

14TH APRIL, 1904.

NOTES ON IRRIGATION.

BY E. J. CLARKSON.

This subject is one of vital importance to the people of these States, and without the aid of institutions, such as ours, whereby some information may be imparted as to the best method of doing this important work, very little progress will be made in this direction. Our President, in his opening address of the present session, referred to "Irrigation" in other countries, and its practical use has been well known for centuries by the people of America, China, India, Northern Africa, and Europe, and it may be of some interest to state that in the Madras Presidency alone there are 3,875,000 acres under the influence of irrigation; and when the total area of the land in this country available for irrigation purposes has been dealt with, it will represent a total of 25,000,000 acres. The Indian Government are considering at the present time another very large scheme, which it is estimated will cost something like £30,000,000. The money spent on irrigation works in India had shown very good returns on the outlay, varying from 11 per cent. to 25 per cent. per annum.

On the River Nile, and its tributaries, irrigation schemes had been attempted for thousands of years, and many devices had been tried to dam these waters, but with no practical result, owing to the vast volume discharged, carrying everything before it, and it remained for engineering skill to surmount the difficulties before these waste lands could be made use of for agricultural and fruit-growing purposes.

From an engineering point of view, this is a wonderful piece of work, and now that it has been practically completed, reflects the greatest credit on all concerned. The importance of the scheme lies embodied in the fact that the larger area now being brought under the influence of water, produces more employment for the people, with better rates of pay, at the same time increasing the revenue of Egypt over £500,000 stg., during the last half of that country's financial year, showing that there is a profit even in large undertakings of this kind. The same remarks may, in some cases, be applied to irrigation works in the United States of America, where there is available something like 100,000,000 acres of land fit for that purpose.

India and Egypt have been referred to as an indication of what can be done with large volumes of water in these countries; but as this State is not possessed of vast running rivers, therefore, prior to a scheme of any size being thought about, a means of storage in our hilly country is required to control the supply, and, if possible, provide a continuous stream for the purpose of irrigation, and it is the opinion of the author that storage of water is necessary, otherwise it will take a minor position in this State. The author is of opinion that the construction and maintenance of irrigation works are public functions, like the building of light-houses and public highways, and that the former can as well be made objects of commercial enterprise as the latter.

Having long since passed the experimental stage, and having reached the point where little can be done by private capital, yet vast areas of Crown lands remain uncultivated, in localities where land would be of high value, if an artificial water supply could be assured all the year round. Without storage reservoirs these areas remain barren and useless indefinitely, but with irrigation it is quite possible that portion of the country would support a much larger population per

acre of land when compared with other districts depending entirely upon the normal rainfall.

Several schemes have been carried out in the States of Victoria and South Australia, for the purpose of fruit-growing, etc., but owing to the want of knowledge as to the climatic conditions prevailing in these States, they have not been so successful as at first anticipated.

Better work is being done, however, in the "Goulburn Valley" district, and at Harcourt, in Victoria, where a variety of fruits are grown for export, said to be equal to anything in the world.

In this State irrigation has not been carried out on a very large scale, though there are a few squatters and other enterprising land-owners who have spent large sums of money, time, and labor on this work, with very good results.

Land, properly prepared and treated under irrigation, on the Lachlan River, has been made capable of carrying 75 sheep to the acre. Prior to this, it would not carry one sheep to three acres all the year round.

The methods of irrigating are as varied as the topography of the country, and so much depends on the proper application of water, that the practice often results in failure, unless it has received careful consideration and study.

Evenness of distribution is important, and if more water is allowed to remain on one place than on another, the ground will dry unevenly, consequently some patches become too dry before others are in a fit state for the plough, and this is a matter of some importance in irrigating orchards, or any crop that requires cultivation, as the plough or cultivator must follow as soon as the ground is in good working order.

In considering an irrigation scheme from a practical point of view, the first thing is to carefully estimate the available quantity of water for twelve months, taking into consideration the average annual rainfall and evaporation of the district. When worked out this should

give a very fair idea as to the average that can be properly dealt with, and form a basis on which the capacity of the pumping plant should be determined.

After having decided as to whether the treatment is to be surface or sub-irrigation, the quantity of land marked out, and the plant ordered, the land should be prepared. If the land is uneven, great care should be taken to see that the water is not allowed to remain in pools, as this causes it to cake on the surface. Should this take place, the ground must be ploughed up, otherwise it becomes sour and in time scalded and unfit to grow weeds. This difficulty is then overcome by the grading machine being passed over the land and the high parts removed and deposited into the hollows. In a surface irrigation scheme the next thing to decide is the position of the check banks, and these are thrown up by ploughing at intervals (the distance apart being decided by the quantity of water to be delivered in a given time) and should be arranged so as to control the water within a given area. The channels formed by raising the check banks are used to carry the water further away from the main channel, before turning it on to the land, but if the water is permitted to flow through the openings made in the main channel, back on the land for a distance of, say, 300 yards, that portion near the main supply would receive too much, doing more harm than good. The main principle to be observed in all irrigation work is to get the water on to the land in the shortest possible time, without causing it to scour, and this is accomplished by cutting small openings in the supply channel banks at frequent intervals. When the check bank races are used for irrigation, the system adopted is to make a series of small dams, by shovelling earth into the race at intervals. When the land has been sufficiently supplied with water, the Irrigator shuts off the supply and opens up the next section, and as soon as the water is started on this, he should return to the first section for examination of the work done, and see if the banks are all secure.

Practically the same methods apply to sloping country, with the exception that the water flowing on the land must be controlled by the check banks being arranged at suitable angles, thus providing an even flow of water over the land from each race to the opposite check bank.

All surplus water should be returned to the source of supply. The author is of the opinion that sub-irrigation is the proper method to be adopted by small farmers, and should be carried out as follows :

Prepare the land as if for surface irrigation, with the exception that check banks are not required, but water races must be cut through at intervals of, from 50 to 200 yards, the distance being controlled by the porosity of the soil. Then plough with a "Mole" plough, from 2 to 4 feet deep, according to the depth of the clay-pan below the soil. The plough differs somewhat from others in use, being made in the form of a shell, with conical ends, carried on a steel arm of about one inch thick by six inches to ten inches wide, and controlled by levers to raise or lower it the desired depth.

The effect of this conical-shaped implement in passing through the subsoil, is to produce a hole in pipe-form, by compressing the soil to such an extent that the passage thus formed has been known to last 5 or 6 years. These passages should also be controlled by the porosity of the soil, and spaced from 3 to 20 feet apart. By this method the quantity of water is only (1-20) one-twentieth of that required for surface irrigation, due to the capillary attraction which takes place, thus permitting the air and light to penetrate the soil, and giving vigorous life to that which needs it most, "Mother Earth."