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# Evaluation of Physical Properties of Irrigated Soils of Morbi District of Saurashtra Region of Gujarat

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**ABSTRACT**

*Geographical co-ordination of Morbi city is $22^0$49' East (longitude) and $70^0$50' North (latitude) in the state of Gujarat India, known as Kathiawar or Saurashtra. Morbi is a newly formed district with an area of 4871.5 Sq. km. The Morbi district consist of 5 talukas viz., Wankaner, Tankara, Morbi, Halvad and Maliya Miyana. Thirty surface (0-15 cm) soil samples were collected from each talukas of Morbi district viz., Tankara, Wankaner, Morbi, Halvad and Maliya-Miyana. The physical characteristics properties of the soils were determined by using standard methods. The soils of Morbi have overall values of bulk density, particle density, total porosity, and MWHC varied from 1.20 to 1.66 Mg $m^{-3}$, 0.75 to 3.44 Mg $m^{-3}$, 22.37 to 66.73 per cent and 11.57 to 60.34 per cent with mean value of 1.40 Mg $m^{-3}$, 2.52 Mg $m^{-3}$, 44.80 per cent and 40.63 per cent, respectively.*

***Key words:*** *Physical properties of soils, Bulk density, Particle density, Porosity, MWHC*

## INTRODUCTION

Maintenance of favourable physical environment in soil is a prerequisite in soil management for the better plant growth in sustainable agriculture. The soil physical condition consisting of different parameters like bulk density, particle density, porosity, MWHC and expansion are the reflections of moisture content and genetic characteristics. Many of these soils have suitable topography and physical as well as chemical conditions for irrigated agriculture, but are still under-utilized. Little is known about the morphology and physico-chemical properties of these soils. The soils of sand dune fields have been ignored because of being low in productivity and due to their weak manifestation of pedogenic development compared to the other soils. Such information for newly formed Morbi district of Saurashtra region of Gujarat was lacking. Therefore, an attempt has been made to study the some important physical properties of cultivated farmer's field of Morbi district of Saurashtra region of Gujarat.

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## RESOURCE AND RESEARCH METHODS

Geographical co-ordination of Morbi city is $22^0$49' East (longitude) and $70^0$50' North (latitude) in the state of Gujarat India, known as *Kathiawar* or Saurashtra. This district bounded on the Kutch district in North, Surendranagar district in East, Rajkot district in the South and Jamnager district in the West. The Gulf of Kutch lies to the North-West of the district about 35 km from the Morbi city. Morbi is a newly formed district with an area of 4871.5 Sq. km. The Morbi district consist of 5 talukas *viz.*, Wankaner, Tankara, Morbi, Halvad and Maliya Miyana Thirty surface soil samples (0-15 cm) were collected from each of the five talukas of Morbi district, *viz.*, Tankara, Wankaner, Morbi, Halvad and Maliya-Miyana during May, 2014. Soil samples were air dried, ground carefully with a wooden mortar and pestle to break soil samples and passed through 2 mm sieve. The bulk density, particle density, total porosity were dermined as per methods described by Page *et al.*[4] and Richards[6], while maximum water holding capacity were determined as per methods described by Piper[5], respectively.

**Table 1: Talukawise range and mean values for bulk density, partical density, porosity and MWHC of soil of Morbi district**

| Name of talukas | Bulk density (Mg $m^{-3}$) | Particle density (Mg $m^{-3}$) | Porosity (%) | MWHC (%) |
|---|---|---|---|---|
| **Tankara** | 1.20-1.44 (1.31)* | 1.96-2.98 (2.47)* | 34.52-59.26 (45.93)* | 39.65-56.78 (45.87)* |
| **Wankaner** | 1.24-1.50 (1.35)* | 2.08-2.92 (2.50)* | 32.85-53.80 (45.40)* | 28.62-49.57 (41.75)* |
| **Morbi** | 1.24-1.56 (1.34)* | 1.76-2.87 (2.38)* | 24.88-55.17 (44.43)* | 25.80-60.34 (44.45)* |
| **Halvad** | 1.25-1.66 (1.43)* | 2.04-3.44 (2.55)* | 22.37-66.73 (43.75)* | 20.74-47.74 (34.21)* |
| **Maliya Miyana** | 1.31-1.50 (1.40)* | 2.11-2.92 (2.48)* | 36.02-49.87 (43.48)* | 11.57-50.28 (36.86)* |
| **Overall** | 1.20-1.66 (1.40)* | 1.76-3.44 (2.52)* | 22.37-66.73 (44.60)* | 11.57-60.34 (40.63)* |

* Values in parenthesis are mean values

## RESEARCH FINDINGS AND DISCUSSION

The data on bulk density, particle density, porosity and MWHC obtained from the present investigation are presented in Table 1. The bulk density value is commonly used as an index of soil physical conditions. The bulk density values of the soils for the entire district were ranging from 1.20 to 1.66 with a mean value of 1.40 Mg $m^{-3}$. The lowest bulk density (1.31 Mg $m^{-3}$) was recorded in a sample collected from Tankara taluka. The data further revealed that the lowest (1.31 Mg $m^{-3}$) and highest (1.43 Mg m-3) mean value were recorded in Tankara and Halvad talukas, respectively. The overall particle density was varied from 1.76 to 3.44 with mean value of 2.52 Mg $m^{-3}$. The lowest (2.38 Mg $m^{-3}$) and highest (2.55 Mg $m^{-3}$) values were recorded in a samples collected from Morbi and Halvad talukas, respectively. The data further revealed that the lowest (1.76 Mg $m^{-3}$) and highest (3.44 Mg $m^{-3}$) mean values were obtained in the soils of Morbi and Halvad talukas, respectively. These results are in conforming with an earlier repoted by Ogunwale and Isa[3]; Savalia *et al.*[8]; Shirgire[9] and Gandhi[2]. The overall pore space ranged from 22.37 to 66.73 with a mean value of 44.60 per cent. The lowest (22.37 %) and highest (66.73 %) pore space value was recorded in a sample collected from Halvad taluka, respectively. The data

further revealed that the lowest (43.48 %) and the highest (45.93 %) mean values were recorded in the samples collected from Maliya Miyana and Tankara talukas. These finding are parallel to those of Savalia[7] who suggested that the total porosity less than 40 per cent in the soils indicates the poor air-moisture regime. The overall MWHC of soils of Morbi district varied from 11.57 to 60.34 with a mean value of 40.63 per cent. The lowest (11.57 %) and highest (60.34 %) MWHC values were recorded in the samples collected from Maliya Miyana and Morbi talukas, respectively. The lowest (34.21 %) and highest (45.87 %) mean values were obtained in the soils of Halvad and Tankara talukas. Similar results were reported for Savalia[7] and Gandhi[2]. These differences were due to the variation in depth, clay, silt and organic carbon content in soils[10]. These results are in conformity with an earlier reports of Ogunwale and Isa[3], Savalia *et al.*[8] and Chauhan and Polara[1].

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