The present investigation entitled to "Study on soil genesis, Land evaluation and nutrient status of some Entisols and Inceptisols of district Bulandshahr." The review of literature followed this chapter under following sub-heads.

1. Soil genesis and classification.

2. Land evaluation and land suitability classification.

3. Nutrient status for different soils series.

1. Soil genesis and classification:

Mukherjee and Agarwal (1947), have reported that soils formed on gangatic alluvium in the semi arid region of central Uttar Pradesh showed evidence that salinisation and desalinisation as influenced by topography were the main soil-forming processes, whereas the dominate processes in the sub humid region. (Agarwal and Mukherji 1951) were classification and declassification. The studies further showed that soils with precipitated lime throught the profile, soils with a zone of calcium accumulation in the lower horizons of the profile and soils free of calcium were associated with their phases in the toposequence of the entire landscape.
Gupta et al. (1957) in their studies on pedochemical characteristics of gray hydromorphic Dhankar soils of loam to clay loam texture in the lower Gangatic plains of U.P. have attributed hydromorphic nature of the soils of flat basins and lowlands that are away from the drainage channels to their characteristics physiographic position in the landscape. These soils have a horizon of Kankar carbonate concretions formation at the depth to which eluviation is confined. The process of gleization is dominate in the lowland soils with iron manganese nodules in the B horizon, whereas in their upland counterparts the profiles are leached of alkaline earth carbonates and concretions and iron nodules normally absent. The reaction is natural to mildly acid.

Agarwal et al. (1958) and Gupta et al. (1960) have similarly reported on the karail soils of estern U.P. derived from the fine textured alluvium of basaltic origin transported through the streams of Bundelkhand. As for morphology and chemistry, these soils resemble the mar and kabar soils Bundelkhand and the requirs of central India, but differ from the soil of associated alluvium of the Gangatic plain.

Mukherji (1965) has brought out the differences in soil formation attributable to nature of the alluvium and physiographic differences. He observed processes of salinisation, alkaliization and those leading to the formation of degraded saline alkaline soils. In the Ganga's plain, soils on young alluvial plains, alluvial plains and terraces have slightly developed soils that show compaction and slight illuviation and leaching. Whereas soils of recent flood plains show lack of horizonation in the stratified soil material. Sinha et al. (1985) in their study of heavy soils in the Gangatic plains of Bihar, distinguished
soils that remain under water for 3 to 4 months in the year from those that are under water for a short period. The farmers have chroma of 2 with not less whereas the latter have chroma of more than 2. Organic carbon content is uniform throughout the depth. The reasons advanced for poor development of these soils are 1st cracking, swelling and consequent mulching of soils obliterating sings of illuviation of clay and 2nd youth of the deposits.

Blum (1989) studied the extent to which chemical, physical, mineralogical and biological properties provide information of value of the genetic interpretation and taxonomy of soils is discussed.

Chaudhary et. al. (1990) reported date on N, P, K, S and Mo in twenty four soil samples taken from shallow, medium and deep ravines and the surrounding flat land, on reclamation projects near the Yamuna river, Uttar Pradesh, India are presented. The contents of N, P, K, S and Mo in the soils varied widely in different categories of land, having maximum values at peripheral table - land followed by shallow ravines, medium ravines and lowest in deep ravines. Nutrient loss was shown to depend on intensity of erosion as well as on slope. The available nutrients were mostly lost by soil loss and runoff. Nutrient levels were minimum ravine - side samples, followed by top samples and maximum in bottom samples with the exception of potassium, the soils are deficient in all the nutrients studied.

Makyev et. al. (1990) studied - soil genesis of the Vladimiropol 'Y' soils, Russia, is discussed, based on relief evaluation and parent material properties. The characteristic complex soil pattern, second humus horizons
and carbonate distribution are attributed to cryogenic hydromorphic pedogenesis in the Pleistocene. The regularities of the distribution and the Holocene evolution of these characteristics are considered.

Eulinger, et. al. (1991) studied soil morphology, genesis and classification course is to teach students how to generate reasonable hypotheses to explain soil distributions on landscapes. The block diagram problem is an exercise that helps the students to teach themselves about the relationships between taxonomic names, soil properties and soil distribution, on three-dimensional landscapes. The task in the block diagram problem is to match a list of soil series to a list of taxonomic names using a block diagram and soil series descriptions. The following is provided, family names from soil Taxonomy, block diagrams, and soil series descriptions. The principles of soil morphology, genesis, and geomorphology are used to related series names to soil taxa. Ammouns, et. al. (1992) determined the objective of this study was to evaluate physical, chemical, and morphological differences between Indian mounds and an undisturbed soil to determine the degree of soil formation in the mounds. The archaeological site dated from the Mississippian period with carbon dated ranging from 930 to 1,000 A.D. only a minimum degree of horizonation (Bw) was shown in mounds 1 and 2 fine silt/total silt ratios were plotted to establish various depositions during.

Sahu et. al. (1994) studied Morphology, characteristics and classification of soil under sisal cultivation. The cation exchange capacity values vary from 52 to 24. 9 cmol (p. t.) kg Higher values of 656 in the sub surface horizons commensurate with the amount of clay.
The CEC in these soils might be attributed to clay content as the organic carbon content is very low in these layers. Cation dominates the exchange complex followed by Mg, N and K ion in saplahora and Kusamura pedone whereas Mg dominates the exchange complex of Badchir and bhandarimal series. The soil are, in general rich in bases.

Kaistha and Gupta (1994) determine morphology and charactersistics of four Entisols and Inceptisols, two from cultivated and two from uncultivated areas representing part of the northwestern Himalayas are described based on morphology and other characteristics, the soils have been classified according to soil taxonomy. The soil profile has been put into typic udorthents at sub - group level, profile 2 into typic Eutrochrepts and profiles 3 and 4 into typic udifluvents.

Syers, et. al. (1994) studies within the context of major land uses such as agriculture, the indicators of sustainability must be framed within the social and economic conditions of the society in question. Whereas an indicator is used to measure changes in key attributes, usually over time, a threshold provides a baseline against which sustainability can be assessed. A direct measure of sustainability using indicators is difficult, and indirect measures or surrogates may be easier to establish. There is some information on threshold values for indicators, particularly for indicators such as soil acidity and nutrient status, and for those relating to root physiology. Because some threshold values are soil specific, a range of values will be required for a particular indicator. There have been few case studies involving indicators and thresholds for sustainable land management. Examples of soil and land
suitability for the production Hevea brasiliensis (rubber) in Malaysia and for the management of sloping lands for annual crops in the Philippines are discussed. Bio physical indicators and thresholds for sustainable rubber production are well understood, particularly those relating to climate and soil physical factors. For sloping lands in the Philippines, yield data and benefit: cost ratios give a clear picture of trends and sustainability.

Sidhu et al. (1994) reported characterization and classification in different soil of Punjab. The soil of Punjab in north-west India have developed on alluvial deposits, reworked by aeolian action at some places. False colour composites generated from bands 2, 3 and 4 were used to delineate and evaluate soil-landscape relationships of the soils belonging to Entisol order.

Bhattacharya et al. (1994) observed Morphology and classification four ultisols from north-eastern region of India for which no information is available have been classify of soil taxonomy. The soils are acidic of low bas status and rich in organic matter in the surface horizons. CEC and EC of clay support the presence of Kambic Horizon in three pedons. The soil of Maghalaya appear to be more weathered than those of manipur.

Blank, et al. (1995) collected three pedons along a hydrologic gradient on a montane meadow of the northern Sierra Nevada range, California, USA, were characterized radiocarbon dating of charcoal indicates that meadow pedogenesis began 3600 years ago, after a catastrophic valley erosional event. Since that time, nearly 1 metre of soil has accumulated over a basal glaciolacustrine unit. Critical factors and processes influencing soil genesis.
and morphology include: season variation in soil redox, status, frigid soil temperatures additions of volcanic tephra, wildfires, and polygenesis related to Holocene climatic, hydrologic, and vegetation changes. Argillans are present on ped faces of certain soil horizons, which suggests extended dry periods at which time clay perversion occurred. Clay mineralogy is disjunct, surface horizons are dominated by kaolinite and underlying horizons by smectite. The high clay content of such youthful soils suggests rapid primary mineral weathering Charcoal-containing strata attest to frequent wildfires during the Holocene epoch. The spatial complexity of soil patterns and their properties infers that these riparian areas are dynamic, and their character may have been shaped by previous climatic patterns.

Marti, et al. (1995) discussed - The influence of the lithology and climate on soil genesis of the eastern pyrenees (Spain) was studied. Ten soil profiles were analysed classified along two altitudinal transects, from 700 to 1600 m elevation. Plant communities varied with elevation, and consistently with an increase of precipitation and a decrease of temp, from oak forest to beech forest. One transect was made on siliceous parent material (Schists, limolites) and the other on calcareous material (marls, limestones). Pedogenic carbonate content, absent in the siliceous transect, decreased with the increase of elevation. The pH, CEC, and clay content were higher in the calcareous transect than in the siliceous transect. The exchangeable complex was always saturated in the calcareous to posequence but, in the siliceous sequence, decreased with the increased of elevation. An increase of organic matter content and C:N ratio were observed with elevation, especially in the siliceous.
transect. The humus type was lime mull along the entire calcareous toposequence, while different transition type of humus between mull and moder were described in the siliceous toposequence. A decrease exchangeable cations with depth, especially in the siliceous transect, was observed. The main genetic features in the soils studied were melanization and decarbonation - recarbonation processes in the calcareous transect and desaturation processes in the siliceous transect. Soils were classified as Mollisols and Inceptisols in the calcareous to posequence and as Inceptisols in the siliceous to posequence.

Gupta et. al. (1996) determined mineralogy genesis and classification of soil of north - west Himalayas developed on different parent materials and variable topography six typical soil profiles, out of a number of them studied by reconnaissance soil survey were selected for the investigations.

Wall and Rao (1996) studied Morphology and other characteristics of six typical pedon dormed on sandstone, shala, granite and colluvium representing different landforms of Banda district of Uttar Pradesh were studied. The soil are deep of very deep, excessively to well drained reddish brown to red, mildly acidic. Low to medium in CEC medium to high in organic carbon with wide textural variations of SiO₂/R₂O₂ are due to parent material. The depth wise distribution of SiO₂ indicate the stabilization of silica content under mildly acide pedo chemical environment. The soil are classified under the orders of inceptisol and Alfisol.

Lin - Kungching et. al. (1996) The survey was conducted in the 1000 - ha broadleaf - dominated forest area of Fu-shan, Taiwan. Parent material,
high precipitation and steep relief are the main factors affecting soil genesis. Clay accumulated in the lower part of the pedon indicating that strong illuviation processes occurred in the flat areas, specially were parent material was red - hardish shale. In general, the soil is strongly acid, with medium quantity of organic matter in the sublayer and has low cation exchange capacity and low base saturation.

Goryachkin (1996) studied an algorithm of qualitative modelling of soil cover genesis and evolution is suggested. During a modelling process of this kind, a system of models is created, including sequentially:

1. a spatial system of model soil cover structure, presented on a detailed map.

2. an ecological - genetic model - factor - ecological matrix. Demonstrating the relations between the soil and the factors of soil formation.

3. a process - genetic model, reflecting processes and mechanisms that form soil cover, in the same way as the concept of elementary soil forming processes describes the origin of soil profiles.

4. a spatial - genetic model - a soil map with differentiated demonstration of soil boundaries connected to soil genesis and stability.

5. evolutionary and/or prognostic models of the soil cover, describing its change in time. The algorithm was applied to soil cover of the karst denudation plain of the European North of Russia.
Chiang et. al. (1996) Reported Black soils are locally distribution in Taiwan. The epipedons contain a large amount of organic matter which strongly influences vegetation, physical and chemical properties, and clay mineral compostions of five representative black soil pedons, derived from various parent materials, were analysed and classified according to soil taxonomy. Melanic, histic, mollic, and umbric epipedons were identified in the five pedons. Principal vegetation included: Machilus (Persea), Chamaecy paris obtusa, cunninghamia lanceolata, Cryptomeria japonica, Casuarina, Areca catechu, rhododendron formosanum.

Djordjevic (1996) reported the results of investigation of genesis, evolution, classification and properties of soils of Rajac calcareous massif (Serbia, Yugoslavia) are presented. Amongst natural soil forming conditions the following are presented: parent material, macro- and microclimate, relief, vegetations, activities of fauna and anthropogenic influences. Two types of calcareous soils are distinguished: black soil on hard limestone with four subtypes (organogenic organic - mineral brownized and lessive black soil) and calcocabbisol. The physical and chemical properties of soils are presented.

Ghonander (1997) Studied of pedology soil taxonomy and minerology of Bareilly district. His investigation was based on reconnaissance soil survey. he examined morphological feature of soil profiles.

Vadivelu and Bandhuopadhyay (1997). Reported characteristics, Genesis and classification of soils of Minicoy Island. The soil were according to soil taxonomy classified up to family level. Since the soils in the Island hard
developed from organiogenic calcium carbonate which contains very high amount of CaCO₃ and traces of other elements, the word, coral, has been prefixed in the mineralogy class in the family level.

Nandu et. al. (1997) determined soil classification and land suitability for irrigation the soil in a segment of common covering 200 ha very so much as to quality to be classified into 3 orders and 4 irrigability management lerit.

Sen et. al. (1997) The soils of the study area can be classified as follows - pedon 1 fine loamy Aeric fluvaquent, pedon 2 very fine typic fapluequept, pedon 3 fine silty aeric Haplaquept, pedon 4 fine aeric Haplaquept, pedon 5 fine typic dystrochrept, pedon 6 fine loamy dystrochrept respectively.

Walla and Rao (1997) determined characteristics and classification of some soil. It is further placed under Haplustert great group due to absence of caleie, gypsum or alic horizon and udic, Haplustert sub group as they show craks through a thickness of 25 cm or more through mineral surface less than 150 days per year.

At family level the pedons are classified as under Khraund. Fine loamy, micaceous, hyperthermic, deep, family of flurentic ustochrept. Bharatkup: fine loamy, mixed hyperthermic calcareous, deep family of typic ustochrept. Badusa: fine, smetitic, superthermic calcareous, deep family of udic haplustert. Anuwan: Fine, mixed, hypher thermic calcarius, deep family of vertice ipiaquept.
Sahu and Mishra (1997) classified based on Morphology physical and chemical characteristics. The soils of the study area were classified into other inceptisol and sub order Aquepts. Pedon II, III and IV satisfied all the requirements to be placed under typic Haplaquepts sub - groups. But pedon I was in all subhorizons between ap and A depth of 75 cm. A matrix colour hue of 10 x R value most of 5 and chroma moist of 2 and so was placed under Aeric Haplaquepts.

Tiwary et. al. (1997) reported three pedons of red soils developed in Raj Mahal trap of Bihar were studied for their various properties.

The climate of the area is tropical monsoon type having pronounced dry period. The morphological, physical and chemical properties suggested that time and topography associated with different moisture regimes have played an important role the genesis of these soils.

Sharma et. al. (1997) reported a reconnaissance survey and soil analysis of captaiengan sugar cane factory zone, Padrauna U.P. was carried out to determine the soil physical conditions and current status of the available major nutrient. pH and EC of the soils ranged from 6.3 to 8.6 and 0.01 to 0.27 with an average of 7.54 and 0.09 respectively. Organic carbon available N and available P and available K were found low to medium, medium and low category, respectively and hence require fertilization to obtain optimum yield of sugarcane.

Habrurema (1997) field studies in southern Rwanda showed that farmers had a profound knowledge of their soils, and classified soils for their own
needs. The classification was based on the identification of different oil types according to their agricultural potential and tillage properties. The main criteria applied were: fertility (Productivity), depth, structure, and colour. Nine major soil types were distinguished. More experienced, order farmers used additional parameters such as indicator plants, texture, consistence and parent material and were capable of further subdividing these types into sub-classes and groups. In the three agro-ecological zones of the study area, situated in different districts, farmers always applied the same names. No clear correlation was found between soil types according to farmers classification and soil types classified according to the U.S. soil Taxonomy since farmers and scientists appraised soil in different ways while farmers were interested in soil productivity and appropriate management practices, they took only the top soil or the arable layer into account. Soil scientists, on the other hand, are also interested in the deeper soil horizons.

Aide, et al. (1997) reported three soil series from Taum Sauk Mountain in the St. Francois Mountains of southeast Missouri were investigated to determine if the soils evolved from the underlying rhyolite and if hydroxy-Al interlayered vermiculite in the clay fraction of the pedons originated from the same parent material. It has been generally accepted that vermiculite is a weathering product of micaceous parent materials and K-feldspar typically weathers to either smectite or kaolinite. Loess deposits frequently possess sufficient micaceous materials to produce significant quantities of micaceous materials to produce significant quantities of vermiculite. Typically however, soils having loess mantles over residuum usually show significant
quantities of vermiculite in the epipedon with little vermiculite in subsurface horizons. However, in this study, unexpectedly high concentrations of vermiculite were isolated from subsurface soil horizons where kaolinite would be expected to be the dominate phyllosilicate mineral. Thus, a thesis was proposed to assess whether the presence of vermiculite arises from a thin liess deposit or as a product of orthoclase weathering. The soil profile characterization date and the interpretations of.

Sidhu (1998) reported elemental and mineralogical composition of course fraction of some soils of Aravalies Yamuna river transe in mineral weathering index of kerala soils.

Singh and Sharma (1998) collected soil sample from Bhopal, sehore, and Raison district, red and yellow soil of murena district. They studied availability status of Boron in major soils group of Madhya Pradesh. The old alluvium soil under investigation have been studied.

Verheyen, et. al. (1998) reported red and lateritic soils are typical weatering products of any intertropical belt, characterized by a seasonally dry to humid tropical and subtropical clime. Both agricultural and non - agricultural land - uses patterns are therefore mainly dominated by species performing well at high temperature and under a continous moisture supply in the growing season. Differentiating climatic criteria for crop selection or productivity evaluation refer primarily to the length of the growing period - corresponding to the time that crops are not hampered by temperature nor moisture constraints and to critical temperatures and insolation/radiation levels
or climatological hazards. The impact of those on land use can broadly be expressed through agroclimatic zoning. Red and lateritic soils can commonly be correlated with ferralsols, Acrisols, Lixisols and Nitisols, Plinthosols or Alisols. Due to their extensive weathering they have a low cation exchange capacity and poor nutrient reserve.

Shivarama et. al (1998) reported soil survey and land evaluation. The study was carried out at Hessaroghatta form near Bangalore for research under peninsular Agriculture division.

Khan et. al. (1998) determined morphology, characteristic and classification of some soils from the flood plains of Bangladeshi. Five soil profiles representing five established soil series were selected for this investigation.

Singh et. al. (1998) reported five pedons widely occurring in Goa were studied for their genesis and classification. Clay/Fe$_2$O$_3$ ratio, degree of hydration and organic carbon content alone or in combination contributed significantly towards the expression of soil colour. Higher Al$_2$O$_3$/Fe$_2$O$_3$ at the surface and lower in the sub surcaea provided confirmatory evidence of clay translocation.

Anjos, et. al. (1998) studied the topographic sequence of oxisols, inceptisols, and ultisols is frequently observed in tropical hilly surfaces in the southeastern region of Brazil. The purpose of this study was to relate pedogenesis to major geomorphic surfaces (MGS) in the caetes watershed, located in paty do Alferes, Riode Janeiro state. The landscape is characterized by steep
bedrock hills and cliffs of pre-paleozoic gneiss, granite, and related metamorphic rocks rising above long, nearly level, accordant ridge crests, convex hills, and narrow fluvial plains. Intense soil development, with deep weathering and kaolinite formation. In the gneiss - granite rock, took place on the ridges and convex hills. Six pedons were examined using field investigation and laboratory soils characterization techniques. The degree of pedogenesis on the various geomorphic surfaces supports the landscape evolution theories of penck and king. A typic Hapludox with the greatest degree of pedogenesis, formed on the stable subit position, MGSI. The upper part of the reteating slope, MGS 2, bevels MGSI 1, and the material eroded from MGS 2 moved downslope and formed a surface with lower gradient, MGS. Dystrochrepts are on shoulder positions and shallow Hapludox are on backslope positions of the geomorphic surface MGSI 2 and kandiuults formed on footslopes MGSI 3. Eutrochrepts are on the youngest surface MGS 4, a toeslope position. 1999 - 071941.

Reintam (1998) studied the creation of plant organic matter as a result of photosynthesis is essential for the production process, plant, faunal and microbial organic matter as well as its derivates are always and every, where recognized as the formative power of soil formation. For the classification aim, this paper deals with the comparative genetic, ecological and technological characterizations of automorphic and hydromorphic soils. Rendzinas on limestones, mires and bogs, alluvial and saline listtoral soils, eroded and eluvial formations have willingly omitted. Gleyic subtypes as transitional ones between any automorphic and respective hydromorphic type have also been omitted - except
temporary gleyiation, and additional stagnic and gleic properties. The comparative characterization of automorphic rendzinas, typical brown, brown lessive, brown and light pseudopodzolic, sod - podzolic soils and podzols as well as hydromorphic gley - rendzinas, gley - brown gley - brown lessive, gley soils and gley podzols has been carried out by the following items: prolific structure, humus horizon, eluvial horizon, accumulative, illuvial horizon, parent material, effervescence with HCl, textural and chemical differentiation, clay fraction, humus, soil reaction, reaction of soil solution, amorphous iron and aluminium, transformation of mineral stratum, dominant pedogenetic process, biological turnover of substances, moisture relationships or reason of overmoistening, natural meadow vegetation - only for hydromorphic soils, technological peculiarities.

Reintan (1998) Estimated: The creation of plant organic matter as a result of photosynthesis is essential for the production process, plant. Faunal and microbial organic matter as well as its derivates are always and everywhere recognized as the formative power of soil formation. For the classification aim, this paper with the comparative genetic, ecological and technological characterizations of automorphic and hydromorphic soils. Rendzinas on limestones, mires and bogs, alluvial and saline littoral soils, eroded and deluvial formation have willingly omitted. Gleyic subtypes as transitional ones between any automorphic and respective hydromorphic type have also been omitted - except temporary gleyization, and additional stagnic and gleic properties. The comparative characterization of automorphic rendzinas, typical brown, brown lessive, brown and light pseudopodzolic, sod - podzolic soils and podzols as well as hydromorphic gley - rendzinas, gley - brown, gley
brown lessive, gley soils and gley podzols has been carried out by the following items: profile structure, humus horizon, eluvial horizon, accumulative or illuvial horizon, parent material, effervescence with HCl, textural and chemical differentiation. Clay fraction, humus, soils reaction, transformation of mineral stratum, dominant pedogenetic process, biological turnover of substances, moisture relationships or reason of overmoistening, natural meadow vegetation.

Malucelli et al. (1999): A study concerning soil genesis was conducted on surface and buried volcanic soils of sao Miguel island, Azores, Portugal (data not given). Three out of eight soil profiles were selected for a detailed study of pedogenesis, using chemical, micromorphological, XRD and DXRD analysis, micropicking on impregnated soil blocks, TEMEDS and IR spectroscopy analyses. An incipient to moderated degree of weathering was observed in the soils, typical in many young volcanic districts. Four different stages of soils development were clearly identified:

1. Primary minerals dominate and some allophane and ferrihydrite formation, with an Feo : Fed ratio of approx. 0.86 (LOM soil).

2. Halloysite and ferrihydrite formation in the lower horizons along with an Feo : Fed ratio of approx. 0.62 (SAN surface soil).

3. Halloysite and ferrihydrite formation in the lower horizon, clay illuviation and stronger pumice weathering, and an Feo : Fed ratio of approx. 0.51 (SAN buried soil).
4. Higher content of hydrated halloysite and considerable amounts of goethite and haematite, and exhibit the most expressed weathering features, with an Feo : Fed ratio of a prox. 0.25 (Lix soils buried soils can be explained by :

(I) The longer pedogenesis of buried soils.

(II) The presence of a climate more seasonal than that of the present day.

Romanova (1999) observed: The main stages in the development of the belarussian school of soil science, as well as results of studies in the 1970 s-1980s, are characterized, formalized and partially parameterized standard characters of genetic soil types and subtypes in Belarus are given for further computer studies, a prevalence of burozem soil formation on the watersheds of belarus is noted, the possibilities of decoding ecological information by soil genesis are considered.

Zengshow et. al. (1999) reported plant - litter - soil interactions were investigated along a soil chronosequence occurring on five coastal terraces in northern California, USA, that range in age from 100 thin 000 to 500 years. Soil and plant communities very markedly and consist of slightly acidic, fertile soils supporting highly productive mixed-conifer forests on the youngest terrace of dwarf (3 m) conifers and Ericaceae species on the older terraces. Soil genesis, soil nutrient status, soil acidity and plant community structure reach a steady state after approximately 250 thin 000 years. All major species
of the pygmy forest are polyphenol-rich, and those highest concentrations of extractable polyphenols when growing on the most highly acidic, infertile sites. Polyphenols provide several beneficial effects on highly acidic and infertile soils, such as nutrient conservation, detoxification of soluble aluminium and enhanced phosphorus availability. Polyphenols may also provide some plant species with a competitive advantage by altering nitrogen cycling, allowing these plants to alter forest succession. The convergent evolution of polyphenol-rich plant communities on highly infertile soils throughout the world may be due to the ability of polyphenols to ameliorate acid soil infertility factors and regulate the nitrogen cycle.

Gol, et. al (1999) determined: The application of phytolith analysis for solving various pedological problems is illustrated by particular examples. It is shown that this method can be efficiently used for reconstructing soil evolution and deducing local time scales for landscape development.

Aide et. al. (1999) observed: Two soil profiles from felsic materials from Mudlick Mountain in the St. Francois Mountains of Southeast Missouri, USA, were investigated to determine if these soils evolved from the underlying rock unit to determine the partitioning of metals into the Fe-oxide fraction, and to evaluate this metal partitioning as influenced by clay illuviation. Chemical extractions, neutron activation analysis (NAA), and classical total element determinations show that: (i) Zr and K were not preferentially accumulated by clay: (ii) V and SC were preferentially accumulated by Fe-oxides: (iii) Ca and Na were almost completely removed from the soil environment Mg, K, Fe, Mn were partially removed from the soil environment, and Si and
Al were largely incorporated into secondary minerals, reducing their loss rates from the soil environment. The rare earth elements (REEs) were not strongly removed from the soil system. Measurements of cation solubility suggest that Al, K and Na were appropriate for soil systems having a kaolinitic mineralogy. Landscape position influenced elemental losses rate S, with a soil on a relatively level landscape position having lower elemental loss rates than an adjacent soil on a steeply sloping position. The influence of lateral water flow in subsurface horizons may be involved in weathering rates and loss of elements.

Steinys, et. al. (1999) studies: The preliminary date on the morphology of soil profile soil texture and agrochemical properties of three soil types selected for a genetic monitoring of Lithuania are presented in the article. Each soil represents the different type of landscape and a different soil region. The calcareous loamy soil of temporary water saturation developed in the lowland of middle Lithuania has the least differential profile. It has been established that accumulative processes of soil formation, but not eluviated ones prevail in this soil because of its youngest stage and is potentially most productive soils of Lithuania.

Sinha et. al. (1999) studied genesis and classification of soil derived from limestone. The have reported dpresence of calcie horizon.

Power and Mehta (1999) gave characterization of soil for the Konkan coast. They collected 54 soil samples. They observed colour 10yr 414. 314, 412 silt loam as the dominant texture of such soils.
2. Land evaluation and land suitability classification for different crops:

Murthey et. al. (1982) gave morphological and physico-chemical properties of 64 bench mark soils of India. They pointed out texture a 'coarse' textured less than 18 do clay (b) medium textured less then 35 (c) fine textured more then 35% clay.


Rathore (1987) observed land capability cancep, principles and methodological term, land capability is used in a number of land classification system. In the U.S.D.A. system, soil mapping unit are grouped primarily on the basis of their capability is viewed by as the inherent capability of land to perform at a given level for a green, and suitability as a statement of the adaptability of a given area for a specific kind of land use, other see capacity as a classification of land primarily in relation in degaradation dazard whilst some regards the terms suitability and capability as interchangeable.

Karan Singh et. al. (1982), studied land capability classes and management needs for sustained productivity in semi-arid regions of north-west Himalayas. A reconnaissance survey of medium intensity was carried out in upper transect of Satlaj catchment comprisiong on area of about 12693 sq. km. in Kannaur and Lahul - spiti districts of Himachal radesh. The area was devided into different association of land capability classes and sub
classes, and management needs for each association where suggested for sustaining the yield potential and for restoration of rapidly deteriorating eco-system. An area of about 21,000 ha in kinkoor could be used for plantation of temperate fruits. The offorestation may be introduced in an area of about 90,450 spiti area, Alpine postures having enormous role in hydrological functioning of the ecosystem, need to be preserved.

Verhey (1993), reported soil survey, Land evaluation and land use planning and alternative land use patterns for the purpose of selecting the best choice. Planning decision deal some time with interest of competing land user and may there for be questioned criticized. Hence, it is recommended that those plains and different scenerious taken into consideration are based on scientifically sound approaches and one objective of suitability assisment. Resources management activities concer basically soil and water conservation. Although being primarily site - specific. These activities also effect the soil properties and use potential of land which is away from the pre national site. hence, it infunaes living conditions of the rural community as a whole. The users should aboviously be associated to all land use planning decisions which directly or indirectly, effect the area Rajeev Srivastave et. al. (1994) countrary to this. Hanragram and Balidango soils developed on lower alluvial plain and meander flood plain, respectively are highl suitable siex for rice cultivation

These soils remain saturated with water due to flooding and impated drainage, thus provide favourable environment for rice crop deering kharif season. The actual rice yield reported on these soils very from 35-38 q ha/.
Srivastva et al. (1994) studied the major limitation in Katuaneswer soil are steep and undulating slopes, shallow rooting depth gravelly texture, low nutrient and water retention capacity. Hence their suitability for some horticultural may be considered alternatively. The Buldunga soils are moderately suitable (S₂) for rainfed rice. The actual rice yield in these soil varies from 26 to 30 q ha. Which also justifies the moderate suitable of this soil for rice. The major limitations for rice cultivation in Buldanga soil are undulating slopes, low organic matter and poor water and nutrient retention capacity.

Bhasker et al. (1996) determined soil site suitability and land use planning, Amravati road Nagpur. The influence of various soil site and climatic parameters on wheat. Yield was evaluated on different soil of saonge water shed. Amongst climatic parameter the air temperature was towards higher side and hardly comes to normal limits, and thus result as moderate to river limitation during entire crop growth period. High temperature and low humidity coupled with high wind velocity lead to moisture stress causing low yield, Depth clay C.E.C, A.W.C. and organic carbon are the most important yield contributing parameters. They show high degree of positive significant correlation with yield. The effective range of soil depth was from 65 to 100 cm, A.W.C. was from 170 to 200 mm. CEC was from 43 to 53 c mol (#) Kg⁻¹, clay content was from 48-56 percent and organic carbon was from 0.63 to 0.74 percent. Saorigi 4, 5 and 6 soils being deep to very deep, well drained, clay loam to silty clay loam in texture, moderate to high in clay C.E.C., A.W.C. and organic carbon were found genetically highly suitable, but categorised as moderately to marginally suitable due to climate limitations. The productivity of wheat decrease with increasing degree of limitation.
Ahuja et al. (1996), reported land evaluation of sand dunal to posequences of Haryana. Three representative sand dunal sites were identified in western 30 nl of Haryana. Each of sand dunes was separated topographically into sand dune top, slope, base, plain and depression. Based on the land qualities, soil problems and their limitation each top - part of the sand dunl was evaluated for its suitability, capability and irrigability classes. Soil of the sand dune top, sand dune base, hummocks and interdunal depression are classified as typic torripsammants, a ridic ustipsamments and that of sand dune base and plain as course loamy, fine loamy typic comporthids. The soil of the sand dune top and slope are placed under and 4 tds for land capability and irrigability classes, respectively. The soils of the sand dune base, very gently sloping plain, hummocks and interdunal depression are placed under class III S and 35 and those of nearly levels plain under land respectively. Fine loamy soil of plain area's are highly suitable for wheat. Arher, oilseed, Guar, Collor, sun flower, Bajra and Gram but moderately suitable for horticultural and forest plantations. The sandy soil under suitable for most of these crops. The interdunal depression are highly suitable for Bajra and Gram and marginally suitable for other crops.

Deptt. of soil science Ct CRI (1996), reported importance of soil classification and land evaluation in effective transfer of agrotechnology has been reviewed. Proper soil survey and interpretation of result are required for agrotechnology transfer. Emphasis should be given to the concepts such as geographic information system.
Mahapatra et. al. (1996), Carried out to evaluate the suitability of the site for establishing National Botanical Garden in an area of about 100 ha at Rohini Delhi. During the course of soil survey for soil were identified characterised and interpreted. The area was evaluated for its suitability based on land capability classes, and management needs were suggested. The study reveals that 64 percent of the proposed site is potential of plantation, while about 30 percent has constraint due to its low lying topography and presence of CaCO₃ concentrations in the sub-soil.

Verheyne (1996), reported roting and defenation of suitability classes. The F, A, O, approach for land evaluation is based on a matching of crop, land attributes. It is purely a conceptual approach, but does not impose proper mentation. In these paper the roceducre of matching is critically reviewed, and attention is facussed on the defination of suitability classes. They are key factors in the final out come of the assisment. The importance of the formate and defination of land qualities, characteristics and land attributes are discussedm and guidlines are given for a more accurate defination of suitability classes.

Das et. al. (1997), studies soil of operational area of sugar factories covering district of Nodia, Mushidabad, Birb humili in West Bengal were evaluated for their suitability for sugarcane cultivation based on soil site characteristics. In suggested topography were rated as marginally suitable and currently not suitable respectively for sugar cane, Soils (typic ustochepts, typic Haplastalsfs and typic ustifluvent) occurring on nearly level to gently sloping land form were assessed as moderately to highly suitably, representing 72.2 percent of the total operational area.

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Pendole and Deshmukh (1998), studied soil survey interpretation for land use planning in salt affected soil pune valley of Vidha - bha Maharastra. They use L.C.C. and irrigability classes, productivity F.A.O. land and suitability classes and sy land index.

According to Jawaher et. al. (1999), F.C. was designed to groups soils having similar limitation of fertility management. It provide a guide for the extrapolation of the fertilizer response. H focuses attention on surface soil properties most directly related to management of field crops. It is best used as an interpretative classification in conjunction with more inclusive natural soil classification.

Chaterji (1999), reported about fuzzy logic methods of land evaluation fuzziness a type of impression, characteristics element grouped into classes that for various reasons cannot have or do not have sharply defined boundaries. Such classes collected fuzzisets aries for example when ever embiquity vaqueness ambivalence in mathematical methods of real life phenomenon for 334 sets are in general classes. That admit the possibility of partial membership in them. Attempts to define exact classes and the exact values of discription critaria by conventional methods using hierarchial classification and boolean methods.

Mukesh Babu (2000), described the soils of Etawah are alkaline in nature. It have 5 sub order and sixe real groups suitable for Bajra paddy, and other crops cultivation. Fertility status of Halaquept is low in O carbon, available phosphorus, available sulphur and available Zn.
Patel et. al (2001), observed land capability classes assessment for land use planning. A study was under taking in a part of solini watersheda of Haridwar and Saharanpur district in Uttarchal and U.P. respectively for assessing the land capability to about suitable soil concervation measures and suggest. Appropriate land use through remote sensing and G/s approaches. The matic information on soils, slopes and land use was generate from remotely sensed data, survey of India toposheet and field survey. These spetial information were intigrated using G/s techniques for generating basic resources maps such as composite land use and land capability. Present composite land capability maps were integrated and suitable criteria were formd to prepare land used adjustment plan for appropriate soil soservation needs and proper land utilization in part of solini watershead.

Sharma et. al. (2001), pointed out soil of Haldighati region of Rajasthan and their suitability for different land uses. Six pedon each representating submit, moderately sloping side slop, gentle foot slope and alluvial plain have been characterised. The soil site characteristics were matched with maize and wheat requirements. The soil associated with nearly level and gently sloping plain are highly suitable for both maize and wheat. The soils of side slop are marginally suitable and submit soils are not suitable for these crops. Afforestation with appropriate first species and proper agrotechniques have been suggested for non suitable summit soil and crops to suitable soils.

Suresh Kumar et. al. (2001), observed the soils developd on shallow burried pediments and moderately buried pediment have the highest productivity rating index classified as good productivity class. Soil of denudational hills and pediments are rated as average and poor in productivity classes.

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Mandal et al. (2002), reported the cotton growing soils of Nagpur district have been according to under suitability classes based on modified require is criteria developed from farmer's yield and requires productivity into correlations derived from the attributes of soil survey information at 1:50,000 scale. While correlating between index and cotton lent yield, it was found that regulator's parametric index shows the high correlation (r = 0.85) whereas sys method yields poor correlation (r = 0.92), indicating the regulator's method is more meaningful when reconnaissnance soil survey data are utilized for land evaluation study for cotton, although, the sys's land evaluation method utilizes many crop specific parameters. The modified crife - area - based land suitability map depicts that 57.5% of the area is high suitable 28.5% of area is moderately suitable and 5% of area is marginally suitable and 9% of area is unsuitable.

Tamgadge et al. (2002) determined land suitability classes. Fourteen different soils from the government research forms mostly under paddy cultivation in seven district along with rating values and yield as sl (Highly suitable) 7851, udic Haplusterts (41.19 ha), Enti haplusterts (37.8 9 ha) chromic haplusterts (37.7 q ha), Typic haplusterts (34-7 q ha) udic haplustepts (31.1 q ha), S2 (moderately suitable) 701-850, ertic haplustepts (22.0 q ha), Typic haplustepts (6.3 q ha), ertic Haplustal fs (11.5 q ha) Typic Rhodustl fs (10.2 q ha) Ni haplustalfs. (Non suitable - temporarily) 401-550, Lithic haplustepts (8.4 q ha) Typic ustorthents (6.9 q ha), and N2 (Not suitable - permanently) Lithic ustorthents (5:0 q ha). The rating values hold true with actual yield of paddy and potential yield efficiency percent.
3. Nutrient status for different soil series:

(1) Status of available Nitrogen -


Prasad et. al. (1996) collected soil samples from konke Ranchi Dihar. They analysed these sample for available N. According to them available N bore weak positive correlation with available p (r = 0.977).

Khan et. al. (1997) studied total and available nitrogen in 6 soil series of Bangladesh. According to them total and available nitrogen was significantly and positively correlated with CEC (r = 0.734) and 0.675 respectively. Total and available N in these soils declined with depth.

Sheeba and Chellamuthu et. al. (1999), reported a long term influence of organic and inorganic fertilization on the micro nutrient status of inceptisol soil.

Nayak et. al. (2000), reported that very little information is available regarding the status of available micro nutrients in
the hill status of North-Eastern region. Some recent studies have reported that 3n deficiency is the major concern among the various micro-nutrients in the area.

Akhilesh Gupta (2001) collected 195 surface soil samples from II district of Rajasthan. Related to three soil orders estimated available nutrients in these soil samples. He studied inceptisol order in Rajasthan soils. He reported four great group.

Ramkishan (2001) studied sixteen soil profile of Brij Bhumi covered five district. He estimated total and available nutrients in inceptisols. He observed fertility status of otnent, psamments aquents and fluquent.


(2) **Status of available sulphur in soil**: Williams and stonberge (1959), reported that total soil sulphur was less than phosphorus and varied from 0.001 to 0.19%, sulphate sulphur was 0.10 ppm, Heat soluable sulphur 8 ppm in Australian soils. They concluded that heating increasing the solubility of sulphate sulphur.

Sharma and Gangwar (1997) studied distribution of different forms of sulphur and their relationship with some of soil -38-
properties in Alfisols, Inceptisols and Molisols of Muradabad district. The total sulphur was negatively correlated with pH and Fe available sulphur had positive correlation with organic carbon and total nitrogen \((r = 0.204 \text{ and } 0.285)\) respectively. The total sulphur showed significant and positive correlation \((r = 0.528 \text{ and } 0.559)\) with organic carbon and total nitrogen respectively.

Gauri Shankar and Shukla (1999), collected 500 surface soil samples the total sulphur content inceptisol of Delhi ranged from 99.6 to 35.5, 4 mg\(^{-1}\) with a mean value of 220.3 mg kg\(^{-1}\). The phosphate extractable sulphur and organic sulphur relatively higher \((114.8 \text{ abd } 107.0 \text{ mg kg}^{-1})\) respectively. All the forms of sulphur except organic sulphur correlateive positive and significant with electrical conductivity. A possible and significant correlaton of organic sulphur was observed with organic carbon and CEC. The Ec of soils was found to have reater impact on different of sulphur followed by CEC.

Trivedi et. al. (2000) reported vertical distribution of forms of sulphur in some profile of Murena and Bhind district of Madhya Pradesh.

Pandey et. al. (2000) wide variability of phosphorus and sulphur was observed in different soil associations of district Kanpur in central Uttar Pradesh. Contents of available P ranged
from 7.7 to 55.4 kg ha\(^{-1}\). About 49.50 and 1 percent soil samples showed respectively low, medium and high range of phosphorus availability correlation studies revealed that availability of phosphorus in all the soil association in general was significantly and positively influenced by organic matter and fine soil particles. Available S contents varied from 58.0 to 53.8 mg kg\(^{-1}\) percent soil samples showed deficiency and sufficiency, respectively in S availability. In correlation studies S availability in all the soil associations was found significantly and positively affected by organic matter, CEC and finer soil particles.

Akhilesh Gupta (2001) collected to 195 surface soil sample from 11 district of Rajasthan. Related to three soil orders estimated available nutrients in these soil samples. He studied Entisol order of Rajasthan soils. He reported four great group of soil.

(3) Status of Available zinc in soil:

Thakur and Bhandari (1986) estimated available major secondary and micronutrient in 45 surface samples collected from a temperate vegetable seed producing valley of Himanchal Pradesh, available zinc varied from a recent report.

Dey (1999) collected profile samples from Assam. he gave elemental composition (Si, Na, K, Ca, Mg, P, Fe, Mn, Cu
and Zn) and association in some inceptisols and alfisols of Assam under between 76 to 143 ppm in surface sample 12 to 167 ppm in sub surface soil samples, there is irregular decrease of total zinc in eight profile.

Mukesh Babu (2000) collected 49 surface samples from district Etawah U.P. from six soil great group. Available zinc ranged from 0.15 mg kg\(^{-1}\) mean value \((r = 0.681)\) 14.28% soil were deficient in zinc, available zinc before negative correlation with sand \((r = 0.620)\) CaCO\(_3\) \((r = -0.532)\) pH \((r = -0.558)\) and He found positive correlation available zinc with silt \((r = 0.552)\), clay \((r = 0.816)\) E.C. kg m\(^{-1}\) \((r = 0.560)\), carbon \((r = 0.520)\).

(4) Nutrient status of available Boron in soil:

Ghani and Haque (1945) were the pioneers to analyses 26 soil sample of Bengal for available boron and reported that is varied from traces to 1 my kg. Soil reaction was found to have little effect on boron availability amongst the soil tested, these subjected to occcational much higher amount of boron.

Ramamurty and Viswanath (1946) reported that the total boron content decrease with the age of the rocks m alluvium, trap, cuddab system, Delhi system and ancient crystalline geologcal system containing 42, 36, 39, 29 and 22 mg kg. Boron respectively, the first report on the statey of born in the soil.
Delhi emanated the division of soil science of the Indian agriculture research institute New Delhi.

Gandhi and Mehta (1960) observed the well drained goradu soil of Gujarat contained 0.3 mg kg. available boron in surface, which gradually increase to 0.4 mg kg. with depth up to 5 ft.

Mathur et. al. (1964) reported that the amount of water soluble boron decrease with the depth in unirrigated soils, but after prolonged irrigation with boron rich water, it increased with depth.

Nethani et. al. (1970) determined the distribution of boron in different soil of Rajasthan was arranged as follow: desert soil unidifferentiated alluvial soil greybrown soil of river basin 7 greys browns mixed red. This suggested that the soluble of boron increasing in most of the cases with increasing in salinity and alkalinity, which was confirmed by Sela and Singh.

Gajbhiye et. al. (1980) compared the available boron status of two type soils of the union territory of Delhi reported the average water soluble boron as 0.73 and 1.21 mg kg., respectively consederig a critical limit of 0.35 mg mg. of water soluble boron suggested by them, non of the soil was found deficient of boron.

Tiwari et. al. (1988) discussed the available boron accumulates
in the surface soil and in most cases decrease with depth. However the decrease is irregular as it has been demonstrated. The available boron contain decrease up to go cm depth below which thue was again an increase. In coarse textured soil more available boron may be noticed in lower depths due to leaching.

Takkar et. al. (1989) determined the percentage of boron deficient soil in red and yellow soils alluvial and deep black soils of Madhya Pradesh was 49.0 and 8 respectively.

Bansal et. al. (1991) contained hot water soluble B in soil samples ranged from 0.3 to 2.0 ppm. About 43 percent of the soil are deficient in available B if a critical limit of 1.0 ppm B is taken as limit for deficiency. Nearly 75 percent of more soil samples in category of coarse texture pH value below 8.5 and CaCO$_3$ less than 1.0 percent are deficient in available B, 56 percent samples containing less than 0.40 percent organic carbon are deficient in B. The magnitude of deficiency decreased significantly with fineness of soil texture and increase in soil alkalinity.

Hundal and Arora (1993) determine the leaves of litchi were found of contain 10. -19.0 mg N g, 1.4 -2.9 mg p g, 3-9-13.7 K mg g., 3.2 -11.3 mg cag 1, 2.0 -58 mg mg g, 12-3-54-7 ug Zn g, 4-7-19.9 ug cu g 87.5 -397.3 ug feg
-1. 8.4-57.1 ug Mn -1 and 15.9 -66.7 ug B g respectively.

Datta and Munnaram (1993) reported in the upland soils from 5.2 to 56 and in lowland soils from 5.1 to 6.7 organic carbon varied from 0.45 to 1.02 percent in upland soil where as from 0.30 to 0.89 percent in lowland soils. Clay content increased with depth in soil profiles and varied from 14.3 to 26. 7 percent in upland soil and 12.3 to 22.8 percent in low land soils. In the soils series studied herein 29 and 50 percent of the soils had available B content below the critical level of 0.5 mg kg. available B had significant and negative correlations (0.64 respectively) with pH in upland soils.

Bhogal et. al. (1993) reported in these soils ranged from 0.2 to 5-6 ppm. using 0.53 ppm B as the theerehold value 31, 16 and 25 percent soil of purnia, saharsa and katihar district are deficient in boron respectively. Available boron was correlated negatively with pH in all. The soils of saharsa, purnia and katihar district with corresponding 'r' value of -0.493 - 0.505 and 0.512 respectively. In all the soils available was positively and significantly correlated with organic carbon.

Arvind Kumar et. al. (1994) observed hot water soluble B varied from traces to 2.8 mg kg. with an average value of 0.7 mg kg in soils of Debatoli series. It ranged from 0.1 to 1.9 and trace to 3.5 mg kg with corresponding mean values of 0.6 and 0.7 mg kg respectively in soils of Dumka and
Laxmipur series, considering 0.50 mg kg, available S in soil as critical limits 36, 51 and 41 percent of soil samples were rated to be deficient in Debotali, Dumka and Laxmipur series, respectively. High permability of these soils associated with poor organic matter status has resulted in such low available B content, these results suggested the need of B application in these soil for medium to high B requiring crops.

Kumar et. al. (1994) determined wide variations among the three soils series in the content of DTPA extractable 3 n, cee, Fe, and B were recorded. The 0.15% to 45.1 mg kg soil, respectively and B hot water soluble varied from traces to 2.8 mg kg with an average value of 0.7 mg kg. in soil of Debatali series. It ranged from 0.1 to 1.9 and trace to 3.5 mg kg with corresponding mean values of 0.6 and 0.7 mg kg. respectively.

Sakal and Singh (1995) identified northern Bihar, part of Assam, west Bengal Meghalaya and Northm Orisa, all in the northeast India together with Karnataka and Gujarat as areas where Boron deficiency was most common. Granite and genesis are the predominant parentmaterial in these state, with the exception of Gujarat. In Maharashtra where most soils are formed from the basalts of deccan trap, soil Boron levels seldom indicate Boron deficiency.
Vasthi et al. (1995) reported that cultivated soil of five different latitude of Sikkim subtropical and tropical zone were selected for the study. the total $\text{Cu}$, $\text{Mn}$, $\text{Fe}$, $\text{B}$ and $\text{Mo}$ content of the surface soil varied widely.


Adhikary (1997) studied available $\text{Mo}$, $\text{Co}$ and $\text{B}$ in fish pond soils. They found negative correlation of available $\text{Mo}$, with $\text{pH}$.

Saha et al. (1998) reported boron content in the available soils of morena district were found to be between 0.08 to 2.6 mg kg with a mean valued of 0.57 mg kg. About 56% of these soil samples were found to contain 0.4 0.76 mg kg available boron. The mean content of available boron in the tehsils of Ambah, Jora, Morena, Sabalgurh of Morena, district were 0.23, 0.26 and 0.37 mg kg, respectively.

Datta et al. (1998) determing available boron in some acid soils was assessed by correlating the amount of extractable boron in untreated soils with Brey's percent yield, uptake and tissue boron concentration of soybeen plants. Hot cal was found to be the most suitable extractant for the determination
of available in soils as followed by hot water salicylic acid and ammonium acetate. They also concluded that salicylic acid was the most efficient extractant for routine soil analysis for available boron if a large number of samples are analysed.

Singh Nayyar (1999) studied available Boron status of some alluvium derived arid and semi arid soils of Punjab. The available Boron content in the soils of Ferozepur district ranged between 0.22 and 2.4 mg kg. soil with a mean value of 0.92.

Singh and Nayyar (1999) The available boron content in soil of Ferozepur district ranged between 0.22 to 2.40 mg kg soil, with a mean value to 0.92 mg kg while in the soil of urid kot district, it varied from 0.20 to 3.85 mg kg, with a mean value of 1.53 mg kg conseduring the critical value of 0.5 and 0.5 to 1.0 mg kg. B for deficiency and low status, suggested by them, the available boron in 13 to 50 percent soil of Ferozepur and in 6 to 28 percent soil of farid cot district of punjab respectively was in the deficient and low range.