**ROMBLON STATE UNIVERSITY**

**College of Engineering and Technology**

**Main Campus, Odiongan, Province of Romblon**

**HANDOUT #2**

**CE5122 Water Resource Engineering & Irrigation Structures Tues/Friday – 1:30-3:30/3:30-5:00PM**

**Engr. Reynaldo P Ramos, PhD**

**IRRIGATION**

* Irrigation is the artificial application of water to the land or soil. It is used to assist in the growing of agricultural crops, maintenance of landscapes, and revegetation of disturbed soils in dry areas and during periods of inadequate rainfall.
* Irrigation provides one of the greatest opportunities for increasing crop production as well as improving germination, controlling air temperature, and applying chemicals with the irrigated water.
* Increasing demands for water, limited availability, and concerns about water quality make effective use of water essential.
* Because irrigation is a major water user, it is very important that irrigation systems be planned, designed, and operated efficiently which requires a thorough understanding of the relationships among plants, soils, water supply, and system capabilities.

**IRRIGATION SYSTEM**

The irrigation system consists of a (main) intake structure or (main) pumping station, a conveyance system, a distribution system, a field application system, and a drainage system.

**IRRIGATION MANAGEMENT**

The irrigation designers must consider the operation and management requirement for the irrigation systems, specifically, a thorough understanding of t he performance or efficiency of the system, water delivery requirements and irrigation scheduling.

1. Irrigation Efficiency. Efficiency is an output divided by an input and expressed as a percentage. There are 3 basic irrigation efficiency concepts as follows:

a.1 water conveyance efficiency

a.2 water-application efficiency

a.3 water-use efficiency

1. Irrigation Requirement (IR). It is total amount of water that must be supplied over a growing season to a crop that is not limited by water, fertilizer, salinity, or diseases.
2. Irrigation Scheduling. Irrigation must be scheduled according to water availability and crop need. Irrigation scheduling requires knowing when to irrigate and how much water to apply. When to irrigate can be determined on the basis of plant or soil indicators or water balance techniques. How much water to apply can be based on soil water measurements or water balance techniques.

**CLASSIFICATION OF IRRIGATION METHODS/SYSTEMS**

The methods of applying water maybe classified as follows:

1. *Subirrigation*. Water is applied below the soil surface by developing or maintaining a water table that allows water to move up through the root zone by capillary action. Water is introduced into the soil profile through open ditches, mole drains, or pipe drains. The open ditch method is most widely used.
2. *Surface irrigation*. It includes wild flooding – where the flow of water is essentially uncontrolled; and surface application – where flow is controlled by furrows, corrugations, border dikes, contour dikes, or basins. Except in the wild flooding, the land should be carefully prepared before irrigation water is applied.
3. *Sprinkler irrigation*. It provides reasonably uniform application of water. It can be used for temperature control. Mechanically-move systems are now widely accepted either intermittent or continuous application.
4. *Microirrigation*. Its either trickle or drip systems that apply water at very low rates, often to individual plants (landscape plantings). Such rates are achieved through the use of specially designed emitters or porous tubes. Both sprinkler and microirrigation systems are well adapted to application of agricultural chemicals, such as fertilizers and pesticides, with the irrigation water.
* Efficient surface irrigation requires grading of the land surface to control the flow of water. The extent of grading required depends on the topography.
* Sprinkler irrigation is adaptable to hilly land where grading or surface irrigation is not feasible. It is appropriate for most areas where the infiltration rate exceeds the rate of water application. It is usually have a relatively high cost of installation. Some sprinkler systems operate at pressure comparable to those of microirrigation systems.
* A well-designed microirrigation system can provide a high efficiency of water application. It is especially well suited to fruit trees and high-value crops. Water must be clean and uncontaminated, usually achieved by a filtration system. It operates at low pressure, thus energy requirements are generally lower than with sprinkler systems.

**CONSTRUTION OF IRRIGATION SYSTEMS IN THE PHILIPPINES**

1. **Types of Systems**

There are three categories of irrigation systems: national, communal, and private. ***National irrigation systems*** (NIS) are large and medium schemes. These are basically operated and maintained by NIA where beneficiaries are charged irrigation service fee for the services rendered in the delivery of water. In the 1980s, joint management of portions of national systems with irrigators associations (IA) was effected.

Communal irrigation systems (CIS) are small-scale schemes and constructed with the participation of farmer-beneficiaries thru their IAs. The operation and maintenance (O&M) of CIS is turned over to IAs upon project completion subject to a cost recovery arrangement. Farmers amortize the chargeable cost for a period not exceeding 50 years at 0 percent interest. The repayment scheme is pre-arranged and acceptable to both NIA and the IA.

Private irrigation systems are those constructed, operated and maintained by private individuals or groups with or without technical assistance by NIA or other government agencies.

**COMPARISON BETWEEN THE NATIONAL AND COMMUNAL IRRIGATION SYSTEMS**

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| --- | --- | --- |
| **For Comparison** | **National Irrigation System** | **Communal Irrigation System** |
|   Area (ha) |   > 1,000 |   < 1,000 |
|   Implementation/construction |   NIA |   NIA with farmers' participation |
|   Operation and maintenance |   NIA and Irrigators Associations |   Irrigators Associations |
|   Water charges |   Farmers pay irrigation service fee per hectare/season/crop |   Farmers pay amortization |
|   Purpose of water charges |   Purpose of water charges |   Capital cost recovery |

1. **Types of scheme of development**

The three schemes of development of irrigation systems are:

1. run-of-the river diversion
2. storage or reservoir, and
3. pump irrigation

Diversion projects entail the drawing of water under controlled conditions directly from the flow of rivers or streams. Storage or reservoir projects involve the construction of storage dams to impound water and released as needed to be drawn from a diversion dam downstream. Reservoir projects are usually multi-purpose to include other functions like power generation, flood control, fishery and recreation. In pump projects, water is lifted from underground or from rivers and streams. Pump systems are also common in some storage or diversion schemes to lift water to irrigate areas on higher elevation or pump groundwater to supplement available supply from the river. Environmental protection and conservation is a key consideration in the design of various schemes.

1. **Status of Irrigation development**

The Philippines has about 10.3 million hectares (ha) agricultural lands. Out of this, around 3.1 million ha are considered irrigable, with up to 3 percent slope, and primarily devoted to rice and corn. A study by the World Bank, however, identified more than 6.1 M ha as irrigable, including areas that are relatively more difficult to irrigate and up to 8 percent slope.

As of December 2013, about 1.678 million ha or 55.59 percent of the 3.1 million ha have been developed for irrigation. Of the total area under irrigation, about 740,213 ha or 24.5 percent are under NIS; 576,419 ha or 19.1 percent under CIS that are farmer-managed; and 194,620 ha or 6.5 percent under privately owned systems that are constructed through private initiatives.

**Note: Visit the link for the History of Irrigation in the Philippines.**

[**http://www.nia.gov.ph/admin\_corner/admin\_page.php?option=book#book**](http://www.nia.gov.ph/admin_corner/admin_page.php?option=book#book)

**REFEERENCES:**

**National Irrigation Authority, (2015). Construction of Irrigation Systems, Retrieved at** [**http://www.nia.gov.ph/activities.php?option=construction#**](http://www.nia.gov.ph/activities.php?option=construction)**, dated 04 October 2015.**

**Shwab, G.; Fangmeier, D.; Elliot, W; and Frevert, R. (1993). Soil and Water Conservation Engineering, Fourth Edition, JMC Press Incorporated, Philippines.**