according to Dr. Harold Biswell of Berkeley's School of Forestry, because of the extreme dryness of the climate at certain times of year. There too they have been beneficial, burning plants back to the ground and allowing fresh, disease-free growth.

He says the prevention of most of such natural fires actually results in harm. If an area goes unburned for many years, much dead and diseased plant material accumulates under the living canopy of the brush. When the inevitable fire finally strikes, this abundant fuel produces too hot a fire, with permanent damage as a result.

Dr. Zinke and Dr. Sanga Sabhasri of Kasetsart University in Bangkok found that the ash reduces soil acidity markedly while making calcium and phosphorus much more available. Nitrates are burned off to an extent, but Dr. Biswell says they are replaced fairly rapidly from atmospheric nitrogen oxides and by soil bacteria.

Californians, Dr. Zinke says, possibly should try the Lua system of rotation instead of attempting to convert brush to pasture permanently.