TABLE 3.—*One herd on test for 3 successive years*

Year	Cows	Milk per cow	Milk price per gallon	Gross income per cow	Cost of feed per cow	Income over cost of feed per cow	Total income over cost of feed for herd	Total feed bill	Total milk produced by herd
	Number	*Pounds*	*Cents*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Pounds*
1	23	4, 680	0. 20	109	96	13	299	2, 208	107, 640
2	15	6, 750	. 20	157	121	36	540	1, 815	101, 250
3	11	7, 359	. 20	171	129	42	464	1, 419	80, 949

Here we have a record of a herd that was on test for 3 successive years. Culling out the low producers had reduced the herd from 23 to 11 cows by the third year. It cost more per cow to feed the 11 cows than the 23 but the total feed bill was $789 less. By milking fewer but better cows in the third year the owner not only placed 26,691 pounds less milk on the market, but increased the total income over cost of feed from the herd by $165. It not only paid the owner of this herd to test continuously but it paid him big returns to study the individual records of his cows.

On January 1, 1934, there were 793 dairy herd-improvement associations in active operation. Doubtless these would nearly all die out in a short time if the testing of the herds were not continuous. As a rule, the owners of the poorest herds are the most likely to drop out of the association. Yet they are the ones that need it most. The wisest members continue year after year, because they have found that continuous testing pays.

J. C. McDowell, *Bureau of Dairy Industry.*

DEPLETED Ground Water May be Replenished by Artificial Spreading It is a noteworthy fact that during the serious droughts and resultant crop losses of recent years the areas that depended wholly or in part on irrigation suffered relatively little in comparison with the drought-stricken regions generally. Indeed, only in extremely limited irrigation sections has any distress resulting from crop failures been felt by the farmers. Most irrigated crops have matured before there was any material shortage of water. This condition was especially marked in districts getting their irrigation supplies from underground sources. Practically all of such areas have come through the drought periods with little or no loss resulting from crop failures.

Naturally, however, the current series of years of low precipitation has been accompanied by an overdraft of surface-reservoir storage supplies and by a corresponding depletion of underground supplies. Furthermore, during the same period there has been a notable increase in the extent of irrigated agricultural areas served by underground water. Consequently, these two factors—decreased natural recharging and increased draft of the supply—occurring simultaneously, have tended to create a serious menace against future assurance of dependability on underground storage.

A survey of areas where water is pumped from underground supplies as the principal source for irrigation use shows a generally constant lowering of the surface of the water table. The situation is naturally more serious in some localities than in others since some underground storage reservoirs are larger, and consequently are depleted more slowly than others; and, on the other hand, some have less favorable recharging possibilities and consequently respond more slowly to recharging either natural or artificial.

It seems certain that in any area dependent upon pumped water for either domestic, irrigation, or industrial use the recharging of the underground supply can be stimulated by artificial methods. This has been found to be true in areas that have been studied in Arizona, California, Oregon, Texas, Utah, and Washington.

There are several different methods that may be employed in effecting replenishment of ground-water supplies. In this connection it should be noted that one of the most important sources of loss of surface-water supplies lies in the seepage that takes place, sometimes very rapidly, during the conveyance and storage stages, and in deep percolation of much of the irrigation water applied to cropped lands. This loss, however, while decreasing the gravity supply, constitutes a material factor in the recharging of the ground-water supply. Similar replenishment may be effected artificially by fall and winter irrigation, involving the use of the canals practically throughout the entire year, by diverting small streams from their natural channels and "spreading" the water over absorptive areas, or by utilizing shafts and wells sunk to suitable gravel deposits. Local conditions and legal requirements must, of course, be complied with, and precautions against the washing or leaching away of soil fertility should always be taken, whatever the method employed.

Southern California furnishes the best examples of well-developed spreading systems. In that locality the recent years of subnormal precipitation have naturally been associated with an accumulated drop in the major ground-water levels, which had already become seriously lowered. Consequently, the State, the counties and other political subdivisions, and even conservation associations have been aided by the Federal Government in extending several hundredfold the works and facilities for conserving and spreading the flood waters discharged by streams of intermittent flow.

On the Santa Ana and Lytle Creek cones, several hundred miles of spreading canals, large and small, have been built in highly porous materials. On Cucamonga, Devils, and San Antonio Creeks retention dams and basins have been provided and extensive systems of canals have been constructed over absorptive areas.

During this period of development the United States Department of Agriculture, through its Bureau of Agricultural Engineering, has been cooperating with the local more directly interested agencies in developing research data concerning rates of percolation in different types of soil surface, the relative advantages and disadvantages of various spreading systems, the differences in percolation factors of areas denuded of vegetation and those of areas still bearing their native growths, the effects of fluctuating water tables, and other important factors.

Water spreading is no longer an experiment; under suitable geologic, topographic, and water-supply conditions it often is the most profitable investment in water conservation that a community can make.

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