
Chapter 1

Introduction

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NJ652.01 Introduction

a) General Information

The New Jersey supplement to the National Engineering Handbook (NEH), Part 652, Irrigation Guide, has been adapted from the original New Jersey Irrigation Guide. The material was developed to assist New Jersey NRCS field personnel and others working with New Jersey irrigators to provide general planning, design, and management guidance on various methods of irrigation commonly used in the State. When the system is designed, installed, and operated in accordance with the basic factors, the irrigator is assured that the irrigation system will apply the needed amount of water without waste or damage to the land and maintain the soil fertility and water quality while achieving optimum yields. The irrigation planner must be aware that every irrigation system should minimize runoff and erosion and account for drainage. For example, usually a desirable system for hoop house sprinkler irrigation is the use of stone lined channels to deliver tailwater runoff to a recovery basin and pump-back system. The need for erosion control and drainage should be kept fully in mind when developing the conservation irrigation plan. Section IV of the Field Office Technical Guide contains standards for conservation practices including irrigation practices such as Irrigation Water Conveyance, Sprinkler Systems, Micro-Irrigation and Tailwater Recovery Systems. The design of all irrigation systems shall follow the procedures in Part NJ652.06 and conform to the requirements outlined in the applicable New Jersey standards.

The New Jersey Irrigation Guide includes information and experience about soils, climate, water supplies, crops, cultural practices, and farming conditions in New Jersey. These basic factors must be evaluated in planning and design of an irrigation system.

Conservation irrigation is an integral part of a complete farm program of soil and water conservation.

The aim of irrigation is to eliminate water as a limiting factor in plant growth. This means that it should be used primarily on land of high potential productivity. Treatment with irrigation must include adequate fertilization and cropping systems that control erosion and leaching, and maintain good soil tilth and organic matter.

For the farmer, the benefits from irrigation must be sufficient to justify the cost of purchasing and operating the irrigation system and leave a reasonable return on the investment.

For the greens keeper, park or landscape superintendent, nurseryman, and homeowner, irrigation helps to maintain the desired growth of grass, ornamental plants, flowers, and garden crops with minimum cost and effort.

b) Considerations

To obtain the maximum benefits from irrigation, the following must be considered:

Soil

Several soil properties directly influence the design and operation of an irrigation system. They are: (a) water intake rate, (b) available water holding capacity of each significant soil layer or horizon, (c) depth.

Plant response to irrigation is influenced by the physical condition, fertility, and biological status of the soil. Physical condition or structure determines the extent to which a root system can develop by growing into and using the available moisture in the soil. The biological status is the condition produced by the relationships of the pH, organic matter, fertility, and available moisture in the soil.

Crops

Crops will respond to irrigation when the normal rainfall does not maintain favorable moisture levels. Benefits result from improved quality as well as increased productivity. Plant wilt and color changes are important indicators of plants that are under stress due to water deficiency. Knowledge of

rooting depths, rates of water usage at different crop stages, and plant growth characteristics is necessary in determining when and how much to irrigate.

Water Supply

Irrigation requires large volumes of water, and the supply must be reliable. The quality of water as well as the quantity must be considered. If there is any question as to the quality of the water, it should be tested.

The right to water use by the landowner must also be considered when planning for irrigation. The landowner must be certain that he or she has a legal right to continued use of the water supply, particularly if it is a natural flowing stream or an underground source.

Drainage

Soils to be irrigated must have adequate drainage. If they do not have adequate natural drainage, artificial drainage measures must be installed. Otherwise, a heavy rainfall following irrigation may cause crop damage.

Erosion Control

If the area to be irrigated is on sloping land, provision must be made to control erosion. Erosion can be aggravated if a rain occurs immediately after irrigation. Needed conservation practices must be installed for erosion control.

Fertility Management

Soil fertility should be maintained at a high level so plants may fully utilize available moisture assured by irrigation. Fertilizer applications should be applied according to recommendations conforming to the nutrient management standards and specifications. Soil testing and

leaf tissue analysis can be obtained through Rutgers Cooperative Extension Service.

Pests and Disease

Damage from insects may or may not increase under irrigation. Cutworms, leaf hoppers, thrips, and army worms may thrive under irrigated conditions.

Plant diseases usually increase with sprinkler irrigation. High humidity around plants and splashing water contribute to a more favorable environment for bacterial and fungus disease organisms. Irrigating at night further increases the potential for diseases.

The pesticide recommendations published by Rutgers Cooperative Extension Service provide guides for control of common insect pests. Integrated Pest Management Practices are encouraged for safe and efficient chemical applications.

c) An Irrigation System Plan

In order for an irrigation system to be successful, it must be planned to fit the site characteristics of soil, climate, and water supplies, plus the management requirements for agricultural, turf, or other proposed uses. Improvements and new methods of irrigation make irrigation possible under a wide range of conditions.

The irrigation system plan should take into account the site resources and the cropping pattern. An economic evaluation should be conducted prior to installation to assure a worthwhile investment.

This Guide will assist planners and irrigators with the development and implementation of effective irrigation water management plans.