

Problems & Progress in Northeast Brazil

by E. L. Smith*

One of the central figures of Brazilian folklore is the vaqueiro of the dry Northeast. Dressed in leather clothes for protection, this Brazilian version of our "brush-popper" pursues his lean, half-wild cattle through the thorny, almost impenetrable tangle of what must be some of the most difficult brush country in the world. He is a colorful individual, but, like so many romantic figures in our own West, one that will have to be consigned to the history books if Brazil is to develop a viable modern agricultural economy.

Ecologists generally refer to this brushland as a "tropical thorn forest." It covers large portions of several states in the semi-arid northeastern portion of Brazil just south of the Equator. Although the rainfall av-

erages about 25 to 40 inches annually, it all falls in a period of only 4 to 5 months, leaving the remaining 7 to 8 months almost totally dry. This seasonal pattern, coupled with high year-round temperatures, great year to year variation and periodic severe drouths, create serious restrictions on the use of non-irrigated land. The brush ranges from scattered plants interspersed in a grassland composed of annual grasses and weeds to a very dense stand of brush and small trees supporting almost no herbaceous understory. In some areas the brush grades into a low dry-tropical forest. During the wet season both the woody and herbaceous vegetation present an aspect of lush greenness and ample, even excessive, moisture, but within

a month after termination of the rain the grass and brush dries up and almost all the brush species lose their leaves, giving the country a very desolate appearance.

The prevailing pattern of land use makes it difficult to determine just what the "natural" vegetation of the

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Figure 1. Wet season clearing of a dense stand of brush with the rolling cutter. The cutter was filled with sand and water to increase its weight and usually two passes were made. The debris was burned during the dry season. This brush stand was at least 30 years old.



Figure 2. Wet season clearing of a dense brush stand with a bulldozer equipped with a brush hook. The brush was pushed into piles, or windrows, and later burned.



Figure 3. Basal trunk application, left, of herbicide on jurema preta. The lower 12 to 15 inches of the trunk were saturated so that some of the herbicide ran into the ground at the base. This particular site has enough understory so that burning alone might give some degree of control. This stand was about 15 years old.

is burned. Without fertilizer, he receives more crop production for less work by following this system and the brush gradually rebuilds the fertility of his soil.

Due to the greatly increased production of forage when the brush is cleared, it would be of considerable benefit to the livestock growers to be able to clear larger areas of brush or at least to control the reinvasion of brush on land cleared by traditional methods and abandoned for crop raising. In 1968 and 1969 several experiments were started by the author and Prof. Ambrosio Araujo (Dept. of Animal Science, Federal University of Ceará) to investigate the effectiveness of various brush control methods. Until this time there was practically no information available regarding the use of chemical or mechanical brush control methods in the area.

In 1968 treatments of 2,4,5-T in

used, 20, 10, 5, 2½, and 0 percent (ie. diesel alone) (active ingred. 100 g./liter) and an average of about 100 ml. of solution used for each tree. Virtually 100 percent kills resulted on marmelero and jurema at all rates, indicating that diesel oil alone is probably sufficient. Kills were erratic on mofumbo but so few trees were involved it was difficult to estimate the effectiveness on this species. A similar experiment was started in 1969 comparing 2,4,5-T in oil with Tordon 22K and Tordon 101 at several comparable rates. Dry and wet season applications were made. It is too early to draw conclusions from this study but based on the 1968 study it appears that these two species can be easily controlled in this manner. This method might be quite effective on sparse stands of brush or as a "mop-up" after other types of control. However on denser stands which run to 5,000 or more trees per hectare, the cost of materials would be uneconomical. (In Brazil, herbicide and machines are expensive but labor is very cheap).

Also, during the wet season of 1968, an experiment was made comparing foliar applications of 2,4,5-T, 2-4-D, Silvex and Tordon 22K each at rates

area might be. Each dry season the farmer cuts the brush and trees on an area of several acres, allows it to dry, then burns it. This treatment kills a large portion of the brush and also many of the grass and weed seeds. When the rain comes, he plants corn, beans and sometimes rice or cotton on this relatively clean seedbed among blackened stumps and keeps the crops weeded during this first year. All of these operations are done by hand. Cotton, a perennial variety, is harvested from the second to about the fifth year after clearing but usually the area is not weeded after the first year. A dense stand of grass and weeds results and the brush begins to resprout and re-invade very rapidly. The brush increases rapidly, with a corresponding decrease in understory vegetation, until after only 5 to 10 years it is distinguishable from its original condition only by size and species composition and provides scant feed for livestock. The farmer clears a new area every year, only returning to the same area every 10 to 30 years.

This pattern is very common in tropical areas and has been practiced almost unchanged for about 300 years or more in northeast Brazil although the area affected and the frequency of return to a given area has undoubtedly increased as the population density has increased. The farmer does not farm the same piece of land year after year because of the difficulty of keeping out the very aggressive weeds and brush by hand methods and the decline in crop yield after the initial fertilizing effect from ash when the brush

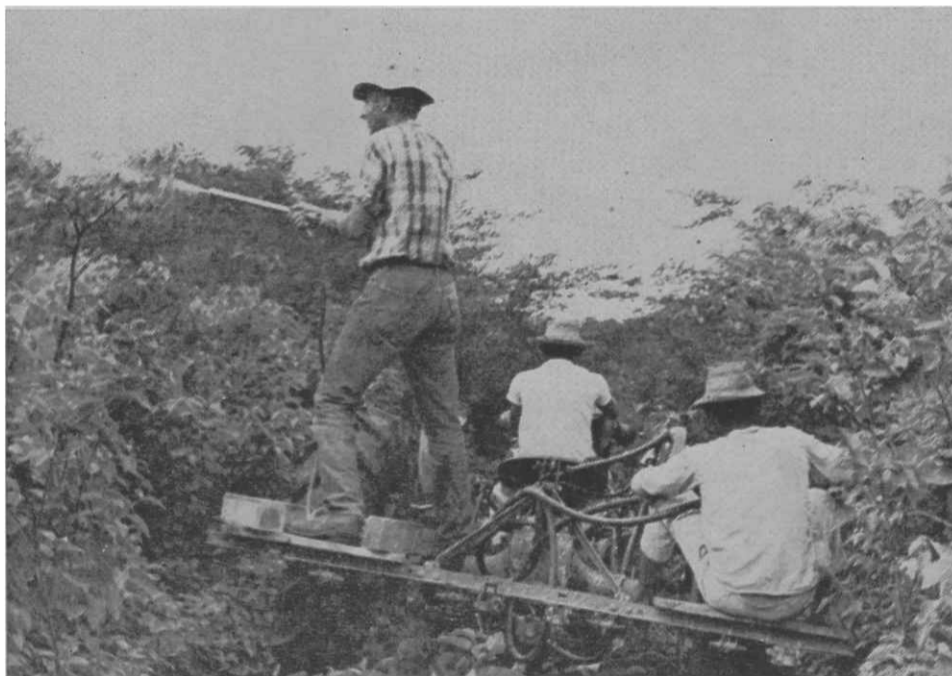


Figure 4. Foliar application of herbicide on a very thick stand of brush which was cleared and farmed about six years before. It was necessary to clear lanes between the plots with the rolling cutter to allow entry of the tractor. The species here is mostly marmeleiro.

diesel oil were made as a basal-trunk application on the three most common brush invader species, marmeleiro, jurema preta and mofumbo. All of these species sprout vigorously from stump and roots when cut by hand. Five rates of herbicide were

of 3, 1½, ¾, and ⅜ kilos of active ingredient per hectare. The herbicide was applied to the foliage of a mixed stand of low growing brush with a back-pack sprayer. After one year,

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kills ranged from practically 100 percent on some higher rates to less than 5 percent on some lower ones. Tordon gave the best results, followed by 2,4,5-T, Silvex and 2,4-D in that order. A great increase in grass production resulted, even in the first year. Although Tordon gave better results on all species, 2,4,5-T at 1½ kilos/hectare gave good enough control (about 70-80%) to achieve near maximum grass production. Respraying, burning or other follow-up measures might be necessary to maintain control. A similar experiment was performed in 1969 testing the same chemicals plus two additional ones, Tordon 101 and Aropen and using a tractor mounted sprayer rather than the hand sprayer. It is too early yet to judge final results but preliminary indications are that Tordon and 2,4,5-T are again the best.

The biggest problem with foliar applications is that the brush is generally too dense and too tall to allow treatment with hand or tractor-mounted sprayers. Areas recently cleared by hand or mechanical means might be treated this way to control resprouts. The costs should be not more than hand clearing and the permanency of control much better. Obviously, the next step is to try airplane spraying, which should be cheaper yet, and it is hoped to do this in the near future.

Another experiment was started in the dry season of 1968, and is still continuing, to compare costs and effectiveness of various combinations of brush control methods and reseeding with perennial grasses. Main treatments include the use of a bulldozer, a rolling brush cutter, hand cutting and herbicides with followup measures of herbicide and burning treatments and reseeding. Again it is too soon to draw final conclusions from the study but a few points are already evident. Burning after hand or mechanical control is very helpful in controlling resprouts of the brush and

the temporary control of the native grass and weeds provided is essential for successful reseeding with perennial grasses without cultivation. Fairly good stands of buffel grass, blue panic, giant bermuda, Wilman lovegrass, and Lehman lovegrass were achieved when the seed was broadcast onto an area which had been burned by a hot fire. It is not yet known whether these grasses will persist in competition with the native species.

Herbicide applied to fresh-cut stumps in the dry season gave nearly 100 percent kills even on hard to kill species such as mofumbo. This technique would be quite costly in terms of material on dense stands but might be useful as a follow up measure to kill resistant species. Costs of chemical and mechanical treatment range from somewhat less to considerably more than hand clearing but make the treatment of larger areas possible and can produce longer lasting control. Burning seems to show a lot of promise as a follow-up treatment but is not very effective unless the stand

is sufficiently open to support a good stand of grass and weeds to carry the fire. Probably a combination of methods will be necessary to provide the most efficient control.

More than 30 years of brush control and reseeding research in this country have still not given us all the answers we need for range improvement and so two years of work in Ceará represent only a start. Much work needs to follow on the timing, methods and costs of control and types of ratio of herbicides for various brush species and soil types before adequate guidelines can be developed.

Two very important questions aside from those mentioned above need to be investigated. First, what are the returns in terms of livestock production that can be expected? It is very possible that no brush control or reseeding project for increased forage production will be economical unless the productivity of the livestock and managerial skill of the ranchers is increased. Second, what will the long-term effects of conversion from brush to grassland be on soil productivity and erosion? It could be that the best management of the pastures will not maintain the productivity of the soil without the periodic "brush rotation" now practiced, or the soils might be improved by the conversion. This question will not be easy to answer and the results of our experience in this country cannot be safely extended to a tropical environment. But the answer is very important for the future of Brazil.

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to: