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# Soil-site Suitability for Commonly Growning Crops in Srikalahasthi Mandal of Chittoor District, Andhra Pradesh

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**ABSTRACT**

Survey was undertaken in Srikalahasthi mandal of Chittoor district to evaluate the suitability of soils for rice, groundnut, sugarcane, sorghum and chickpea crops. The soil belongs to Entisols, Inceptisols and Alfisols. The major limitations in pedons 1 (Typic Ustipsamments) were pH and organic carbon. Pedon 2 (Vertic Haplustepts) and pedon 4 (Typic Haplustepts) showed wetness, texture, pH (except for pedon 2) and organic carbon as limitations. Pedon 5 (Typic Haplustalfs), pedon 6 (Typic Ustifluvents) and pedon 7 (Typic Haplustepts) exhibited wetness, texture, pH and organic carbon as the limitations. Pedons 3 (Typic Ustorthents) had wetness, texture, $CaCO_3$, depth, pH and organic carbon as the major limitations. The limitation levels of the land characteristics varied from crop to crop. The suitability classes can be improved if the correctable limitations (soil fertility characteristics) were altered through soil amelioration measures.

**Key words:** Crop suitability, Land evaluation Limitations.

The variability in soil influences the use of different soils for different purpose and application of suitable management practices for maximizing the agricultural production. Each plant species requires definite soil and site conditions for its optimum growth. These illustrate how soil depth, soil texture, salinity and drainage condition are related to soil quality. The objectives of such soil-site suitability evaluation studies have been to predict and classify land into different suitability classes for plant growth (Sehgal, 1996). Information on soil site suitability for commonly growing crops in Srikalahasthi mandal is very much lacking. Hence, an attempt has been made to evaluate the soil suitability for five commonly growing crops *viz.,* rice, groundnut, sugarcane, sorghum and chickpea on Entisols, Inceptisols and Alfisols of Srikalahasthi mandal in Chittoor district, Andhra Pradesh.

## MATERIAL AND METHODS

### Study area

Srikalahasthi mandal lies in between 14°13' and 14°49' N latitude and 79°38' and 79°41' E longitude. The study area was covered by alluvium, weathered granite containing plagioclase with pegmatite veins and granite-gneiss parent material (Table 1). The climate was semi-arid monsoonic with distinct summer, winter and rainy seasons. The mean annual rainfall was 1031.07 mm of which 90 per cent was received during June to December. The mean annual temperature was 27.7 °C with mean summer temperature of 31.77 °C and the mean winter temperature of 23.6 °C. The maximum temperature was in the May that rises to 38.83 °C and the minimum temperature registered was 18.13 °C in the month of December. The soil moisture regime was *ustic* and soil temperature regime was i*so-hyperthermic* (Soil Survey Staff, 1999). The natural vegetation comprises of *Tridax procumbens, Parthenium hysterophorus, Prosopis juliflora, Calotropis gigantia, Acacia nilotica, Cynodon dactylon, Cyprus rotundus, Pongamia pinneta, Azadirachta indica etc*.

### Methodology

Seven typical pedons were studied on defined land forms (plains and uplands) representing Srikalahasthi mandal for their morphological characteristics following the procedure given by Soil Survey Staff (1951). Horizon-wise soil samples were collected from the typifying pedons which were analyzed for their physical, physico-chemical and chemical properties following the standard procedures (Table 2). Soils were classified

according to Soil Taxonomy (Soil Survey Staff, 1999). These pedons were selected for evaluation and their suitability assessed using limitation method regarding number and intensity of limitations (Sys *et al.,* 1991).

The landscape and soil requirements for these crops (Sys *et al.,* 1991) were matched with generated data at different limitation levels: no (0), slight (1), moderate (2), severe (3) and very severe (4). The number and degree of limitations suggested the suitability class of pedons for a particular crop (Sys *et al.,* 1991). The potential land suitability (Table 3) sub-classes were determined after considering the improvement measures to correct these limitations (Sys *et al.,* 1991).

## RESULTS AND DISCUSSION

Equivalent soil characteristics were given in table 1 and the site and weighted means of soil characteristics were given in table 2. These soils were developed from alluvium, weathered granite containing plagioclase with pegmatite veins and granite-gneiss parent material. The kind and degree of limitations for the five commonly growing crops were presented in table 3. Soils with no or only four slight limitations were grouped under suitability class (S1) (very suitable); soils with more than four slight limitations, and / or with more than three moderate limitations under moderately suitability class (S2); soils with more than three moderate limitations, and / or one or more severe limitations(s) under marginally suitable (S3) class; the soils with very severe limitations which can be corrected under N1 (currently not suitable); and soils with very severe limitations which cannot be corrected grouped under unsuitable class N2 (Sys *et al.,* 1991). This method also identifies the dominant limitations that restrict the crop growth in the sub-class symbol such as climatic (c), topographic (t), wetness (w), physical soil characteristics (s), soil fertility (f) and soil salinity / alkalinity (n). The suitability classes and sub-classes were decided by the most limiting soil characteristics. The studied soils vary in their suitability for different crops according to the criteria for the determination of the land suitability classes (Table 3).

Pedon 1 was grouped under Typic Ustipsamments. Pedon 1 was marginally suitable (S3) for crops like rice, groundnut, sugarcane, sorghum and chickpea (Table 3). The severe limitation of organic carbon and slight limitation of pH were major limitation factors in all the five crops. So the organic carbon status in these soils can be improved by the application of farm yard manure, green manuring and inclusion of legumes in rotation and pH can be controlled by application of organic manures and sulphur. Organic carbon and pH were the major problems for rice and sorghum whereas organic carbon, pH and $CaCO_3$ were the major limitations for groundnut, sugarcane and chickpea.

Pedon 2 was classified under Vertic Haplustepts and was marginally suitable (S3) for all the five crops (Table 3). The moderate limiting factors for the growth of rice and sorghum in this soil were wetness and texture with severe limitation of organic carbon. Texture was a limitation for all crops and this can be improved by mixing the soil with tank silt year after year. Organic carbon status in these soils can be improved by the application of farm yard manure, green manuring and inclusion of legumes in rotation. Vertic Haplustepts were found to be marginally suitable (S3) for chickpea (Satyavathi and Suryanarayan Reddy, 2004).

Pedon 3, which was grouped under Typic Ustorthents was marginally suitable (S3) for crops like rice, groundnut, sugarcane, sorghum and chickpea (Table 3) and these suffer from the constraints like wetness, texture, soil depth, $CaCO_3$, pH and organic carbon. The moderate limiting factors for the growth of rice and sorghum in this soil was soil depth with severe limitation of organic carbon and slight limitation of wetness, texture and soil pH. The moderate limiting factors for groundnut and sugarcane were soil depth and $CaCO_3$ with severe limitation of organic carbon and slight limitation of wetness, texture and pH. The moderate limiting factor for groundnut and sugarcane was soil depth with severe limitation of organic carbon and slight limitations of wetness, texture, $CaCO_3$ and pH. The organic carbon status in these soils can be improved by the application of farm yard manure, green manuring and inclusion of legumes in rotation and pH can be controlled by application of organic manures and sulphur. Satish Kumar (2007) reported that Typic Ustorthents were marginally suitable for growing rice crop.

Table 1. Relevant characteristics of the selected pedons

| Depth (cm) | Sand (2-0.05) | Silt (0.05-0.002) mm | Clay (<0.002) | $CaCO_3$ (%) | CEC (cmol($p^+$) $kg^{-1}$ soil) | Sum of basic cations (cmol($p^+$) $kg^{-1}$ soil) | pH (1:2.5 $H_2O$) | OC | EC (dS $m^{-1}$) | ESP |
|---|---|---|---|---|---|---|---|---|---|---|
| | — % of <2 mm soil— | | | | | | | | | |
| **Pedon 1** | **Typic Ustipsamments** | | | | | | | | | |
| 0.00-0.21 | 55.40 | 26.40 | 18.20 | 16.00 | 6.72 | 3.55 | 7.51 | 0.33 | 0.05 | 0.15 |
| 0.21-0.39 | 60.30 | 24.30 | 15.40 | 6.50 | 5.83 | 3.45 | 7.35 | 0.29 | 0.02 | 0.51 |
| 0.39-0.56 | 80.10 | 10.30 | 9.60 | 12.50 | 6.90 | 3.69 | 7.32 | 0.19 | 0.01 | 0.43 |
| 0.56-0.73 | 80.50 | 6.70 | 12.80 | 8.50 | 7.22 | 3.83 | 7.27 | 0.13 | 0.02 | 0.55 |
| 0.73-0.92 | 86.50 | 6.50 | 7.00 | 9.50 | 7.95 | 4.40 | 7.21 | 0.15 | 0.04 | 0.75 |
| 0.92-1.13 | 88.20 | 6.20 | 5.60 | 7.50 | 5.63 | 3.19 | 7.18 | 0.11 | 0.08 | 0.53 |
| 1.13-1.38+ | 75.80 | 17.40 | 6.80 | 13.00 | 6.24 | 3.52 | 7.12 | 0.15 | 0.02 | 0.02 |
| **Pedon 2** | **Vertic Haplustepts** | | | | | | | | | |
| 0.00-0.22 | 36.70 | 24.80 | 38.50 | 14.00 | 25.86 | 17.26 | 6.62 | 0.42 | 0.02 | 0.50 |
| 0.22-0.41 | 35.40 | 24.20 | 40.40 | 12.50 | 30.46 | 18.92 | 6.58 | 0.16 | 0.01 | 0.33 |
| 0.41-0.61 | 30.90 | 23.80 | 45.30 | 11.50 | 33.96 | 20.14 | 6.86 | 0.15 | 0.01 | 0.47 |
| 0.61-0.79 | 40.20 | 16.50 | 43.30 | 20.50 | 33.04 | 21.20 | 7.35 | 0.22 | 0.01 | 0.45 |
| 0.79-1.16 | 42.80 | 18.70 | 38.50 | 14.00 | 28.12 | 17.41 | 7.21 | 0.13 | 0.03 | 0.36 |
| 1.16-1.70 | 50.30 | 21.30 | 28.40 | 16.50 | 20.08 | 14.04 | 7.26 | 0.06 | 0.20 | 0.69 |
| **1.70** | **Weathered gneiss mixed with soils** | | | | | | | | | |
| **Pedon 3** | **Typic Ustorthents** | | | | | | | | | |
| 0.00-0.20 | 54.80 | 24.80 | 20.40 | 9.00 | 12.22 | 10.03 | 7.29 | 0.43 | 0.02 | 0.73 |
| 0.20-0.39 | 56.80 | 22.40 | 20.80 | 10.50 | 12.87 | 10.29 | 7.33 | 0.23 | 0.02 | 0.93 |
| 0.39-0.67 | 61.50 | 21.20 | 17.30 | 12.50 | 17.98 | 13.09 | 7.31 | 0.17 | 0.01 | 0.78 |
| **0.67** | **Weathered material mixed with soil** | | | | | | | | | |
| **Pedon 4** | **Typic Haplustepts** | | | | | | | | | |
| 0.00-0.20 | 36.21 | 24.70 | 30.60 | 13.50 | 24.07 | 19.73 | 7.45 | 0.33 | 0.03 | 0.88 |
| 0.20-0.39 | 38.43 | 29.48 | 25.70 | 18.50 | 23.14 | 19.55 | 7.72 | 0.21 | 0.04 | 0.89 |
| 0.39-0.57 | 32.41 | 47.11 | 20.30 | 5.50 | 32.49 | 27.81 | 7.71 | 0.13 | 0.02 | 0.83 |
| 0.57-0.73 | 49.21 | 26.41 | 19.80 | 10.50 | 29.61 | 25.71 | 7.77 | 0.17 | 0.02 | 0.83 |
| 0.73-0.93 | 44.21 | 14.47 | 20.40 | 17.00 | 34.01 | 25.81 | 7.81 | 0.11 | 0.02 | 0.79 |
| **0.93** | **Granite containing plagioclase feldspars with pegmatite veins** | | | | | | | | | |
| **Pedon 5** | **Typic Haplustalfs** | | | | | | | | | |
| 0.00-0.19 | 60.50 | 18.80 | 20.70 | 11.50 | 17.33 | 12.67 | 7.80 | 0.54 | 0.05 | 0.46 |
| 0.19-0.48 | 51.40 | 18.00 | 30.60 | 12.50 | 20.86 | 12.66 | 7.80 | 0.13 | 0.02 | 1.06 |
| 0.48-0.73 | 42.80 | 21.40 | 35.80 | 7.50 | 27.44 | 21.76 | 7.85 | 0.04 | 0.02 | 0.26 |
| 0.73-1.10 | 34.60 | 21.20 | 44.20 | 15.00 | 33.69 | 19.42 | 7.95 | 0.12 | 0.04 | 0.33 |
| 1.10-1.60+ | 39.80 | 29.40 | 30.80 | 6.00 | 21.17 | 14.70 | 7.81 | 0.07 | 0.10 | 0.57 |
| **Pedon 6** | **Typic Ustifluvent** | | | | | | | | | |
| 0.00-0.20 | 56.40 | 21.10 | 22.50 | 5.50 | 17.49 | 11.42 | 7.61 | 0.26 | 0.02 | 0.51 |
| 0.20-0.38 | 58.90 | 21.30 | 19.80 | 6.00 | 14.99 | 9.96 | 7.65 | 0.12 | 0.03 | 0.40 |
| 0.38-0.76 | 60.40 | 22.00 | 17.60 | 7.50 | 13.31 | 10.31 | 7.77 | 0.11 | 0.03 | 0.45 |
| 0.76-0.99 | 70.30 | 19.00 | 10.70 | 4.50 | 9.94 | 6.67 | 7.82 | 0.17 | 0.01 | 0.70 |
| 0.99-1.19 | 79.60 | 11.80 | 8.60 | 8.00 | 6.00 | 4.46 | 7.76 | 0.16 | 0.04 | 0.67 |
| 1.19-1.50+ | 88.50 | 8.50 | 3.00 | 6.00 | 8.91 | 5.62 | 7.71 | 0.14 | 0.03 | 0.11 |
| **Pedon 7** | **Typic Haplustepts** | | | | | | | | | |
| 0.00-0.20 | 36.90 | 22.80 | 40.30 | 12.50 | 30.24 | 25.85 | 7.13 | 0.39 | 0.02 | 0.03 |
| 0.20-0.47 | 40.20 | 17.30 | 42.50 | 10.00 | 32.59 | 25.57 | 7.17 | 0.17 | 0.01 | 0.43 |
| 0.47-0.76 | 35.40 | 27.80 | 36.80 | 8.50 | 28.81 | 22.15 | 7.33 | 0.11 | 0.02 | 0.14 |
| 0.76-1.10 | 39.30 | 29.80 | 30.90 | 6.50 | 24.29 | 18.23 | 7.19 | 0.13 | 0.02 | 0.16 |
| 1.10-1.50+ | 40.80 | 29.70 | 29.50 | 15.00 | 24.12 | 17.61 | 7.08 | 0.10 | 0.02 | 0.12 |

Table 2. Site and soil characteristics of pedons.

| Pedon | Land form | Wetness (w)Drainage | Soil depth (m) | $CaCO_3$(%) | Apparent CEC (cmol (p+) $kg^{-1}$ clay) | Sum of basic cations (cmol(p+) $kg^{-1}$soil) | BSP (%) | pH (1:2.5) | OC (%) | EC (dS $m^{-1}$) | ESP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P1 | plain | Excessively drained | 1.38 | 10.51 | 49.22 | 3.53 | 56.03 | 7.48 | 0.32 | 0.04 | 0.75 |
| P2 | plain | Somewhat poorly drained | 1.70 | 10.70 | 72.51 | 17.45 | 65.62 | 6.62 | 0.39 | 0.01 | 0.47 |
| P3 | upland | Moderately well drained | 0.67 | 16.05 | 75.24 | 10.10 | 78.41 | 7.30 | 0.39 | 0.04 | 0.79 |
| P4 | upland | Somewhat poorly drained | 0.93 | 12.53 | 68.25 | 19.69 | 83.18 | 7.50 | 0.31 | 0.03 | 0.43 |
| P5 | plain | Moderately well drained | 1.60 | 11.73 | 80.88 | 12.67 | 74.94 | 7.80 | 0.44 | 0.04 | 0.77 |
| P6 | plain | Moderately well drained | 1.50 | 6.03 | 76.35 | 11.13 | 69.99 | 7.62 | 0.23 | 0.02 | 0.51 |
| P7 | plain | Poorly drained | 1.50 | 6.81 | 76.67 | 25.89 | 77.10 | 7.14 | 0.35 | 0.02 | 0.43 |

Topography (slope) (t) : <3%
Flooding : F0 : Climate (c) : Semi-arid monsoonic

Pedons 4 and 7 which were grouped under Typic Haplustepts were marginally suitable (S3) for crops like rice, groundnut, sugarcane, sorghum and chickpea (Table 3). Rice and groundnut have moderate limitations of wetness, texture with severe limitation of organic carbon and slight limitation of pH and $CaCO_3$ in pedon 4 whereas pedon 7 have severe limitation of wetness and organic carbon with moderate limitation of texture and slight limitation of $CaCO_3$ and pH. Leelavathi *et al.* (2007) reported that Typic Haplustepts were marginally suitable (S3) for growing paddy crop in Yerpedu mandal of Chittoor district, Andhra Pradesh.

Pedon 5 classified under Typic Haplustalfs was marginally suitable (S3) for growing rice, groundnut, sugarcane, sorghum and chickpea (Table 3). This soil has limitations of wetness, $CaCO_3$, soil characteristics like texture and fertility characteristics like pH and organic carbon. However, texture can be improved by mixing the soil with tank silt year after year. Rice and sorghum have moderate limitation of organic carbon and slight limitations of wetness, texture and pH whereas groundnut, sugarcane and chickpea have moderate limitation of organic carbon and slight limitations of wetness, texture, $CaCO_3$ and pH.

Pedon 6 which was grouped under Typic Ustifluvents was marginally suitable (S3) for rice, groundnut, sugarcane, sorghum and chickpea (Table 3). The limitations were wetness, physical soil characteristics (texture and depth) and soil fertility characteristics (pH and organic carbon). So the organic carbon status in these soils can be improved by the application of farm yard manure, green manuring and inclusion of legumes in rotation. Texture was a limitation for all crops and this can be improved by mixing the soil with tank silt year after year. Satish Kumar (2007) reported that Typic Ustifluvents were marginally suitable for growing rice crop.

In conclusion, the soil-site suitability evaluation of study area revealed that all the pedons were marginally suitable (S3) for growing rice, groundnut, sugarcane, and sorghum and chickpea crop. Pedon 1 was marginally suitable (S3) for growing all the five crops with major limiting factors of organic carbon and pH. Pedons 2 and 4 were marginally suitable for rice, groundnut, sugarcane, sorghum and chickpea with major limitation of wetness, texture, pH and organic carbon whereas Pedons 3, 5 and 6 were marginally suitable for rice, groundnut, sugarcane, sorghum and chickpea with

Table 3. Limitation levels of the land characteristics and land suitability classes.

| Soil | Crop | Wetness (w) drainage | Physical soil characteristics (s) | | | Soil fertility characteristics (f) | | | OC (%) | Alka-linity (n) | | Actual land suitability sub-class | Potential land suitability sub-class |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Texture | Coarse fragments (vol. %) | Soil depth (cm) | $CaCO_3$ (%) | Sum of basic cations (cmol (p+) $kg^{-1}$ soil) | pH 1:2:5 | | ECe | ESP | | |
| Typic Ustipsamment | Rice | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | S3f | S1 |
| | Groundnut | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 3 | 0 | 0 | S3f | S1 |
| | Sugarcane | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 3 | 0 | 0 | S3f | S1 |
| | Sorghum | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | S3f | S1 |
| | Chickpea | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 3 | 0 | 0 | S3f | S1 |
| Vertic Haplustepts | Rice | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | S3fw | S1w |
| | Groundnut | 2 | 2 | 0 | 0 | 1 | 0 | 0 | 3 | 0 | 0 | S3fw | S1w |
| | Sugarcane | 2 | 2 | 0 | 1 | 1 | 0 | 0 | 3 | 0 | 0 | S3fw | S1ws |
| | Sorghum | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | S3fw | S1w |
| | Chickpea | 2 | 2 | 0 | 1 | 1 | 0 | 0 | 3 | 0 | 0 | S3fw | S1ws |
| Typic Ustorthents | Rice | 1 | 1 | 0 | 2 | 0 | 0 | 1 | 3 | 0 | 0 | S3fsw | S1sw |
| | Groundnut | 1 | 1 | 0 | 2 | 2 | 0 | 1 | 3 | 0 | 0 | S3fsw | S1sw |
| | Sugarcane | 1 | 1 | 0 | 2 | 2 | 0 | 1 | 3 | 0 | 0 | S3fsw | S1sw |
| | Sorghum | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 3 | 0 | 0 | S3fsw | S1sw |
| | Chickpea | 1 | 1 | 0 | 2 | 1 | 0 | 1 | 3 | 0 | 0 | S3fsw | S1sw |
| Typic Haplustepts | Rice | 2 | 2 | 0 | 1 | 1 | 0 | 1 | 3 | 0 | 0 | S3fsw | S1ws |
| | Groundnut | 2 | 2 | 0 | 1 | 1 | 0 | 1 | 3 | 0 | 0 | S3fsw | S1ws |
| | Sugarcane | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | S3fw | S1w |
| | Sorghum | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | S3sw | S1w |
| | Chickpea | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | S3fw | |
| Typic Haplustalfs | Rice | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | S3fw | S1w |
| | Groundnut | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 3 | 0 | 0 | S3fw | S1w |
| | Sugarcane | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 3 | 0 | 0 | S3fw | S1w |
| | Sorghum | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | S3fw | S1w |
| | Chickpea | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 3 | 0 | 0 | S3fw | S1w |
| Typic Ustifluvents | Rice | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | S3fw | S1w |
| | Groundnut | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 3 | 0 | 0 | S3fw | S1w |
| | Sugarcane | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 3 | 0 | 0 | S3fw | S1w |
| | Sorghum | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | S3fw | S1w |
| | Chickpea | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | S3fw | S1w |
| Typic Haplustepts | Rice | 3 | 2 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | S3fw | S3w |
| | Groundnut | 3 | 2 | 0 | 0 | 1 | 0 | 1 | 3 | 0 | 0 | S3fw | S3w |
| | Sugarcane | 3 | 2 | 0 | 0 | 1 | 0 | 1 | 3 | 0 | 0 | S3fw | S3w |
| | Sorghum | 3 | 2 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | S3fw | S3w |
| | Chickpea | 3 | 2 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | S3fw | S3w |

Limitations : 0- No; 1-Slight; 2-Moderate; 3-Severe, 4-Very severe Suitability classes : f-Soil fertility limitations; s-Physical soil limitations; w-Wetness limitations; n-Salinity (and / or alkalinity) limitations.

major limitation of wetness, texture, $CaCO_3$, pH and organic carbon. However, pedon 7 was marginally suitable (S3) with severe limitations of wetness and organic carbon. All the pedons (1, 2, 3, 4, 5, 6 and 7) had organic carbon content as severe limitation for growing rice, groundnut sorghum, chickpea and sugarcane. Improper drainage was severe limitation for pedon 7. Texture was a limitation in pedons 2, 4 and 7. Shallow depth was a major limitation for pedons 3 and 4. By correcting the above limitations sustainable yields can be achieved in rice, groundnut, sugarcane, sorghum and chickpea.

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