Proceedings of the Iowa Academy of Science

Volume 31 | Annual Issue Article 36

1924

Drainage in Iowa

B. Shimek

DRAINAGE IN IOWA

B. SHIMEK

Recently a number of interviews have appeared in the papers of the state to the effect that drainage has not affected rainfall in Iowa, and their evident purpose is to excuse and encourage the continuance of the policy of indiscriminate drainage which has been practiced in our state.

Our legislators and the people of the state should understand that this argument is wholly beside the question involved, and that its only effect can be to becloud the issue and lead our attention away from the real questions which should receive our consideration.

So far as the writer knows, no really competent authority has asserted that artificial drainage has influenced rainfall in our state. There have been those who have suggested that in the end such a result might follow, but we have no positive and concrete information that would warrant the conclusion that such effect is being produced.

It is just as true, however, that we have no definite information which would warrant the positive statement that such effect is *not* being produced, particularly on the local showers of midsummer which so often save our corn crops. Anyone who has followed Iowa weather and weather reports will see at once that a record for a limited number of years such as have elapsed since drainage became general could not be relied upon as a basis for conclusions concerning the effect of *any* particular factor on rainfall.

Rainfall in Iowa has been such a variable quantity within the period during which records have been kept that rash indeed is he who would attempt to draw definite conclusions from any particular briefer period. This is shown for any longer record for the state, but one of these, selected because of its length and because it has been published in convenient form, will suffice for the purposes of this argument. It is also very appropriate because it was made in a region (Harrison County) in which drainage has been practiced on a large scale. This is the record for Logan, Iowa, kept for 33 years (1866-1909) by members of the Stern

family.[1] During that period the total annual rainfall at this station varied from 16.63 inches (in 1894) to 56.60 inches (in 1881). The distribution of the wet and dry years during the period was extremely variable. Sometimes the wet and dry years alternated, as during the following years:

1872—32.1 inches	1875—42.0 inches
1873—43.2 inches	1876—28.2 inches
1874—28.4 inches	1877—45.1 inches

At other times wet and comparatively dry years came in groups. Thus the following list shows a group of consecutive years during which the rainfall was distinctly above the average:

1881—56.6 inches	1884—36.6 inches
1882—37.3 inches	1885—40.2 inches
1883—39.9 inches	

On the other hand the following were consecutive dry years with a total rainfall distinctly below the average:

1893—22.40 inches	1895—26.12 inches
1894—16.63 inches	

During some periods the fluctuation was quite irregular, as is illustrated by the following years:

1904—24.14 inches	1907—22.73 inches
1905—30.35 inches	1908—28.12 inches
1906—38.05 inches	1909—43.39 inches

In view of this great variation it is impossible to draw any definite conclusions from reports covering any period of a few years. We know too little of the various factors which enter into these fluctuations, and until we have such information the question of rain-*fall* cannot serve as a basis for conclusions of any kind. This variation in rainfall will no doubt continue. We have absolutely no evidence to show that there is a persistent rise or fall in any of our climatic conditions, the very general opinion to the contrary notwithstanding, and we will be sure to have a recurrence of changes at least similar to those recorded in the past.

There is another side of the problem, however, which is much more definite, and which is much more worthy of immediate consideration than this straw-man of rainfall which is set up merely to be knocked down. This is the problem of the conservation of the water which falls upon our surfaces.

A moment's consideration will make it plain that we are not concerned so much with the total amount of rainfall during the

[1] Published by the writer in the Iowa Geological Survey, vol. XX, pp. 419-426. 1910.

year as we are with the seasonal distribution of the rains and the disposition of the water after it falls. We sometimes have wet springs which swell the rainfall total for the year, but dry summers may overcome this and give us poor crops, or cause native plants to fail. A cloudburst may add six or seven inches to the total for the year (thus apparently being an asset), but this will do vastly more harm than good by washing the slopes and flooding the bottomlands, and then running off to far-away regions were it does us no good. A summer shower, yielding perhaps only a fraction of an inch, may save a corn crop, while rains coming in the fall may do much damage to the same crop. It is futile and misleading to attempt to use the total rainfall for the year as a measure of conditions suitable for plant growth and plant production.

Our state has a reasonable amount of rain practically every year, but the amount is not excessive. During the growing period, however, it is often quite low, for on the whole our climate is quite dry. The claim is often made that Iowa's riches lie in her soil, but it is nearer the truth to say that they are found in her waters. Remove the water from the soil and the atmosphere and you will have a barren waste. There are large areas in New Mexico, and elsewhere in the southwest, covered with wonderfully fertile soil (as has been demonstrated where irrigation has been possible) which are worthless and wholly unproductive deserts because they lack water, both in the soil and the atmosphere.

This latter need is not sufficiently appreciated by crop-growers. The fact is that for plant growth the moisture of the air is fully as important as that of the soil. Dry air causes very rapid loss of water from plants by transpiration, and when this loss exceeds the intake through the roots (and this may occur when there is a comparative abundance of water in the soil) the plants will perish. Vapor of water in the air checks this loss and enables plants to continue their activity. The effect of dry air is well shown when an attempt is made to grow house-plants in the dry, superheated atmosphere of an ordinary room. No matter how much water is poured upon the soil in which they are grown, the more delicate plants, such as ferns, palms, etc., soon display curled and drying leaves, and many fail entirely.

The same effect is produced by our dry summer winds. The writer has seen the entire landscape changed in two or three days by hot winds, even when these winds followed a comparatively moist period during which there was a sufficiency of soil water.

In such cases both native and cultivated plants show the effect of the excessive loss of water in a short time, and many perish.

The plant's need of both soil and atmospheric water is continuous. Each plant requires a definite amount of water in both soil and air for its continued growth and activity, and this water cannot be given to it at one time, or in larger amounts at long intervals (as during infrequent heavy rainstorms), but it must be so distributed that there may be enough for each day's need of the plant. With our moderate and very variable amount of rainfall the problem which really faces us, then, is one of conservation of water for both soil and air during the longer intervals between rains.

The water of the soil is accumulated in largest amounts where rapid runoff is checked. This is best done by preserving a continuous covering of vegetation (perferably forest) on the steeper slopes and by checking the rapid removal of water from the soil by artificial drainage.

The moisture of the air cannot be thus stored (though its dissipation may be checked by windbreaks), but must be constantly renewed, and its only source during drier periods is in the swamps, ponds, lakes and streams of the state which we have been destroying or limiting under our drainage practices of recent years. These bodies of water produce a marked effect on the moisture of the atmosphere in their vicinity. The writer has frequently measured the comparatively high relative humidity of the air in such places, and it may be observed also in the heavier dews which simply represent the condensed vapors which arose from the water surfaces during the preceding day.

The steep slopes along all our streams and natural drainage channels should remain forested, or at least unbroken, to assist in storing the water of the soil, and a decided check should be put upon the indiscriminate drainage of our wet areas to conserve the waters of both soil and air.

Artificial drainage reduces the amount of soil-water, and the straightening of streams particularly lowers the level of the water-table, thus endangering the constant water supply required by plants. The very claim of the advocates of stream-straightening that it produces a more rapid run-off (hence, according to their claim diminishing the danger from floods), is an acknowledgement of the fact that the run-off is also faster at lower stages of the water, thus increasing the possibility of lowering the water-table to the danger point.

As a matter of fact the danger from the greater floods has not been removed by our drainage schemes, as the writer has observed in the Muscatine Slough, Little Sioux and other drainage systems, and whatsoever of good may result from the partial checking of floods is evidently more than offset by the increased danger of water-shortage in dry periods. It must not be forgotten, moreover, that the more rapid run-off which lowers the floods in the upper course of a stream will just as surely increase the floods farther down the stream.[2]

It will not do to argue in this connection (as has been done) that the cultivation of the soil naturally results in the lowering of the water-table. Let us grant this, — but why, then, should we unneccessarily increase the danger which to some extent is unavoidable? In thus diminishing the available water supply for both soil and air we are paying a heavy price which will increase whenever we have a return of dry seasons. We are in fact killing the goose that lays the golden eggs.

This sacrifice could be excused only if distinct gains resulted, but such is not the case in a large number of our drainage ventures, and so far as the writer has been able to ascertain, the great hopes which have been entertained as a result of painted promises have not been realized in any of the larger drainage projects. Some of the drained land in most of the areas still remains wet so long in the spring that it cannot be profitably cultivated; in some cases peat and muck remain, giving a poor soil; and for these and probably other reasons, some of this land has produced no crop other than noxious weeds, though drained for several years. Many drained tracts in the Okoboji and Spirit Lake region, for example, are marked from afar during the summer by the light-colored beds of the squirrel-tailed grass (*Hordeum jubatum*), one of our great pests, and others chiefly yield crops of Spanish needles (*Bidens*) and other weeds.

Not only is the land secured by drainage often of poor quality, but it is a question whether it is worth while to attempt to secure most of it under any circumstances. The claim usually made that we must "reclaim" more land for cultivation is not well founded. Even now farmers are seriously considering the reduction of the cultivated acreage. As a matter of fact they could farm less land and, by farming it better, secure more satisfactory results. A very substantial gain could be made, for example, by reducing or

2 Incidentally it may be noted that the straightening of streams has resulted in the heaping up of ridges of excavated earth which form an excellent breeding ground for countless noxious weeds, and weeds form an alarming source of loss to crop-growers.

eliminating weed-patches alone (which drainage only increases), and there are other possibilities. In densely populated central Europe, where every foot of usable land is highly valued, no effort is made to cultivate the areas with poor soils, but they are used for growing forests, for fish-ponds, etc. Surely our mad desire to get more tillable land is only an exhibition of personal greed, and does not represent a real want.

The advocates of wholesale drainage usually flatter themselves that they are favoring and urging improvements, but too often the increased value of the land will not equal the cost of the "improvements," which are always expensive, and in such cases it is poor economy to put into the land more than can be taken out of it. A striking illustration of this is furnished in the Muscatine Island cases recently reported,[3] and in numerous other cases in Iowa and adjoining states. It is a significant fact that the conservative loan companies of Muscatine will not make loans on lands included in this drainage district.

In practically all the drainage projects a few of the tracts assessed derive some direct benefit, and this largely at the expense of a much larger number of owners who derive little or no advantage, but are called upon to pay for the "improvement." This is done on the assumption that any piece of land which is drained is benefitted, when as a matter of fact many of the tracts are probably injured by over-drainage. This is clearly the case in much of the sandy area on Muscatine Island, where distinct harm was done to areas included in the drainage district, yet the owners were taxed to pay for that which injured them! (See report cited.) The whole problem of overdrainage should receive much more attention, and it should be studied by those who are competent to determine not only whether a given area *could* be drained, but also whether it *should* be drained. It is evident that we should adopt a system of selective drainage in place of the present reckless system which operates on the groundless assumption that *all* drainage is beneficial.

The problem of drainage in our state is one which does not concern sportsmen or pleasure-seekers alone, as advocates of drainage like to claim; it does not primarily concern the occasional individual property owner who may derive benefits from some particular drainage project; but it concerns the welfare and the future of the entire state. Its dangers are so many that we cannot close our

3 See report of the hearings on the upper Mississippi River Wild Life Reservation before the Agricultural Committee of the U. S. House of Representatives, 1924.

eyes to them, and its benefits are too often illusory, especially when urged by the engineer who wants the job or the speculator who is looking for personal profit. It will be the part of wisdom to proceed slowly in matters of drainage in the future. Drainage may always be undertaken later, but it is usually extremely difficult to undo its accomplished evil effects, as has been abundantly demonstrated in such cases as that of Rice Lake, Goose Lake, Muscatine Slough, etc.

This Academy, and especially the Botanical Section, should consider this problem, as it involves scientific investigation of our natural conditions, and is particularly concerned with the interests of plants. We should take a stand for the sane investigation and solution of the problems involved before it is too late.