ABSTRACT

The systems and layouts of drip irrigation as used in Hawaii are outlined. Traditionally, Hawaii has used furrow irrigation and this paper describes the industry's attempt to develop an irrigation method using plastic pipe to carry the water to the cane plant so as to enable it to do away with the deep furrows now in use. Materials required and field layouts are discussed. Benefits expected and current research programs are mentioned. The irrigated plantations of Hawaii are noted for being short of water and the rapid increase in population bringing about the diminishing reserves of surface and underground water has created an awareness of the necessity of increasing the irrigation efficiency. Further mechanization of cultural and harvesting methods can only be accomplished by moving into a flat culture operation and this means a change in irrigation methods.

INTRODUCTION

In 1970 Olokele Sugar Company and the Hawaiian Sugar Planters' Experiment Station recognised that the availability of low cost plastic pipe offered the opportunity of eliminating the problems associated with furrow irrigation. These problems included poor water efficiency, high labor usage, and sugar yield restrictions.

By 1973 all of the Hawaiian irrigated plantations were testing and installing drip irrigation. By the end of 1974 it is estimated that over 6,500 acres will be converted from furrow to drip irrigation.

Harvesting results to-date show a material increase in cane and sugar yields per unit area and a 30% improvement in water efficiency. A reduction in labor requirements is expected once the conversion to drip irrigation is accomplished.

LAYOUT OF SYSTEM

Due to the small orifices used in drip irrigation, filtration and water treatment are of the utmost importance. At the present time the most popular filtration method is the use of 3 filters in sequence. First the water is passed through a 150 mesh bronze Ykur screen, at which point it is chemically treated, and then into a sand filter. The sand filter reduces the volume of the suspended solids from 7-15 parts per million to between 2 and 3 parts per million. The bulk of the particles filtering through the sand bed is in the 60 micron to 2 micron range. After the sand filter there is a 150 mesh line strainer to prevent a shortcoming of the sand filters which is the dribbling of sand from the bed immediately after the backflushing operation. The filtered water will still plug the small orifices. Particles of colloidal size are observed to aggregate and form larger flocculent masses. The treatment of water must be carried out to destroy the polyelectrolytes on the bacteria and thus to prevent their increase in the...
water. At the present time the chemical oxidants (chlorine, sodium chlorite, or sodium hypochlorite) seem the best choice.

From the filtration station a permanent, plastic, main line pipe is installed underground to supply water infield. This main line delivers water through risers to the surface submains that supply water to laterals running parallel to the cane rows. At present these laterals are on the surface but, in the future, they may be placed subsurface. The orifices in the laterals are 45.7 to 76.2 cm apart. The water is left running continuously in the main line, doing away with the need of reservoirs. Laterals are grouped into “sets” and the water is moved from one “set” to another by a series of valves. Water can then be supplied to the cane plant daily if so desired. Working pressure ranges from 2.5 to 15 PSI and dual wall pipe is the most common now being used although experimental work is being carried on with single wall pipe. The dual wall pipe has one orifice in the inner pipe to every four orifices in the outer pipe. The cane rows are planted on the contour although the pipe laterals will take a plus or minus grade with the degree of variance depending upon the pressures being used. Laterals are flushed periodically, either manually or by flushing valves, to help keep the orifices from plugging. Very little manpower is required to irrigate after the system is installed. Fertilizer and ripening compounds may be applied through the system. Weeds are less of a problem due to the dry condition of the surface soil.

CONCLUSION

We now know that drip irrigation improves water efficiency and growth of cane. The flat culture associated with this method of irrigation enables the cane farmers to use mechanical equipment in cultivation and harvesting that was impossible in furrow irrigation. Proper irrigation of the cane plant is now possible in sandy soils where cane could not be grown economically using furrows or sprinklers. Lower cost and increased yields should be the results.

IRRIGACION POR GOTELO

Donald J. Martin

RESUMEN

Los sistemas y diseños de la irrigación por goteo como se usan en el Hawaií se delinean. Tradicionalmente, Hawaii ha usado irrigación por surco y este informe muestra cómo la industria ha tratado de desarrollar el método de irrigación usando tuberías plásticas para transportar el agua a las plantas de caña el cual permitiría que se eliminaran las zanjas profundas que se utilizan hoy en día. Se discute sobre los materiales necesarios y el diseño de los campos. Se mencionan los beneficios esperados y los programas actuales de investigación. Las plantaciones irrigadas del Hawaií son conocidas por tener escasas de agua y el rápido aumento de la población trae consigo una disminución de las reservas de agua superficial y subterránea lo que ha creado una consciencia hacia la necesidad de aumentar la eficiencia de la irrigación. Una mayor mecanización de los métodos de cultivo y labranza solo se pueden obtener cambiando a una operación de cultivo plano y esto significa un cambio de los métodos de irrigación.