



Geography 211

Drainage



Donald Bodeker
894524H

Tutor : Dr. Garry Moore
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Introduction

The main objective of agricultural land drainage is to remove excess water in order to improve the profitability of farming the land.

There are periods on most land when excess water occurs. However, these need not be too harmful provided the quantities are small, the periods of occurrence are of short duration or the excess occurs during a non critical season. Most land also has some natural drainage which assists in the removal of a certain amount of the excess water. It is only when large quantities occur for prolonged durations at critical periods, that its removal by artificial means may be feasible.

Drainage Problems

Excess water may occur on the land surface or deeper down in the soil profile. The adverse effects on farming may be broadly classified as follows -

Impaired Crop Growth : Most crops respire by gaseous exchange in the rootzone (the process whereby roots absorb oxygen from the soil atmosphere and release carbon dioxide back into it).

In waterlogged soils, the air content of the soil is low because most pores are filled with water. Moreover, the exchange between the remaining air in the soil and the air in the atmosphere above is very restricted by these conditions. In consequence, respiration is restricted by the oxygen deficiency while at the same time the carbon dioxide accumulates to toxic levels, directly impairing the root growth and the root's ability to absorb nutrients. **1**

Waterlogging of the entire rootzone for a period of two to three days can be fatal when it occurs during the seeding stage. Crops suffer more from waterlogging under warm than cold conditions, the reason being is that growth increases at higher

temperatures, increasing the oxygen consumption. Waterlogging also indirectly affects plant growth by its effects on soil biological life and on the structure of the soil.

Impaired Farm Operations : Excess water on or in the soil adversely affects the soil workability. There are fewer work days on poorly drained land and essential farm operations (planting, spraying and harvesting). If such activities progress, then compaction may occur which leads to soil structure collapse.

Sources of excess water

Direct rainfall is the most common source of excess water. Within a semi arid landscape like Australia, large rainfall events occur mostly infrequently, however, there is emerging an meteorological pattern that has been identified that predicts increasing large rainfall events, tropical storms (cyclones) and extended periods of draughts and floods - *El Nino*.

The following are some of the effects that excess water has on the land -

Flooding : Rivers and coastal plains may be inundated during large rainfall events such as cyclones.

Erosion by runoff : Erosion of the soil by water runoff occurs in landscapes that have been denuded of native vegetation and contain undulating land forms. As a consequent, the top soil is washed away and eutrophication occurs when fertilizers are also discharged into the river systems.

Salinity : Waterlogging of the land and the removal of native vegetation for pasture production are the main reasons why it has been estimated that 30% of the agricultural land within the state will be affected by salinity. [2](#)

Drainage Systems

A typical agricultural drainage system has the following main components -

Field Systems : This gathers the excess water from the land by means of a network of field drains and where necessary these are supplemented by measures which promote the flow of excess water to these drains. The system used depends mainly upon the drainage characteristics of the soil. Two principal types may be distinguished -

Groundwater Drainage Systems : These are used in soils in which the excess water is able to infiltrate and percolate through the main rootzone to the sub soil and then move as groundwater flow to the drains;

Shallow Drainage Systems : These are used where the infiltration or percolation of excess water is impeded at the surface or at shallow depth in the rootzone due to the

presence of poorly permeable layers. The excess water either ponds on the surface or flows above the impeding layer to the drains.

Main System : This receives water from the field systems and conveys it to the outlet. A main system is usually composed of ditches and canals of differing order. The smaller canals are usually aligned along the field boundaries towards which the field drains flow.

Outlet : This is the terminal point of the whole system at which it discharges into a major element of the natural open water system of the region (rivers or lakes). 3

Conclusion

The measures taken to improve the drainage conditions of an area ultimately depends upon the benefits these are expected to yield when compared with costs.

Benefits from drainage of agricultural land may accrue from improved crop growth conditions or from the improved soil workability. All in all, land drainage may be expected to result in better yields at lower costs, these returns should be considered in relation to the costs of the drain and the possible environmental impacts the drain may have on the landscape.

End Notes

1. R. Q. Cannell, "*Effects of soil drainage on crop production*". (London : Pan Books, 1989) pp 15 - 45.
2. J. Erikson, "*Irrigation, Drainage and Salinity*". (London: Croom - Helm, 1988) pp 52 - 75.
3. N. W. Hudson, "*Drainage in the economy of the farm*". (London: Hutchinson Books, 1992) pp. 21 - 69.

Bibliography

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