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THE ROLE OF BARAIGRAM *THANA NIRDESHIKA* IN WATER MANAGEMENT: A CASE STUDY

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Abstract: Moisture status of different soils under seven mapping units of Baraigram *Thana* has been described. The basis of description has been compiled from *Thana Nirdeshika* that includes moisture storage capacity in the dry season, availability of moisture to the plant/crops. Four moisture status have been categorized. These are greater than 250 mm, 250-150 mm, 151-70 mm and less than 70 mm per 100 cm profile respectively, and shown on the moisture status map. It has been observed that in dry season most of the crops suffered heavily due to drought. Satisfactory crop yield has not been observed due to lack of proper water management practices. The study shows that siltloam (Sara) is the best suited for low cost involvement in irrigation for wheat and pulses, whereas silty clay/clay (Ishurdii/Ghior) is the least suitable. Lowest amount of irrigation for wheat and pulses is required for all soils during the period of 15th November to 5th March. Adapting *Thana Nirdeshika* technology, large area of single crop land can be converted into at least double cropped land and command area of irrigation can be increased following proper water management practices.

Key words: *Thana Nirdeshika*; Water management, Moisture; Irrigation

Introduction

Soil Resource Development Institute and other Agriculture Research organizations have undertaken a programme for preparing soil and land resources utilization guide by collecting land, soil, hydrology and land use related information at *Thana* level. This Soil and land utilization guide is named as *Thana Nirdeshika*. Soil and land utilization guide plays an important role in various sectors of Agriculture planning. Water management is one of the important components of agriculture. With the increasing growth of population, the demand for water is increasing day by day not only for drinking but also for agriculture purposes. Therefore, there is an urgent need of proper use of water in the field of agriculture. Soil and water resources are the important factors for agriculture development. Soil and land utilization guide includes land, soil and its properties, fertilizer recommendation, water resources, etc. This paper deals only with soil, its physical properties and moisture status. The study area is Baraigram *Thana*, which covers an area of about 29,973 hectares. It is located in the south -eastern part of Natore district and is about 64 kilometers away from Natore town. Only one physiographic unit has been identified: Ganges flood plain. In Ganges floodplain, Sara, Gopalpur, Ishurdi in ridge and

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Ghior, Kumarkhali soil series in basin have been identified based on the following objectives:

To prepare moisture status map for irrigation planning and,
To find out an irrigation scheme for *rabi* crops by using Soil and Land Utilization Guide.

Materials and Methods

Interpretation of aerial photographs of Baraigram *Thana* has been done by using mirror stereoscope. Soil and Land type map has been prepared in the scale of 1:50,000. Semi-detailed soil survey has been carried out following grid methods by using aerial photographs. Soil samples have been collected 200 hectares apart from one sample to another by spade and auger. Soils have been observed by digging mini pit and the boundary checked on the basis of complexity of soils.

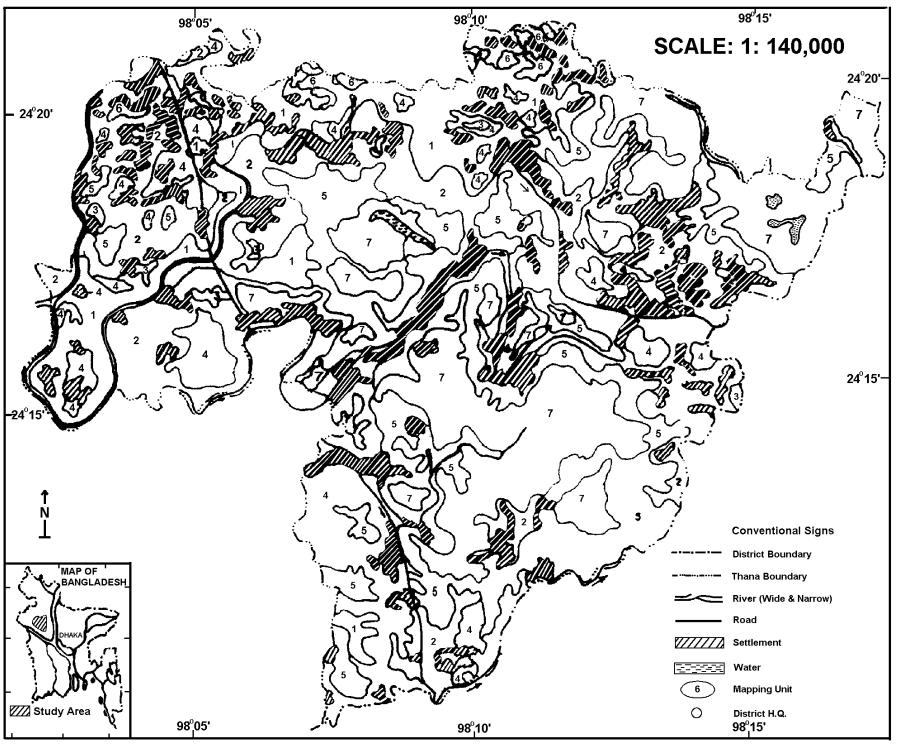

Fig. 1. Soil and land type map of *Baraigram Thana*, Natore (Source: SRDI, 1993).

A final soil and land type map has been prepared in the scale of 1:50,000 with a report of Soil and Land Utilization Guide (*Thana* Nirdesika). On the basis of different textural soil groups, information on available soil moisture has been incorporated into the legend of the map. Moisture status data of different soils in Ganges floodplain have been collected and compiled from the published reports (Rahman and Joshua, 1982-83). A soil moisture

status map has also been prepared following different soil moisture status in the legend and an irrigation schedule has been done by using the moisture data provided in the above-mentioned report.

Results and Discussion

The map of Soil and Land Utilization guide has been prepared in the scale of 1: 50,000 following standard methodology. From Table 1, it may be observed that 7 units were described in one physiographic unit of Ganges Floodplain. Five land types: highland, medium highland, medium lowland, lowland and very lowland were identified. Six soil groups, namely Sara, Gopalpur, Ishurdi, Ghior, Batra and Kumarkhali were identified also in the field. Surface water drainage condition on the basis of water receding and available moisture and texture have been stated in the legend. On the basis of available moisture of soil groups mentioned in the legend, a soil moisture status map (1:50,000) of Baraigram *Thana* has been prepared (Kumar, 1988). In the legend, four different units of moisture status have been described on the basis of moisture storage capacity of different soils in dry season depending on availability of soil moisture to plants /crops. These units of moisture status are: >250mm, 250-150mm, 151-71mm and <71 mm of water /100 cm and these profile have been classified as very high, high medium and low, respectively.

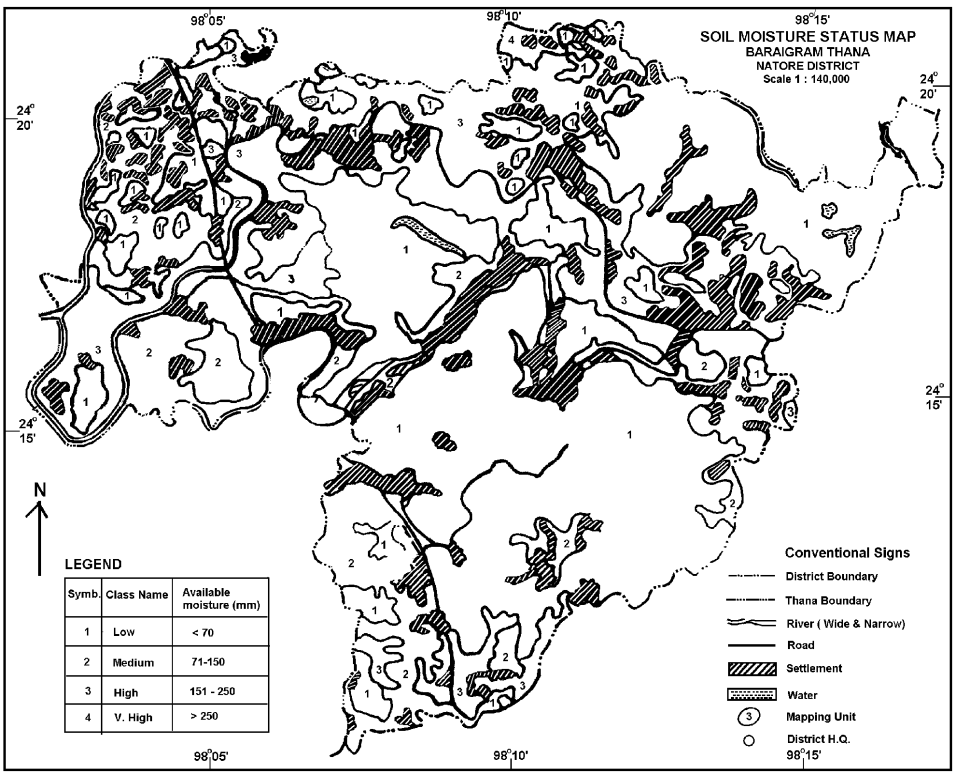

Fig. 2. Soil-moisture status map of Baraigram *Thana*, Natore (Source: SRDI, 1993).

Table 1. Soil and land resource information of *Baraigram Thana*, Natore.

Physiography	Mapping Unit		Non Agricultural Land (ha.)	Land form	Agricultural Land				SurfaceWater Drainage Condition	Available Water	Remarks
					Land type		Soil group				
	Symbol	Area (ha.)			Type	Area (ha.)	Name	Area (ha.)			
Ganges Floodplain	1	2,391	239	Ridge	Highland	1,913	Sara	956	Very arly	High	Mainly irregular land
					Medium	239	Gopalpur	957	Very arly	Medium	
					Highland		Ishurdi	239	Early	Low	
	2	3,600	180	Ridge	Highland	3,060	Sara	1,080	Very early	High	
					Medium	360	Gopalpur	1,980	Very early	Medium	
					Highland		Gopalpur	180	Early	Medium	
							Ishurdi	180	Early	Low	
	3	595	--	Ridge	Medium	595	Gopalpur	178	Early	Medium	
					Highland		Ishurdi	417	Early	Low	
	4	4,796	--	Ridge	Medium	4,796	Ishurdi	959	Normal	Low	
				Basin	Highland		Ghior	3,837	Normal	Low	
	5	7,194	--	Basin	Medium	719	Ghoir	719	Normal	Low	
					Highland	6,475	Ghior	5,036	Normal	Low	
					Medium		Batra	1,439	Late	Low	
					Lowland						
	6	600	30	Basin	Medium	570	Ghior	240	Late	Low	Mainly flood hazard
					Lowland		Kumarkhali	380	Late	Low	
	7	5,995	300	Basin	Lowland	4,796	Ghior	1,491	Late	Low	Mainly flood hazard
					Very Lowland	899	Batra	3,297	Very late	Low	
							Batra	899	Very late	Low	
Miscellanaeus Settlement		3,596	3,236	Ridge	Highland	360	Madeland	360	Very early	High	
Water bodies		902	902								
River		304	304								
Total		29,973	5,191					24,782			

Source: Kumart, 1988.

Tables 2a-2c have provided important information regarding soil moisture. From this information, a legend of the moisture status map has been developed. From research work done by Rahman and Joshua (1982-83). It has been found that Sara soil series has the highest moisture storage capacity of 28.25 vol.% and Ishurdi soil series has the lowest 16.0 vol%. Gopalpur soil series has 20.5 vol.% moisture availability in the Ganges river floodplain.

Table 2a. Average moisture availability for soils of different textural class in Ganges flood plain.

Soil condition	Average moisture content (vol. %)		
	Sil (Sara)	Sicl (Gopalpur)	Sic/C (Ishurdi & Ghoir)
Permanent wilting percentage	12	23	28
Available moisture	28.25	20.5	16
Readily available moisture	18.25	8.75	7.5
Available moisture in 100 cm soil	282 mm	205 mm	160 mm
Readily available moisture in 100 cm soil	185 mm	87 mm	75 mm

Source: Rahman and Joshua, 1982-83.

Table 2b. Monthly total evapotranpiration of pulses and wheat in Ganges flood plain.

	Evapotranpiration (mm)					
Crop	Oct.	No.	Dec.	Jan.	Feb.	Total
Pulses*						
(a)	20	70.2	113.4	59.4	--	263
(b)	--	41.4	84.6	113.4	21.6	261
Wheat**	--	13.5	77.4	113.4	70.2	274

* Pulse (a) sown on Oct. 10th, and (b) on Nov. 1; ** Wheat sown on Nov. 15th. Source: Rahman and Joshua, 1982-83.

Table 2c. Evapotranspiration rate (mm/day).

Dist.	Jan	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Pabna	3.4	4.2	6	7.2	6.7	4.6	4.7	4.4	4.7	4.9	3.8	3.1

Source: Rahman and Joshua, 1982-83.

Table 3 shows the monthly evapotranspiration (ET) crop, effective rainfall (ER), soil moisture storage (SM) and net irrigation requirement (IR) for different sowing time of wheat. From these data, it has been found that total ET crop from 15th November to 5th March growing period, 1st December to 20th March and 15th December to 4th April are 274.3 mm, 290.0mm and 323.1 mm, respectively. Moisture storage for SR (Sara), SICL(Gopalpur) and SIC/C (Ishurdi, Ghior) are 180mm, 88mm and 75 mm, respectively. ER is zero throughout the growing period. Net irrigation (IR) of SIL, SICL and SIC/C are 94.2 mm, 186.2 mm and 200 mm during 15th November to 5th March and IR of these above soils are 110 mm, 202mm and 214.8mm in 1st December to 20th March IR of the above soils are 143.1mm, 235.1mm and 247.9mm on 15th December to 4th April. From the data, it has been found that SIL soil is the best suited for its low cost having low amount of irrigation and SIC/C is the least suited for the highest cost for irrigation.15th November to 5th March is the best period for low amount of irrigation required for all soils.

Table 3. Monthly evapotranspiration (ET crop), effective rainfall (ER), soil moisture storage (SM) and net irrigation requirement (IR) for different sowing time of wheat.

ET crop (mm)	Texture	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Total
Nov. 15-Mar. 5		16.7	71.1	110.7	69.7	6	--	274.3
Dec. 1- Mar. 20		--	43.9	92.6	123.5	30	--	290
Dec. 15- Apr. 4		--	13.6	78	105.8	118.5	7.2	323.1
ER		0	0	0	0	0	0	0
SM (mm)	SIL	--	-	-	180	-	-	-
	SICL	--	-	-	88	-	-	-
	SIC/C	--	-	-	75	-	-	-
Net IR (mm)	SIL	0	0	18.5	69.7	6	-	94.2
Nov. 15- Mar. 5	SICL	0	0	110.5	69.7	6	-	186.2
	SIC/C	0	13.5	110.7	69.7	6	-	200
Dec. 1- Mar. 20	SIL	-	0	0	80	30	-	110
	SICL	-	0	48.5	123.5	30	-	202
	SIC/C	-	0	61.3	123.5	30	-	214.8
Dec. 15- Apr. 4	SIL	-	0	0	17.4	118.5	7.2	143.1
	SICL	-	0	3.6	105.8	118.5	7.2	235.1
	SIC/C	-	0	16.6	105.8	118.5	7.2	247.9

Source: Rahman and Joshua, 1982-83.

Conclusion

This is one kind of procedure to utilize *Thana Nirdeshika* in development planning of local agriculture. In this paper, information regarding soil, its properties and water storage capacity have been taken into account for irrigation requirement for dry land *rabi* crops. It means that moisture status map will be helpful for planning in irrigated and non irrigated areas and irrigation scheduling.

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