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additional two dollars per acre-foot was required to move the effluent from the sewage plant to the irrigated agricultural areas and apply it to the soil. Normal well irrigation water in the area cost eight dollars per acre-foot.

Future Potential in Agriculture

City sewage effluent can be utilized efficiently as a source of irrigation water and plant nutrients in the production of small grains forage and grain. It contains considerable quantities of the three principal fertilizer elements — nitrogen, phosphorus, and potassium. Properly treated sewage effluent does not possess any objectionable odor or other undesirable characteristics that might make it objectionable to irrigators who apply it to the soil. Preliminary observations do not indicate any undesirable effects of sewage effluent on the soil. Forage and feed grain produced with sewage effluent is high in protein and valuable for livestock feed.

Lodging often occurs when sewage effluent is used as the only source of irrigation water on soils of high fertility. It may be difficult to obtain immediate market acceptance of agricultural crops grown with sewage effluent, but this may be solved through consumer education.

It is anticipated that sewage effluent will be accepted by farmers. Since 1956, a Tucson rancher has used sewage effluent as sole source of fertilizer and irrigation water for barley pasture for beef cattle. The pasture carries four 500-pound steers per acre during the grazing season. Steers have made an average weight gain of one to two pounds per day.

Gains of this magnitude compare favorably with those from barley pasture grown with commercial fertilizer and regular irrigation water. The beef cattle drank the sewage effluent in place of well water with no detrimental effects. The rancher has not observed any soil problems as the result of using sewage effluent.

Time to Look Ahead

Although sewage effluent may be just plain sewage to us now, in the not too distant future, as our population increases, city sewage effluent may mean bread and butter for all of us.

Aventazon

La utilizacion de los alimentos por los rumiantes depende de la cantidad de saliva disponible durante la digestión de la comida en el rumen. Investigaciones recientes indican que las vacas susceptibles a la aventazón secretan menor cantidad de saliva y que la proporción de materia seca en el rumen es mayor que en las vacas que no se avientan y que consumen alrededor de 24 por ciento menos de alimento.

—TIERRA

Mechanical Pruning of Citrus Trees

D. R. Rodney

Mechanical pruning is now a regular practice in many Arizona citrus groves. This is a rather severe type of pruning and is usually employed with the objectives of (1) rejuvenating old, declined grapefruit or orange trees or (2) controlling the size of vigorous, fast growing lemon trees.

When rejuvenation of old trees is the objective, topping entails cutting into relatively large wood (two to four inches in diameter) in order to remove the top three or four feet of the trees. The cutting of such large wood requires heavy duty mechanical toppers such as the one shown in Fig. 1, which consists of five circular saws which rotate at a high speed while the arms, on which they are mounted, rotate slowly.

Mechanical hedging may be used in addition to topping for rejuvenation purposes. The hedger (Fig. 2) consists of a vertical boom on which are mounted several overlapping circular saws. With it, the branches on the sides of the trees are cut back as far as necessary in order to leave the desired amount of space between trees and induce new growth from the cut ends.

When the objective is the control of fast growing lemon trees, the tops are cut back so as to reduce height and induce the upward-growing shoots to branch rather than continue terminal growth. Mechanical hedging is used in this type of situation to cut back the side branches to provide room for cultivation and picking equipment to move through the orchard.

Mechanization of the operation is made complete by use of a self-propelled chopper (Fig. 3) which picks up the branches removed by topping and hedging, cuts them into small chunks and spreads them out as a mulch between the rows.

In Fig. 4, vigorous lemon trees are shown with branches touching the branches of adjacent trees. The same orchard is shown in Fig. 5 after topping and hedging are completed and the brush has been chopped.



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