IRRIGATION POTENTIAL OF ITAPAJI DAM

Adeosun, E.O.

Abstract

The irrigation potential of Htapaji Dam was carried out with the aim of" determining the quantity of water available for irrigation purpose especially in dry season. Visits were made to the dam site to gather valuable information and the necessary data. These data were used to calculate the excess water available for irrigation after the dam has met the designed function. The Dam has the potential to successfully irrigate 240 hectares of land planted with tomatoes using furrow method of water application with an excess volume of 800 million liters/month.

Keywords: Irrigation potential, Dam, Crop water requirement,

Introduction

Irrigation is the artificial application of water to farm land to eliminate moisture deficiency at every stage of crop growth. Modern irrigation technology holds the promise for food and fibre sufficiency, and of it's primacy in conquering hunger and poverty. Irrigation civilization stands today as the centre of our efforts geared towards food sufficiency and enduring agricultural policy (Musa, 1992).

Between 1965 and 1977, there was an established 32.7 percent increase in irrigated land in developing Countries (World Bank, 1982).According to another school of thought, about 119 million hectares of irrigated land would have been developed by 1990 (Raddle and Manna shara, 1987). Meanwhile Jurriene and Bos, (1980) observed that the total amount of land to be established for irrigation would have increased to over 145 million hectares in same year.

The present irrigated land around the world is 85 million ha. Nigeria has an irrigation potential of 3.14 million ha. The amount of irrigated land in Nigeria can be doubled although it will take time and require unprecedented flow of resources from the rich to poor Countries and non- agricultural sector (Johl, 1980).Musa, (1992) in his work observed that at the beginning of 20^{th} century, irrigation practice barely existed in Nigeria. In terms of geography, irrigation revolution and its agriculture fruits were confined to the Northern Nigeria that were predominantly of Fulani Hausa who lived in and around natural inundated areas commonly referred to as fadama. They constructed berries, sunk wash boreholes and shallow wells and developed local techniques of lifting water and transplanting to suit their traditional irrigation method.

Fatokun and Ogunlana (1992) reported that farmers in the South started to grow high valued crops like lettuce and vegetable along river courses or swamps during dry season in places like Lagos Badagry Express way and in some cities and villages. The potential production from irrigated farms with those from rainfall agriculture shows that out of the available 90million hectares of land in Nigeria, only 53 million hectares are cultivable out of which at least 9 million hectares are irrigable.

The Furrow method of water application is irrigating row crops such as tomatoes with furrow development between the crop rows in the planting and cultivating process. The size and shape of the furrow depends on the crop grown, equipment used and spacing between crop rows. Water infiltrates into the soil and spread laterally to irrigate the areas between the furrows. The length of time the water is to flow in the furrow depends on the root zone and infiltration rate of the soil.

Methodology Dam site

Itapaji dam is located at Itapaji Ekiti in Ikole Local Government area of Ekiti State at latitude of 7° 58'N and longitude of 5°28'E. The dam was built in 1972 with a capital cost of N4.2 million across river Ele, which flows, from Osin Ekiti in Ekiti State. The dam covers an area of about 1 *Zi* - 2km with a drainage area of 340.35km^2 and the soil present in the study area is sandy loam. The topography of the area is plain; the dammed river has tributaries such as river Oye, river Omo etc. The

darm at Itapaji has four service reservoirs and two booster stations, one at Araromi and the other at Osin Ekiti respectively.

Data Source.

The data used in this research were obtained through visits to the production Manager at the dam site, collection of data from Ekiti State Ministry of water resources, Benin Owena River Basin Development authority as well as National population commission. The methods used to obtain the information includes, interview, telephone and through questionnaire.

Data Analysis and Calculations

The under listed data were obtained from the dam site.

(1) Dam holding capacity = 250 million gallons 50
(2) Designed daily discharge = million gallons 25
(3) Daily discharge for domestic use = million gallons/day 1
(4) **Area covered by the dam** = $1^1/_2$ - 2k

Calculations

* 1 million gallons = 4 millions litres (British standard)
* 25 million gallons = 100 million litres/day 8 days/month
* In 4 days interval, supply is approximately 100 million liters X 8 days = 800 million litres/month.
* From data obtained, the daily designed discharge is 50 million gallons (200 million litres/day)
*Therefore 200 million litres in eight days is $1.60xl0^3$ billion litres/month. After pumping water out for domestic use, the remaining can be calculated as follows:
*The monthly designed discharge = $1.60xl0^3$ billion liters/Month
* Monthly discharge for domestic use = 800 million litres/month
* The excess ($1.60xl0^3$ billion - SOOmillion) litres/month 800
= million litres/month
* This excess water is then planned to irrigate tomato.

Computation of Water Use for Tomato

*The root depth = 48 in (Table 1)
*The peak daily water use = 0.2 litre/day (Table 1)
*Net amount of water stored in 48 in depth for sandy Loam soil = 3.0 liters (Table 2)
*Water Application efficiency = 80% (Table 3)

*Water Applied $= \frac{Depth\ of\ water\ stored}{Application\ efficiency} x100$

$= \frac{3}{80} x\ 100$

= 3.75 litres/tomatoes/day.

*Irrigation Interval $= \frac{Depth\ of\ water\ stored(in)}{Rate\ of\ water\ use(litre/day)}$

$= \frac{3}{0.2}$

= 15 days interval

*Since planting Spacing = 30cm x 30cm (0.3 x 0.3) m
= $0.09m^2$

*Therefore, the No of Tomatoes/Hectare. $= \frac{10,000}{0.09}$

= 111,111Tomatoes

*Water use of tomatoes/day = 111, 111 x 3.75 liters

= 416,666 1 iters/day

*At irrigation Interval of 15 days i.e two times in a month

*Therefore, the water use needed for a month = 2x416,666

= 833,332 litres/month/ha.

*For the growing season of Tomatoes which is 4 months *The water use = 833,332 x4

- 333, 330 liters/season/hectare

*Recall that the Excess water = 800 million liters/month

Therefore the No. of hectares to irrigate/Season

$$\frac{800\ million\ litres}{3{,}333{,}330\ litres\ /\ season/\ hectare} =$$

240 hectares

Discussion

Table 1: Moisture requirement for different crops

Crop	Root Zone depth of principal moisture Ext (in)	Length of Growing Season	
		180-210 days peak use (Lit/day)	10- 250 days peak use (Lit/day)
Beans	24	0.2	0.2
Com	36	0.3	0.35
Melon	30	0.2	0.22
Potatoes	24	0.38	0.20
Tomatoes	48	0.2	0.22

Source: Roth, Crow and Mahoney, (1987)

The data obtained were analysed as shown above. The designed daily discharge was used to calculate the excess water available for irrigation and it was calculated to be 800 million litres/month since one of the best crops that can be grown on sandy loam soil of the study area (Itapaji dam) is tomatoes ('Lycopersium eculentum). The crop water requirement for tomatoes was calculated using the parameters in (Table 1) which includes the root zone depth of 48in and the peak daily water use, which is 0.2 liter/day.

Soil Profile	Net amount of water for various root zone depth			
	424cm	30cm	36cm	48cm
Coarse sandy loam uniform in texture (6ft.)	0.85	1.10	1.30	1.75
Coarse sandy loam more compact soil	1.50	1.75	2.00	2.50
Fine sandy loam uniform in texture (6ft.)	1.75	2.20	2.60	3.00
Fine sandy loam more compact soil	2.00	2.40	2.80	3.25
Silt loam uniform in texture (6ft.)	2.25	2.75	3.00	4.00
Silt loam in more compact soil	2.50	3.00	3.25	4.25
Heavy clay of loam soil	2.00	2.40	2.85	3.85

Source: Roth, Crow and Mahoney, (1987)

The net amount of water shared in depth 48in for sandy loam soil, which is 3.0 litres obtained from (Table 2).

All these parameters were used in the above calculations to determine the crop water requirement of 3,333,330 litres/season/hectare for tomatoes. Dividing the excess water by the crop water requirement gives the number of 240 hectares of land to irrigate per season. With the excess volume of 800 million litres of water per season.

Table 3: Water application for different crops

Crop	Growing period (days)	Soil Requirement (mm)	Water Requirement (mm)	Water Utilization (%)
Onion	100-140	Medium textured soil (6-7) ft.	300-550	5-8 bulb (85-95) %
Tomatoes	90-140	Light loam well drained	400-600	10-12 fresh fruit (80-90)%
Water melon	80-110	Sandy loam	400-600	5-8 fresh fruit (90)%

Source: Roth, Crow and Mahoney, (1987)

Table 4: List of hydrological gauging stations with their parameters

SI **N**	**Name of Guaging Station**	**State Location**	**Basin**	**Lat.**	**No**	**Long**	E.	**Drainage Area ^Km^2)**	**Installation**	**Staff Guage Zero (M)**
1.	Adofin River at Ossisa	Delta	Ase	5	55	6	28	425.95	S.G & A.R	92.20
2.	Owan River at Owan Village	Edo	Osse	6	46	5	46	1256.75	S.G & A.R	92.96
3.	Ossiomo River at Ologbo	Edo	Ossiomo	6	30	5	40	3974.15	S.G & A.R	93.94
4.	Ikpoba River at Benin City	Edo	Ossiomo	6	21	5	39	922.00	S.G & A.R	95.37
5.	Owenna River at Owenna Village	Ondo	Siluko	7	12	5	10	783.00	S.G & A.R	89.65
6.	Ele River Downstream of Itapaji Dam	Ekiti	Oye	7	58	5	28	340.35	S.G & A.R	95.14
7.	Ukhum/Era River	Edo	Orle	6	50	6	10	984.40	S.G.	

Source: Benin Owena River Basin Development Authority: HydVoIogical Year book (1995 - 1998) Vol. iv

Conclusion

From this research work, it was found that Itapaji dam has an irrigation potential of 240 hectares of land that can be planted with tomatoes using furrow method of water application after performing its designed purpose of serving the population of about 981,826 with potable water.

References

Tan, C.S (1980). *Estimating crop evapotranspiration for irrigation scheduling.* Agriculture Canada 26-29.

Johl, S. S. (1980): *Irrigation theory and practice agricultural development.* Pergamon press Inc. New York

Rath, O. Crow E. & Mahaney, S. **(1981):** *An introduction to agricultural engineering.* **Longman Ltd., London.**

Tan, C.S & Fulton J.M. (1980). *Ratio between evapotranspiration of irrigated crops from floating lysimeters and class A Pan Evaporation.* Can. J. plant sci. 197-201.

Treidi, R. A. (1997). *Handbook on agriculture and forest meteorology manual.* Atmosphere Environment Downsview, Ontario.

Musa, I. K. (1992): *Charging policy horizon for irrigation in Nigeria.* Spectrum Books Ltd. Ibadan

Raddle, A.C. & Manashara, U.K. (1951): *Irrigation modeling systems.* Third Afro-Asian regional conference IC1D, New Delhi.

Jurriene, K.R. & Bos, B.H.(1980): *Water management in irrigation system* Third Afro-Asian regional conference IC1D, New Delhi

Fatokun, J.and Ogunlana F.A. (1992): *Prospect of irrigation Development in South -western Nigeria.* Published by spectrum Books Ltd; Ibadan.