

SOME CONSEQUENCES OF IRRIGATION.

In all countries where land is brought under irrigation certain deleterious effects, the incidence of which depends upon a variety of circumstances, sooner or later appear. Since this survey was undertaken partly on account of adverse criticism of Central Otago irrigation projects, a few remarks may be made upon some of the visible consequences of irrigation in that region.

Salty Patches.—The most harmful consequence of irrigation in a dry climate is the accumulation of salts in the soil. This effect is most marked in countries where the irrigation-water contains appreciable quantities of salts in solution. In Central Otago the irrigation-water is remarkably pure; salty patches are of small extent, and are more noticeable in unirrigated land than on land under irrigation. The salty patches contain mixtures of the sulphates, chlorides, and carbonates of sodium, potassium, calcium, and magnesium in varying amounts. These salts are derived from the schist rocks that form the mountain-ranges, and are present in the younger sedimentary beds that form the floors of the Central Otago depressions. They tend to accumulate on the surface of the land, but, since these accumulations are transient, the present small rainfall is evidently sufficient to cause their removal.

On unirrigated land, when the present natural water-supply, due to a 15 in. to 20 in. rainfall, is augmented by irrigation water, these salty patches will probably disappear. Conversely, on land under irrigation salty patches may persist on the banks of water-races where seepage and evaporation bring forward saline matter as fast as it is washed away, but on cultivated fields salty patches are either absent or show a tendency to migrate down the slopes as irrigation-water is supplied from above.

On farms where irrigation has been practised for a number of years salty patches are scarce, whilst, on the other hand, where irrigation has been introduced recently incrustations of water-soluble salts are conspicuous. This would indicate that the first effect of irrigation in Central Otago is to bring to the surface the soluble salts naturally present in the soil, and the ultimate effect is their removal. If under present methods of irrigation saline patches should continue to give trouble they could be removed by increasing the amount of water and by attending to the drainage. Heavy applications of water in cool weather would certainly have a beneficial effect in washing the excess of soluble salts out of the soil. The Dip Creek sections near Alexandra, recently supplied with irrigation-water, should be periodically inspected in order to determine what will eventually happen to the saline matter now accumulating there.

Salts in the soil in apparently excessive quantities are not altogether harmful, because, as is well known, animals require mineral matter with their diet, and sheep grazed on salty land are reported to fatten better than they do on irrigated land carrying a heavy stand of fodder.

Bare Patches.—The presence of bare or almost bare patches of land surrounded by healthy crops is due to several causes. When the soils and subsoils are excessively porous a too free movement of water renders the land too dry to support crops, and, contrariwise, where the soils and subsoils are impervious small salinas occur. The aspect of the land also has its influence on soil moisture, hill-slopes facing north-east in Manuhierikia Valley and facing north-west on Maniototo Plain being generally rather bare. Irrigation readily obliterates most of these bare patches.

Some bare patches are due to the soil being too hard and too dry to allow grass-seed to germinate and take root, or the young grasses may be asphyxiated owing to the plants being unable to abstract sufficient moisture from the slightly saline soil-water. Here cultivation is the remedy.

Waterlogging.—In places where the soils and subsoils are excessively porous the land is readily saturated by seepage-water coming down from higher ground. The soil in such areas, although not permanently waterlogged, is rendered less productive. In Ida Valley there are a few small bare patches due to this cause, and some orchards in the Molyneux Valley suffer in the same way. Cultivation and perhaps the provision of catch-drains, will provide a partial remedy.

In certain areas where the supply of irrigation-water is liberal there is a strong growth of rushes. This growth is said to be beneficial in that it provides shelter for sheep and makes small quantities of food available when the countryside is snow-covered. Land at lower levels, however, becomes waterlogged and sour, and thus deteriorates in value. There need be no difficulty in adjusting the water-supply to prevent this.

In parts of Ida Valley not supplied with irrigation-water drains have been dug to prevent waterlogging, but in one or two cases these drains have become obstructed and do not function. In contrast to this, in the same localities there are some unirrigated crops that are grown on soils that obtain their moisture by capillary action from the ground-water close beneath. Drains excavated in these areas will lower the water-table and decrease the productivity of strips of land parallel to them. Over large areas care should be taken not to disturb the nice adjustment between upward movement of subsoil water and transpiration of the growing crops.

USES OF A SOIL SURVEY.

A soil survey of a country is a stocktaking of its soil resources with a view to utilizing them to their fullest extent. This is demanded by the natural increase of population. (Cf. A. D. Hall, Rep. Brit. Assoc. Adv. Sci., pp. 255–66; 1926.) The resulting soil map seeks to portray various classes of land differentiated according to origin, texture, situation, water-supply, quality, or some other factor that may have a preponderating influence on production. The map thus provides the foundation upon which can be based the future development of the country—that is to say, increased production to meet the needs of increasing population.

Increased production can be brought about in several ways—for instance, by removing unfavourable conditions, such as scarcity or superabundance of water, by substituting good pastures (and breeds of stock) for poor ones, and by supplying mineral deficiencies in the soil. The last method involves the intelligent and economical use of fertilizers both as regards nature of fertilizer and quantity used.