cent of the cultivated land of Utah is under irrigation. The water right, the maintenance of that water right, and the distribution of the water on the land are items of considerable expense in an irrigated district such as ours. The average cost of these items will vary in different places, but will range from $2 to $4 on the average. This extra outlay calls for an extra crop to pay for it. With wheat at the average price for the past few years, the cost of water calls for from four to eight bushels over the average from the humid states to balance the account. It would seem, too, that as this expense has to be maintained every year whether the crop is large or small, more care should be devoted to the preparation of the land and the handling of the crop so as to ensure at all times the larger yield.

The following table will show how the actual yield compares with what it might or should be:

	Utah.		Calif.	Colo.	N. Y.	Ohio	Ont.	U. S.
	Avr.	Highest.						
Wheat	19.7	80.	17	18.6	15.8	14.4	20.	13
Wheat	21.5	150.					30.	
Oats	28.1						34.	
Barley	31.						35.7	
Peas							20.	
Corn		150.					60.	
Timothy	18.8							1.4T
Clover or lucerne	1.4T	2.8T						
Average for five years, except Ontario, which is for 10 years.		8.6						

The soil of the farm, or rather the plant food of that soil (about 2 per cent in the first 9 in.) is a large portion of the farmer's working capital. The object should be, first, to use as much as possible of that capital every year; second, to use it so that it will give the most economic returns; and, third, to use the capital in such a way that, while it is returning interest it is not decreasing in quantity. The first of those points calls for the growth of large crops, the second for the growth of those crops that can be disposed of most advantageously, and the third, the disposal of these crops in such a way will leave the largest possible amount of the food material, which they have gathered from the soil and air on the farm.

Of the plant food in the soil, a small portion only is soluble in water, the major portion is insoluble, and as the plant takes up its food dissolved in water, it is essential that it should have an ample supply to feed upon. The preparation of this food is a prime requisite of cultivation. The soil is an immense chemical and biological laboratory. Cultivation rearranges the particles of the soil, it permits the entrance of the air and exposes new surfaces of the soil to the chemical changes and the breaking down of complex into simpler compounds. The soil also contains myriads of bacteria. Cultivation gives conditions favorable to their multiplication and to their dissolving action on the soil, thus preparing it for the use of plants. Another object of cultivation is the preparation of the ground for the seed. Different crops require different preparation, and the object should be to get the soil in the best possible condition for the particular crop grown.

A practice which I have observed in several places, particularly in the central and southern counties of the State, was that of cropping the land every alternate year. The reason given for the practice in most places was, that owing to the scarcity of water, better average crops were believed to be obtained by changing the land each year. In other places, however, where the water supply was abundant, the same practice prevailed, and the improved crop given as a reason. This is a practice which, I believe, under the conditions referred to, is of very doubtful economy. With proper methods of cropping and cultivation, the fertility of the soil may be maintained for generations. If the land is to be kept free from weeds it must be cultivated, thus two acres of land are cultivated, and taxes paid on the same for every acre of crop produced. The advantages of the alternate cropping could, I believe, be obtained by the proper rotation and at much less expense, and this would be particularly the case where the water is plentiful.

I have not the exact figures but the reports from England and France places the average crop at from 50 to 75 per cent above the best averages from America. The first lesson from these figures is that Utah ranks ahead of the other states in crop production though coming behind Ontario, Canada, almost all down the line; but whether the four bushels of wheat per acre which the Utah crop is above that of New York, amounting in cash at recent prices about $2.50, or this year $2.75, will pay for the extra expense, I will leave the reader to answer. Another point to note is the highest as compared to the average yield in this state. Those highest yields certainly show a possibility, but even if they are extravagant I think it is quite possible to double the average yield of the crops from the irrigated area of the state. Many instances of this possibility might be given. England and France raise an average of 40 to 45 bushels of wheat to the acre. On the College farm at Logan, on land which six years ago nearly every person said was no use for farming—a light porous leechy soil—there was raised last year double the average yield of grains and fodders that is reported for the state. On this same land, in fact on the poorest part of it, we kept two cows in good feed for three and one-half months on one acre of pasture land, a record which I have never seen equalled outside of the state. On the rich bottom lands in some of the warmer valleys. I fully believe one-half an acre of land will support a cow in good feed for from four to five months. These are possibilities which are within the reach of all who will become students of their business.

To call attention to a few points where this improvement might be affected and to point out some profitable methods of disposing of the increased crop, is the object of this paper.

In conversation with a farmer friend some time ago he said: I know all about farming, ploughing, sowing, etc., but there are a few things about dairying that I might learn." (I suppose as a compliment to the dairyman with whom he was talking). From observation and conversation I fear there are too many who are in the same position, due, I believe, largely to the fact that agriculture has been presented mainly as physical work only, forgetting that it has an intellectual and scientific side.

At Teasdale, in Wayne Co., a little settlement in a valley among the hills rather prettily situated and watered by a mountain spring. I gave a talk on a few practical agricultural topics. At the close of the meeting a gentleman who had been a very interesting listener said that he did not expect to hear a talk on things that they could put in practice on their farms, did not know that that was possible, but thought that perhaps some interesting theories would be discussed which would have a very distant relation to their work. But these thoughts were in no wise confined to that locality, they were frequently met with in other places and seem to indicate that the occupation of the farmer has frequently not been one of the objects of his study. The experience of every agricultural student is, on the contrary, that the subject is so vast that a mere fraction of it may be mastered even in a lifetime.

I noted particularly, in driving from Nephi to Mona, that the sides of the road were lined with sunflowers, and the thought occurred to me, why, if the sunflowers grew on the hard soil, other things would not grow if the land was properly cultivated. The same thought came to me in several other places. With dry land, or land in dry seasons, cultivation has another purpose besides those referred to above, that is, to prepare the soil for the reception and retention of moisture. The water which falls on dry, compact soils tends to run off and is thus lost to that land. Again, when left in its natural state, or if allowed to become campact, pores or openings are formed in the soil which allow the water to be brought readily from the sub-soil to the surface by capillary attraction and then into the air. Cultivation corrects both those tendencies. Ploughing land with a clay sub-soil in the fall improves the absorptive power of the soil, and if ploughed again in the spring, particularly if it had been sub-soiled, loosening the soil down at least twelve inches, the natural pores of the soil are broken and the moisture that comes up from the sub-soil disperses itself in the surface soil where it becomes available for the growth of crops. If the crop is planted so that surface cultivation may be contoniued through the season at stated intervals, and particularly right after a rainfall which compacts the soil and opens up communication with the sub-soil, all of the rain that falls may be saved for the growth of crops. It may even pay in some places to husband the moisture of two seasons by proper surface cultivation so as to get a crop every second year. This might well apply in districts where, because of the limited water supply, only half of the cultivated land is cropped each year, and thus add one-third to the crop in two years.

In seeding, two points require particular notice. All experiments show that, as a rule for all cereal crops, the earlier the seed gets into the ground after the land is ready, the better the crop. This frequently calls for fall preparation so that in the spring surface cultivation, a preparation of the seed bed is all that is required. In the second place the seed sown should be clean, that is, free of weed seeds and other grain. Carelessness on this point is all too common and it was the exception rather than the rule to see a grain field that was not mixed or weedy. In this same connection it should be noted that it pays to sow plump seed only. The start in life has much to do with a successful career. As it is from the seed tthat theyoung plant gets its start, the advantage of a good plump seed—a good supply of food for the young plant—is apparent.

The time to irrigate, the amount of water to use and the frequency and