Chapter – VI

THE SETTLEMENT PATTERN OF EARLY FORMING CULTURES OF MUNERU RIVER VALLEY
A quick perusal of the cultural materials collected from 72 early farming sites in the Muneru River valley shows that Neolithic, Megalithic and Early Historic cultures have nurtured the area and made their settlements at different physiographical and environmental niches depending upon the known technological developments during different times. The stone made tools and ceramic objects during the Neolithic period and the iron made tools and ceramic objects during megalithic and early historic periods have prompted the human beings to have a safer and consistant settlements at different ecological niches (fig. 24).

A closer examination of the various settlements at Muneru river valley against their environmental background made it possible to make a few generalizations on certain of settlements and subsistence patterns followed by the early farming cultures of the area. Although there are certain limitations in the use of surface data for estimating the extents of occupation of the site during different periods, there is no other go except to depend on the surface collections only.

Inspite of these limitations, it is found more useful method to identify ways of extinct cultures whose have only few material traces left to us. By studying environmental and ecological aspects coupled with the use of scientific aspects such as palaeo-Botony, palaeo – Zoology and physical aspects, a reasonable picture can be amerged. Besides these, the tribal populations residing in the area also throw some light on the probable geographic and economic
organizations prevalent during the early farming cultures in the area of present investigation.

An attempt was also made to correlate the surface data with the data obtained from the stratigraphical scrapings at Kondapeta and Pallagiri in Krishna District and Peddapuram in Khammam district was also utilized to identify the technological developments that have taken place in Muneru river Valley to understand the land use patterns and to know demographic aspects during different cultural periods besides understanding the possible extra regional contacts.

SETTLEMENT PATTERN STUDIES

A Settlement pattern is the distribution of human activities across the landscape and the spatial relationship between these activities and features of the natural and social environment. By assuming that these relationships are patterned in a predictable manner, the analysis of settlement patterns can be used to reconstruct and explain the organization of human societies and their interactions with the surrounding environment. This analysis can be performed at several levels, from the spatial analysis of small activity sites to the large-scale investigation of human settlement across an entire region. Settlement pattern studies aim at obtaining ecological, social and cultural information of ancient societies not from a single site but by studying the remains of the people from a multitude of sites. In other words, settlement pattern analysis is a geographical
concept which brings into focus the working relationship between people, their environment and their technology.

Julian Steward’s (1930) research on the relationship between regional settlement patterns, population size, and the environment represents one of the first explicit applications of settlement pattern analysis. He was an ethnographer by profession and during World War II observed at different sites the artefactual deposits left by Nomadic Indian Bands of great Basian, Western United States, by following them from place to place. This, in course of time became as the first step for the formation of the concept of settlement pattern studies in Archaeology.

Steward’s work inspired others such as G.R. Willey (1953), whose famous Viru Valley study in the 1940s combined aerial photography, architectural observations, and regional maps of site distributions to reconstruct socio-political organization. Although his analysis consisted of simple inferences derived from observations of the settlement data, his work had an important influence on the future of settlement pattern studies. During the 1950s, the analytical techniques employed by settlement archaeologists became increasingly sophisticated. For example, formal sampling methods and different scales of analysis integrating intrasite and intercommunity perspectives were increasingly employed, and ethnographic material began to be used to correlate specific settlement configurations with different types of social organization.

The beginning of the New Archaeology in the mid-1960s profoundly influenced the direction of settlement pattern analysis through its concern with
scientific methods and new analytical tools. Quantitative statistics were increasingly used for investigating spatial data, beginning with Lewis and Sally Binford’s reconstruction of Paleolithic settlement systems through the application of multivariate statistics. Statistical techniques were commonly employed for identifying spatial patterns in the distribution of artifacts and their stylistic attributes, which could then be associated with particular social units. The New Archaeology (Binford: also encouraged the development of new techniques for producing detailed environmental reconstructions. Through the 1970s and 1980s, archaeologists continued to borrow quantitative models and statistical methods from other disciplines while developing their own tools for analyzing settlement patterns.

The late 1980s and early 1990 have seen the further refinement of the analytical techniques used in settlement patterns. The accessibility of powerful computers has stimulated the use of increasingly sophisticated tools for the analysis of larger regional data sets, which can be managed and manipulated using spatial databases known as Geographic Information Systems.

The analytical techniques available to the settlement archeologist can be grouped according to their most common application. The first group consists of locational models (Vita Finzi, C:1978), which predict where in the landscape a particular activity should be located. These models often assume a least-cost perspective in which humans are seen as situating their activities in such a way as to conserve the amount of energy needed to access or distribute resources. When
specific behavioral objectives and constraints can be quantified, location-allocation analyses are useful for determining the optimal locations for human activities (Vita Finzi, C and E.Higgins 1970). Predictions from these locational models can be compared with actual settlement data to evaluate the influences of economizing behavior and environmental factors on settlement patterns. Because these models focus on environmental characteristics, the researcher should known how modern conditions differ from those encountered in the past. (Flannery, K.V.1976)

Other analytical techniques focus on past economic organization. One of the most common methods is catchment analysis (Flannary, K.V. 1976), in which estimates of a site’s resource base and overall productivity are calculated based on a hypothesized economic range. This technique is especially effective when the results are compared with the actual plant and animal remains recovered from the site. Other analytical techniques are useful for reconstructing regional economic interaction(vita Finzi and E.Higges : 1970).

SETTLEMENT PATTERN STUDIES : DEFINITIONS :

Willey, G.R. (1953) was the first to give comprehensive definition about settlement pattern. According to him the settlement pattern is the study of the “the way in which man disposed himself over the landscape on which he lived it is a strategic point for the functional interpretation of archaeological cultures, since they reflect on the natural environment, the level of technology on which
builders operated and various institutions of social interaction and central which the culture maintained”.

After Willey (1953) has published a monograph on the “Prehistoric settlement patterns in the viru Valley, peru” many archaeologists were attracted by Willey’s type of work and formulated their own definitions on the settlement pattern studies. Chang, K.C. (1958) described settlement pattern as “the manner in which human settlements are arranged over the landscape in relation to the physiographic, geographic environment” and community patterns as “the manner in which the inhabitants arrange their various structures within the community and their communities within the aggregate”.

According to Flannery, KV. (1976) “a settlement pattern, is the pattern of sites on the regional landscape, it is emperically derived from sampling, total survey and is usually studied by counting sites, measuring their sizes and the distances among them and so on”.

Vogt, E.E. (1956) defined settlement pattern as “the patterned manner in which household and community units are arranged specially over the landscape”.

A settlement pattern according to Trigger, B.C. (1963), is “the manner in which people, cultural activities and social institutions are described over the landscape”.
Settlement pattern studies are being used as a working model by scholars to identify different activities of ancient people. While Chang, K.C. (1958) tried to identify the social patterns, Mac Neish, R.S. (1970) tried to interpret in the light of the ecosystems. Religious traditions were reconstructed by Sears, W.H. (1961) while Clarke (1968) tried at the interpretation of cultural systems.

Flannery, K.V. 1976) tried to draw out a distinction between settlement pattern and settlement system. According to him settlement pattern is the study of the distribution of sites “on regional landscape whereas the settlement system is the set of rules that generated the pattern in the first place”.

According to Rouse, I. (1972) settlement archaeology means “the study and reconstruction of cultural life ways and processes of change”.

Trigger, B.C. (1968) has identified three levels as the determinants of settlement patterns. Those are:

1. **Individual building level**: The individual structures are the first determinant factor. The construction of household depends on the environmental conditions, available technology and the status of the individual who proposed to construct it. Nomadic people prefer to have round huts as they are easy to construct and transport. Settled communities on the other hand plant for rectangular permanent houses with more than one room. The non-availability of the building materials and proper environment makes those people living in deserts prefer tents. On the basis of the dimension and measurement of a house an appropriate estimate can
be made about the persons that once occupied the house, the position and rank of the person owning it etc. The scholars who worked in this direction include Chang, K.C. (1958), Trigger, B.C. (1963), Flannery K.V. (1972) and Dhavalikar, M.K. (1977) etc.

2. Community level: The assortment of house constructions in an area might give a few clues about the social and economic framework of the community which was occupying them. The mode of construction of the houses also reflects the economy and subsistence pattern of the community. In this direction the scholars who worked include Chang, K.C. (1962), Adam, N.M. (1965), Clark (1972), Flannery K.V. (1976) and Dhavalikar, M.K. (1977, 1978a).

3. Zonal pattern: Zonal pattern is a geographical concept. The factors that directly or indirectly influence the settlement pattern of any culture include nearness to perennial water supply, fertility of the soil, the availability of raw material, good grazing grounds and the stable environmental conditions to live on etc. In complex societies besides the above said factors, political organization, trade, warfare, and religion also play a dominant role. Many works that corroborate zonal pattern have come up which include Adam, N.M. (1961), Willey, G.R. (1956), Sanders, W.T. (1965), Flannery K.V. (1969), Renfrew, C. (1972), Suraj Bhan (1977), Dhavalikar, M.K. (1978), Chitalwada, Y.M. (1979), Makhanlal (1984) and Shinde. V. (1984), David Raju, B. (1985)

The present study here is mainly based on the zonal pattern proposed by Bruce Trigger bearing on the determinants of settlement pattern. The data
gathered from the writer’s field trips from 72 early farming sites distributed over three districts viz., Krishna, Khammam and Warangal District of Andhra Pradesh have been utilized to draw the inferences about the way in which the early farming societies organized their settlements in respect of their physical and cultural aspects.

**LIMITATIONS OF SETTLEMENT PATTERN STUDIES**:

The settlement pattern studies require strenuous and through field work for collection of artefactual data from various sites to identify specific aspects of different cultures that originated at a particular area in different periods. In the process it may also be required the use of different scientific approaches such as palaentology, paleo-botany, physiography, climate, rainfall, soils, land use patterns etc. to bring out a reasonable conclusions to bring out the over all picture of the cultures. Even then there are certain limitations for settlement pattern studies as slown below.

**The total No. of sites**: It is difficult to determine with certainty, that the total number of sites of different cultures which were discovered in the region under study were exactly the same number of sites that which were existing during different cultures.

**Flood Activities**: Some of the sites that were established on the banks of rivers might have been destroyed beyond recognition by the natural agencies. If the river has changed its flow channels frequently on account of such as erosion and deposition floods or due to other reasons, the danger of obliterating of settlements
are more. Though no direct evidence to this effect is available in Muneru river basin, at Krishna and Muneru confluence, there is evidence of two sites viz., Kunikina padu and Kondapeta which are situated on left bank of river Krishna roughly 5 meters above the present water level got silted up by 20 cm thick due to flood deposits. But for the present agricultural operations, these sites would not have come to light.

**Hill wash:** Some sites which are existing at the foot of the hills might have been concealed under taluks or hill wash. This type of evidence is found at Pallagiri, Tangampadu and Papatpalle where the archaeological mounds were covered by red earth washed down from the hill slopes. However, the recent agricultural operations have brought these sites to light but otherwise the existence of these sites would not have known to us.

**VILLAGE CONSTRUCTIONS:**

Some of the sites might have been lying buried under the present village constructions. In the field explorations the writer noticed many such evidences, at Tatigummi, Ullapalle, Erullapadu etc. But for the recent deep diggings in these villages for road or house constructions, the archaeological mounds would not have been noticed. Further, the possibility of some more sites still remaining concealed under present village debrees cannot be ruled out.
AGRICULTURAL ACTIVITIES:

The area under study is exposed for agricultural activity of either wet or dry cultivation since a long time. The agricultural activities often involve clearing the cultivable area by way of digging to remove big stones and boulders and fill the lowlying areas with clay and other materials of adjacent areas to make it flat and prepare it suitable for cultivation. Besides these, the area is also required to be ploughed continuously and manured properly for stunted growth of crops. This process might have resulted in the destruction of archeological sites beyond recognition especially the evidences of post holes and floors and other important things of Neolithic sites and dolmens, menders and dolemenoïd chists of Megalithic period. Further, the occupational deposit of a particular site is very thin, there is a possibility of loosing site identity beyond recognition.

In this connection, it may be specifically noted that wet land cultivation does more harm and obliterates all the cultural indications than the dry cultivation. The process of wet cultivation is such that water logging in the fields for a couple of days and deep plouring which is followed there after. This water logging and deep ploughing naturally push the heavy cultural materials such as pottery, stone tools etc. to the bottom levels and thereby allow to form silty layer on these artefacts. In such a situation also the explorations may not give correct results. The writer is of the opinion that it might be one of the possible reasons for the absence of Neolithic and megalithic sites in Krishna deltaic region. This area is very fertile and well connected with a network of irrigation channels.
Presently all the area except the village proper and roads were brought under wet cultivation which yields double or triple crops each year.

The exact size of the archaeological site in relation to different periods of its cultural occupation is difficult to establish on the basis of surface findings. As most of them usually belong to the terminal period i.e., the period in which the site was totally abandoned or amalgamated into the succeeding culture. Hence, the surface explorations and calculations of the site dimension mostly provide clues for only the last phase of the site occupation. The extent of the site at different phases of habitation or succeeding cultural phases is difficult to establish on the basis of surface explorations. If the site is a multi-cultural one which is often the case and that too exposed for agricultural activity for several centuries, the estimates of the site dimensions such as length, breadth and thickness of each culture would not come out accurately. The early farming cultures of Muneru river valley lasted for more than 2000 years; the differences in size of the occupational area at different periods is difficult to predict. Even if the mound was a single culture site, and that too exposed to ploughing and vandalism, the artefacts and pot pieces are scattered in the site to larger areas and then also cultural occupation of the site would not come accurately.

**SURFACE EXPLORATIONS:**

The data from surface collections make us to presume that all the sites were occupied more or less contemporaneously within a broad period of several centuries. Sites could be occupied for a number of years and get deserted owing
to the prevailing environmental conditions, and lack of sufficient food products and raw materials for preparation of tools etc. Now localities could be identified and occupied simultaneously with the already existing habitational complexes, with the result that it becomes extremely difficult for an explorer to decide whether all the sites located by him in a region were occupied at a time or at different periods. No doubt changes in pottery and artefactual variations in the settlement patterns and the building materials would provide tangible information for cultural entities but at times only insufficient clues make the final analogies presumptuous statements. Since the demographic and subsistence pattern is estimated on the basis of the extent of the site which varies considerably from period to period, the interpretations on the demographic levels might give misleading conclusions. Moreover the soil fertility and ecological niches vary from site to site and hence a fixed parameter cannot be imposed uniformly to all the sites which were discovered at a particular region. No tool is known as yet to estimate exactly the dynamics of post depositional alterations taking place in archaeological material. However, the extent patterning of artifacts and ecofacts shall offer clues, though skewed to some extent for assessing the man-land relations of the past cultures.

Though there are a few limitations, the settlement pattern studies are considered more valuable model than any other known models to project the cultural entities. It is believed that ethnographic parallels of the present day society might reduce the ambiguity in interpreting the cultural effects of the past.
PROXIMITY TO WATER SOURCES (Fig.25):

The ample availability of water throughout the year is the important criteria for the anchorage of any settlement. The establishment of early farming sites in Muneru river valley is no exception to this rule and it is well documented in the present area of study.

The important rivers in the area include river Krishna, which is a major river and forms the southeran boundary of the present area of investigation and its northern tributaries such as Manneru, Paleru, Budameru etc. River Krishna is one of the three major rivers in South India and flows from west to east and receives the waters of Tungabhadras, Bhima and Muneru etc. at different strategic locations on its drainage channel. Hence, there is no scarcity of water supply in it throughout the year. The northern tributaries of river Krishna on the other hand only carry the rain waters during rainy and winter seasons but during the summer season they either carry less water or get dried up. But however during the lean season there always exist low lying depressions and pools all along their course which assure minimal water supply throughout the summer season as well. This might be one of the reasons why majority of the early farming settlements exist either near the meanders or close to shallow pools in the river beds. Only about 10% of the sites are located away from these rivers atleast by 5-10 km. Such sites are located adjacent to the tanks which are formed due to the natural depressions of the ground level. The early farming sites such as
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Fig. 24
Penugonda, Gundurupadu, Senagapadu, Pallagiri, Chilikuru and Erullapadu may be cited as examples.

Of the 72 sites that have been discovered so far, only 6 sites are located on the left banking of river Krishna while 57 sites are located on Muneru or its tributaries such as Akeru, Wyra or Katleru etc. The remaining sites are located far off from the revarine system and either near lowlying areas or tanks. The paucity of early farming sites on the left bank of Krishna river may be accounted for its shallow banks and annual floods which inundates the whole area and causes damage to the life and properties. This might be a probable reason for the early farming cultures to avoid settlements on fertile banks of river Krishna except at a few elevated areas.

During the monsoon season the velocity of Krishna river at Vijayawada which is not far off from Muneru river valley, is estimated to be 7,61,000 cubic feet for an hour and during the high spate its velocity is beyond comprehension. Because of these factors, Krishna River suddenly swells and overflows its banks. Recorded evidences within a hundred years span between 1864-1964 indicate that river Krishna is flooded for nearly 20 times causing so much of loss for life and property (Chandrasekhar, A. 1964 a, b.)

The hundred year flood data of river Krishna belong to the period after the construction of various dams across its trunk channel and providing the protective bonds on either banks. It is anybody’s guess to assess the floods in
river Krishna from the times immemorial when protective bunds were not laid
during the early farming cultures.

The third reason for the sporadic occurrence of settlements on Krishna
might be due to the enormous width of the river bed, a narrow water channel in
the center and high sandy banks on either sides might have made water
procurement difficult. The sites on its left bank namely Bobbellapadu, Ustepalle,
Kesarabanda, Pokkunuru, Kondapeta, Kunikinapadu etc. are far from the river
Krishna atleast by 3 km and situated on high elevated terraces.

In contrast to river Krishna, the adjacent areas of Muneru river and its
tributaries were intensively occupied during the early farming cultures. As many
as 61 early farming settlements were located on these rivers. This might be due to
the small catchment areas where the water seldom over flow out of their banks but
provide required water supply for drinking and irrigation activities. In dry season,
these rivers flow sluggishly or dry up. But however, at the meanders, water pools
exist and hence the early agricultural settlers might not have found difficulty in
procuring water in hot season as well. The location of the early farming sites
indicate that these rivers were flowing in their prescribed channels and were not
changed their course frequently.

There are 9 sites which are away from any of these rivers. At all these
sites there exist tanks which are caused by natural land depressions where rain
waters collect. Since most of the areas are provided with an assured water supply
through a network of canals, the importance of tanks is not acutely felt in the
present times. This has resulted in silting up of tanks at many places. But this might not have been the situation during the time of early farming cultures. These tanks might have served the daily needs of the people and even if the tanks became dried, for a couple of weeks, there would not have been much difficulty in the procurement of water as the rivers were flowing within a radius of 5-10 km from these sites.

There might be many reasons for the early farming man to choosing the Muneru river and its tributaries for their settlements such as –

1. All these minor rivers flow for short distances and hence the water that flows in the shallow incised channels of these rivers is predictable. Except in abnormal conditions these rivers would not overflow from their banks and cause devastation in sharp contrast to river Krishna. Except for a rare instances these rivers are usually confined to their banks only.

2. Most of the sites are located at the strategic locations such as crossing points or meanders, which is probably due to several advantages such as:
   a. The meanders offer deep depressions where water pools are formed and conserved the water for lean season and also allowed the aquatic animals to grow.
   b. Since the water is preserved in the low land depressions, the game animals frequently visit the area for water, particularly during the summer season.
c. The banks at the meanders are generally shallow and hence the river overflow and inundates the surrounding areas during rainy season. In the process it deposits fresh riverine deposits which makes the areas more fertile and thus allow stunted growth of plants.

d. The bunding of rivers / streams near meanders is very easy. It does not require a great engineering skill as the rivers are small in size and flow for shorter distances in incised flow channels. A few boulders if placed across the rivers is enough to divert waters to nearby low lying areas. The Krishna district manual (Makenzie, G. 1883:155) provided an interesting information regarding the damming of the streams which are known as “Kattuvas” thereby the waters were diverted at ‘L’ shaped meanders for raising “Garden Lands”. The Muneru river and its tributaries such as Akeru, Wira, Katleru etc. have several ‘L’ shaped meanders and by placing a few stone boulders across these streams is not a difficult problem to the early agriculturists to divert the water for agricultural purposes.

A corroborative archaeological evidence at Inamgoan, a chalcolithic site in Maharashtra indicates that artificial irrigation was already in practice during chalcolithic period. The water in the flow channels is diverted in the above fashion by placing the rock bunds for irrigation and other purposes. The recent areal photographs of the area have also confirmed the data obtained from Inamgoan excavation (Dhavalikar, M.K. 1977).
As Flannery, K.V. (1976) observed elsewhere, also the crossing points and meanders of Muneru river and its tributaries might have been exploited by early agricultural communities and hence a majority of their settlements were located close to them. These rivers might not only facilitated easy procurement of water, but also allowed the aquatic animals to grow and attracted game animals.

**FERTILITY OF THE SOIL**

The fertility of the soil is another important diagnostic criterion for the settlement of early agriculturists (Fig.26). The area under consideration is composed of 5 important soil types such as:

1) Deltaic alluvium.
2) Black cotton soils
3) Red soils
4) Red earths
5) Mixed Red sandy soils

Among these 5 soil groups differences exist in their fertility of which a detailed account is given in Chapter II. The mixed red sandy soils, gravels and red soils are less fertile and not suitable for stunted agricultural growth. Except with an improvised agricultural system, farming in these soils, if not impossible, is difficult. Added to these factors, these soils do not absorb the rain water quickly as in the case of deltaic alluvium or black soils (Spate, O.H.K. et. al. 1972). Hence, the early agriculturists of Neolithic period safely avoided their settlements in this region.
On the other hand, for reasons not known in the deltaic areas of river Krishna which is considered as one of the most fertile land forms of the country, the early farming sites are very few. Only 7 sites came to light of the total 72 early agricultural settlements in the region.

There might have been so may reasons for the early farming societies avoiding alluvial soils such as : 1. The deltaic alluvium was spread like a table land in Vijayawada, Gudivada, Guntur and Bapatla taluks. It has covered all the underground rocks atleast by one or two meters and at some places slightly more (Foote, R.B. 1916-121).

The river is not in a position to deposit pebbles the area under consideration but on the other hand is depositing thick sheets of sand. In this context, the observations of Foote, R.B. (1916:121) for the absence of stone age sites in the locale is worth nothing. According to him

1) “compared with the number of finds made in many other districts to the south and south west, the yield of prehistoric objects in Krishna district is very meager; but no reason for this was apparent from its physiography unless it be that so large a proportion of its area is formed of the alluvium of river delta, which has covered up the older land surface occupied by the Paleolithic and neolithic”.

2) The frequent floods which might have caused loss of property and life in the area and hence the early agriculturists avoided the area.
3) The presence of alluvial deposits between Bapatla and Gudivada, a vast area covering 150 km in length suggests that the river had changed its flow channel from time to time. Added to that, the river banks past Pulichintala gorge have turned to be very shallow and allowed swamps to grow.

So taking into account all the above mentioned aspects such as over flooding, shifting in river course, bridged channels, marshy lands etc. might be the reasons for non availability of early farming sites in deltaic soils.

**BLACK COTTON SOILS:**

when compared with other soils, the early farming sites in black cotton soils are numerous as many as 40 sites out of 72 available early farming sites are located in black cotton soils.

1. The black cotton soils is said to be “sub-serial origin formed due to the impregnation of certain agricullaceous soils by organic matter” (Foote, R.B. 1916:183).

Foote, R.B. attributed these soils to the former existence of large and thick forests when a moderate moist climate prevailed than now. Thus black soil is the humus formed insitu by such forests (Mackenzie 1883; 240). It has the great capacity of absorbing the moisture and retaining it for longer duration. This might be one of the reasons for the growth of trees and other vegetable matter for a longer duration. Even if there is a failure of rains for one or two years, the plants that grow on the soil are seldom affected, since the moisture it retains will help the plants grow without any obstruction.
The manual of Krishna district published in 1883 (Makenzie 1883:226) describes the Black cotton soils as follows. “Black soil otherwise called cotton soil and designated by geologists ‘Regur’ from the Telugu ‘ragada’. It is a fine Black soil highly arrigillaceous and slightly calcareous, which in dry weather contracts to such an extent that the surface exhibits cracks, often five or six inches across and several feet in depth and in wet weather retains an extraordinary amount of moisture, becoming them singularly adhesive. The soil is therefore to be avoided by a traveler on a horse back, for in the hot season, the fissures will admit the horse’s hoof and in the rain a mass of stickly soil that will adhere to the hoof is worse than balling snow. Dr. Christe dried experimented with a regur soil and exposed it in a wet atmosphere and found that it increased its weight by eight per centum. The soil is never more than about six or ten feet in depth, when it usually alters into Kankar. It was never found at any depth below the surface unless, where it has been carried down and rearranged as a stream deposit. It is wonderfully fertile, yielding crops of cotton and millet year after year without manure”. (Mackenzie 1883:239).

In the words of Foote, R.B. (1916:183-4), “in hot weather, as the soil (the black cotton soil) shrinks, it becomes fissured with cracks two to three inches wide and about eighteen inches deep which drive the surface into blocks of two or three inches square. The first of heavy rain washes the surface soil into these cracks and fills them removing the surface soil and exposing a fresh under layer”. This, in other wards, is known as self ploughing nature of the black cotton soil.
The formation of cracks has another advantage, i.e. during the thunderstorms, the lizards and other small animals such as snails and immense numbers of insects of many varieties and vast quantities of vegetable matter is washed down into the gaping fissures which soon fill up and the washed in objects securely buried, (Foote 1916: P.184) and this process ultimately fertilizes the black cotton soil to a greater extent. The climate also appears to be very congenial. The rainfall is neither too heavy and will never exceed more than 1000 mm as in the case of Coastal tract or inadequate as in the case of upland areas (650 mm). A constant rainfall around 700-900 mm is a common feature here. The temperature in the summer touching upto $46^\circ$ C, is one way or the other helps the black cotton soil for its self ploughing nature. All the above features such as moisture absorption and retention, self ploughing nature and self fertilising nature of the black cotton soil and congenial environment might be the possible reasons for the early farming culture for anchoring then settlements in Black Cotton soil areas.

When compared with the black cotton soil, the locations of early farming settlements in red soils are very limited. There are altogether 18 sites in red soils. Of these 18 sites, 16 sites fall in red sandy soils and the remaining 2 sites fall in red earths. In red loamy soils not even a single site has been encountered so far. Of the sixteen sites, that fall in red sandy soils, 6 sites fall adjacent to the black cotton soils thereby the advantages of black soil was equally shared by the early farming settlers.
The above said sites might have subsisted on mixed economy such as collection of wild roots and fruits from the nearby forests and practicing a sort of farming to supplement food stuffs in the lean seasons. The domestication of animal and hunting of wild animal might be other criteria of their economy. These sites are very small in nature and will not extended more than 2 hectares. Further, the iron made tools such as plow share, crow bar etc. facilitated the water supply by digging wells and other aspects during the megalithic and early historic periods and hence there were sporadic occurrence of settlements in red soils as well.

THE AVAILABILITY OF RAW MATERIALS:

The raw materials used for the preparation of tools during Neolithic period include igneous and metamorphic rock varieties. The igneous rocks such as dolerite, basalt, and charnockites are mostly used for the preparation of the edge ground tools whereas the metamorphic rocks such as quartzite etc., used for the preparation of non edge ground tools. The igneous rocks are locally available in the granetoid and schistose gneissic areas in the form of dykes, sills, while the metamorphic rocks are amply available in Kurnool and Cuddapah formations (fig. 27) on the river beds in the form of pebbles. The proximity of the raw materials close to the sites prompted the Neolithic folk to promote tool manufacturing centers of edge tools at Pallagiri, Kondapeta and D. Puram.

At all these places the finished and unfinished edge ground tools in the association with by product flakes are available. The crystal quartz which is the
chief raw material used for the preparation of the associated microliths is also locally available in the form of veins in granetoid and schistose beds.

In this connection, it may be noted that during Megalithic and Early Historic periods, due to the technological development, the smelting of iron was in vogue. The implements that were made on iron was durable and efficient. Hence, with the help of iron made crow basis shawls and other implements the early agriculturists during megalithic and early historic periods started agricultural operations in the infertile lands such as red sandy soils and red earths. This is corroborated in the absence of settlements during Neolithic period and presence of settlements in red soils during megalithic and early historic periods.

**THE SITE – SIZE:**

Of the total 72 early farming sites discovered so far 24 sites are less than one hectare in area, 32 sites fall between 1-2 hectares, 17 sites are in the category between 2-3 hectares while 12 sites extend to an area of 3-4 hectares. There are 11 sites which are above 4 hectares. All these sites on the basis of extent are divided into 3 groups i.e. :

1. Big village;
2. Small village; and
3. hamlet.

The big villages are those which extend above 4 hectares in area. The sites which are spread over an area of 2 to 4 hectares are placed in small village
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1. MATEDU ○ 41. KOLLUVELA ○
2. KACHHAL ○ 42. VENALAPURAM ○
3. PENDURRADA ○ 43. MUNDAKADU ○
4. KOLLAKURU ○ 44. NOMARPET ○
5. BODDUKONTDA ○ 45. THOTACHAMLA ○
6. KAMALAPALLI ○ 46. SAVAGANDU ○
7. G. MAAUS ○ 47. KONURU ○
8. G. PALLE ○ 48. MAGALU ○
9. HAYRAM ○ 49. TANNAKRAM ○
10. MUNIRAMADU ○ 50. DAKURU ○
11. ULEPPALLI ○ 51. CHILUKURU ○
12. FIGUREM ○ 52. D. DEVARAPADU ○
13. TANAGAMPADU ○ 53. F.EEELAPADU ○
14. MAPPALLI ○ 54. VISAJOAPA ○
15. MUNUGONDODA ○ 55. PEDSAPURAM ○
16. HAYRAM ○ 56. KANURU ○
17. GUDURPADD ○ 57. JAATHI ○
18. GUMMADAMIJU ○ 58. ALURU ○
19. RAJUPET ○ 59. DACHAVAM ○
20. JAKELPALE ○ 60. AJSU ○
21. SURUFAILAPADU ○ 61. TIRUALAPURAM ○
22. G.PURAM ○ 62. VEILANI ○
23. MADERAPALLI ○ 63. THADUGRAM ○
24. NELAKONAMPALLI ○ 64. GANDEEPALE ○
25. GARDASA ○ 65. KALLAGIRI ○
26. ANNAPETTA ○ 66. MUPALLI ○
27. MALLAM ○ 67. BORIGELAHDU ○
28. T. PURAM ○ 68. USTERAPADU ○
29. CHIRJUMAHA ○ 69. KASAARADA ○
30. BIRHAMPALLI ○ 70. POJUKURU ○
31. SAWAPADU ○ 71. KONDAPET ○
32. RAYAMAPET ○ 72. KUNDURAPADU ○
33. BAYAMANDODA ○ 73. KONURU ○
34. ADHAHOLM ○ 74. KURAMPADU ○
35. KABALADE ○ 75. MELOTHI ○
36. JAHIRAD ○ 76. MEGALITHIC ○
37. MALLAVAM ○ 77. EARLY RIVERIC ○
38. ROMPALLA ○ 78. KALAVOTA ○
39. GUMAMAPADU ○

Fig. 27
category whereas the sites of less than two hectare in area are considered as hamlets (fig.28). In this connection, it may be mentioned that for obvious reasons, the camp sites and hereding units which usually possess a very small area of occupation are not encountered so far.

Large size settlements on river Krishna are limited. There are 10 sites on river Krishna and except Kondapeta, there are practically no other sites which can be considered as a big village settlement. For the reasons already cited, it is not possible to know the nature the number and size of settlements in the Krishna deltaic area. However, Kondapeta, one of the biggest multicultural settlement on the bank of Krishna and enjoys an unique prevelege of its location on an elevated area above the level of flood waters, the availability of fertile lands for cultivation and pastures for grazing, the easy accessibility of raw material for the fabrication of tools from the exposed rock surfaces and pebbles on the river bed etc. The site might have been a big village even during the Neolithic period and continued its position during megalithic periods as well.

The present settlement pattern on river Krishna even if it is observed, there won’t be much difference when compared with the Neolithic times. Between Nagarjunasagar and the Bay of Bengal, there is only one big town i.e., Vijayawada. But unlike the Neolithic times there are so many villages on either bank but very small in nature. This might be due to the protective bunds and dams across the river in the present day times.
The locational analysis of the early farming sites shows that these settlements are arranged in linear pattern. Generally, the linear pattern follows the resource pattern. The resource pattern is constant only when the population is maintained below the carrying capacity of the area (Lee, R.B. 1968). Whenever it was felt that the economy was falling short of the optimum demand, possibly due to the population rise or failure of crops or scarcity of water, migration of people in small bands to the nearby promising areas in order to avoid food crisis is a natural phenomenon (Cohen, M.N. 1977; Possehl, G: 1880). Thus a big village after reaching a certain stage beyond its carrying capacity, splits into one or more sites by way of migration of certain bands of people to the nearby promising areas resulting in the emergence of new villages. Usually this spread and split is a continuous process if the sites are situated on river banks (Tiffany, J.A. and L.R. Abhott 1982). This phenomenon is well documented at the Neolithic sites that are located on the left bank of river Krishna when compared with the Neolithic sites that were located far off from the area and located on Muneru and its tributaries such as wira and Katleru. The Neolithic sites of Krishna river seemes to have continued for a longer duration (as could be seen from the thick habitational deposit) and got splitted at different times. This split is indicated by the predominance of Fabric A (i.e. coarse fabric) pottery over fabric B (i.e. fine fabric) pottery in those sites that came to light in the area adjacent to Krishna river. The predominance of fabric A pottery over fabric B pottery in some of the sites which came to light on the banks of Muneru and its tributaries wira and Katleru also indicate that these site got established at a later date by means of
migration of certain bands of people whose cultural entities are already in deteriorating condition and have already adopted or about to adopt fabric A pottery.

The spacing between sites is not always uniform. As King (1961) observes elsewhere, that the spacing of a settlement was governed not only by the size of a settlement but also by the environmental and economic potentialities of the area. This observation also holds good for the early farming sites of Muneru river valley. At the fertile areas where Black Cotton soils and Detaic soils prevailed, the settlements are clustered and the spacing between one site to the other is less than 5 km, while at the areas where the unfertile soils such as red sands, sandy soils prevail, the settlements are dispersed and hence the inter site distances are more than 10 km. The analysis shows that the clustered and dispersed settlements are due to the resource potential of these areas.

**Migratory Route:**

It is difficult to deal with whether the Neolithic culture and megalithics are indigenous cultures or migrated to South India from elsewhere. There are several theories on the origin and spread of South Indian Neolithic culture. These theories include West Asian origin (Allchin, F.R. 1960 : 139-142), South East Asian Origin (Wheeler, R.E.M. 1948:295) and indigous theory (Thapar, B.K., 1965: 87-112). In the absence of corroborative evidence to suggest one of the above theories in the present state of affairs, it is sufficient to point out here that the further work based on systematic excavations at several places might give
more tangible data regarding the question under consideration. But as per the Neolithic culture of Muneru river Valley one significant factor is that adjacent to the area under consideration, only 2 sites were exposed for systematic excavations for which reports are available. They are Nagarjuna Konda (Subrahmanyan et al. 1975) and Kesarapalle (Sarkar, H. 1973). Kesarapalle material presents only a phase connected with Neolithic and chalcolithic and hence it cannot give any clue to the origin of the Neolithic and subsequent of Muneru River valley.

The excavations at Nagarjuna Konda on the other hand has brought to light three phased development. The first period which is identified as early Neolithic has the cultural components such as microliths, crude axes and crude redware etc. and the date of the period is estimated by the excavators of to 2500 B.C. The second phase is identified as mature Neolithic phase which is characterized by the prolific occurrence of burnished red, grey and buff wares, ground and polished stone tools etc. whereas the late phase is represented by the occurrence of coarse red, brown, buff and grey wares etc. The chronological estimates of the phase and late phases are fixed respectively as 2000-1500 and 1500-1000 B.C (Subrahmanyam et. al. 1975). The obtained data from 11 neolithic sites do not provide any supporting evidence for the early phase of Nagarjuna Konda, though a majority of them are located within a distance of 80 km from Nagarjuna Konda. On the other hand the artefactual evidences of Neolithic culture from the present field data from Muneru river valley provide close similarities to the mature and late phase of Nagarjunakonda respectively.
with the presence of fine and course wares. In the stratigraphical scrapings conducted at Kondapeta Pallagiri and Peddapuram also corroborates the said evidence.

On the basis of above features, it is clear that the Neolithic culture of Muneru river valley has two phase development i.e. the first phase is akin to that of matured Neolithic phase of Nagarjunakonda with fabric B as a dominant feature and represented by fine grained and burnished pottery of grey, buff, brown wares and prolific occurrence of ground and non-ground stone tools. The second phase on the other hand is akin to that of the late phase of Nagarjunakonda and represented by predominant occurrence of fabric A represented by course grained and mostly unburnished pottery and limited occurrence of ground stone tools with or without polish and scanty occurrence of blade industry. The same situation of nature and late phases is also represented at the Neolithic sites of Bellari and Dharwar areas of Karnataka State in the sites of Brahmagiri, Kupgal, Hallur, Takkelakota and Piklihal of Western Andhra Pradesh. As this area is considered to be the epicenter of Early, middle and late phases of Neolithic culture, it is probable that the cultural traits of Neolithic if not people might have migrated all along the Krishna river to the eastern parts of Andhra and also to Muneru river valley. Hence, it may be conjectured that is why only mature phase and late phases of Neolithic traits are found in Muneru river Valley and ultimately the late phase of Neolithic culture is emalgamated with higher cultural trait of Megalithic culture which has introduced more efficient iron tools for agriculture and
carpentary works, fine grained and inverted fired pottery etc. Further, the use of iron tools facilitated early agriculturists to till the soil more efficiently and dig wells for procurement of underground water and also facilitated the forest clearance to more areas for settlements including the non fertile red soil areas which were considered by Neolithic folk as unproductive. Thus the early farming cultures spread to different areas of both black cotton and red soils simultaneously during megalithic and early Historic periods.

**Trade:**

Trade in pre-historic societies is a complex phenomenon which has recently begun to receive the attention it deserves from archaeologists. In this context, the opinion expressed by Renfrew, C. (1972) is worth consideration when he refers to pre-historic trade as a reciprocal exchange of movement of materials or goods through human agency. In Muneru river valley faint reminiscence of a net work of exchange (trade) is found particularly regarding the goods such as steatite disc-beads, salt and ground stone tools. The steatite disc-beads which are an invariable component of chalcolithic culture of Patapadu and its neighbourhood are also found at several sites in Muneru river valley although they are not prolific at any of sites but recovered at Neolithic sites at Kondapeta, Muppalla, Chinamandava and Pallagiri etc. and that to recovered in finished form in different sizes. Further, the steatite is not locally available in Krishna, Khammam and Warangal districts. This suggests that these beads were manufactured elsewhere and were transported to these areas in fully prepared
condition as a part of trade or cultural exchange. But, on the other hand, the parallels can be drawn from the sites such as Ramapuram (Narasimhaiah; 1980), Singanapalle and Palvoy (Rami Reddy V.R.: 1968, 1976, 1978) etc., where the beads in finished as well as incomplete stages are available. The raw material is also amply available within the dolemites of Vempalle formations from the areas such as Jangamreddipalle, Madigupalle, Karampudi, Mutukot and Tabjula in Anantapur district; Chandrapalle, Marrikunta, Yaparlapadu and Gadidemadugu of Kurnool district etc., (G.S.I. 1975: 43). These steatite bearing localities are close to the Neolithic settlements in Kurnool and Anantapur districts. It is also presupposed that a few border sites such as Poosalapadu, Akkapalle, Tarlupadu (David Raju. B, 1985) etc., might have served as the centers of exchange of steatite disc-beads to the other areas of eastern Andhra including Muneru river valley. This suggestion should be corroborated with more intensive work based on excavated data.

The salt is one of the important aspects in the day today life of human beings. Though there is no direct evidence on hand to show that there was use of salt in Muneru river valley during the Neolithic and megalithic times, the location of Neolithic sites such as Vemavaram, Sivapuram and Jayavaram close to shore line (David Raju 1985 : PP) and dried up salt pans at uppugunduru (Makenzie :1983) is suggestive of such exchange. In the absence of rock salt in Muneru river valley it is not over stating that these sites might have served as trading centers for salt. The presence marine shells in some of the early farming sites in Prakasam district also strengthens the above viewpoint.
The presence of a copper celt at Gandluru a Neolithic site on right bank or river Krishna is another important evidence to suggest that there was a kind of exchange of copper objects with the chalcolithic communities of south-west Andhra Pradesh as elsewhere (Soundararajan, K.V. 1969 :30-35). At present there is no evidence from the explored or excavated Neolithic sites of Muneru river valley to suggest that the smelting of copper was locally practiced. From the trenches at Kondapeta and Damsula puram also the copper implements such as pins are present. Same is the case with the excavated site Nagarjuna Konda. Hence, the most probable explanation for the presence of copper celt at Gandluru is that it might have reached Gandluru in a prepared condition from elsewhere either from Neolithic chalcolithic sites of Western Andhra or from Deccan chalcolithic cultures of Maharashtra as part of exchange programme or trade. Some explanation may also hold good for the copper celt discovered at Guntupalle (IAR 1975-76). As copper tools are not many their presence in some of the Neolithic sites could be associated with the higher echelons of the contemporary society, who perhaps organized the social systems and therefore, had access to exotic objects (Murti, D.B. 1983 : 124).

Another aspect suggestive of exchange of trade is the ground stone tools. A few sites such as Pallagiri, Kondapeta which are close to natural resources such as dolerite or basalt dykes seem to have been manufacturing centers of ground and polished stone tools and it is corroborated by the presence of a large number of ground stone tools in various stages of preparation along
with the by product flakes at these sites. These sites might be acting as the exchange centers of ground stone tools to the nearby areas where the proper raw materials are not available. At such sites of the latter kind the ground stone tools are collected only in fully prepared condition without being associated with by-product flakes.

**Population:**

Demographic estimates of ancient societies have been thoroughly worked out during the past two decades with an emphasis on the size of population density and growth rates etc. To overcome several drawbacks and short comeings several theories are proposed on the basis of the available.


4. Phosphate content of the area is supposed to provide the confines of a given settlement (Joshi, R.V. per.com).


Since the present work is mostly based on the explored data, the first four theories are not possible to work out. Hence, the theory i.e., the settlement
area is taken as the basis to postulate the demographic analysis of early farming cultures of Muneru river valley. There are a few limitations to work out the population estimates on the basis of size of the settlements such as:

1. The population of a site is estimated on the basis of the maximum extent of the site. The site extends to a maximum area either in a matured phase or during the terminal period. Hence, the population that is estimated at a site does not reflect the true picture in respect of different periods of occupation it has undergone.

2. The demographic data predicted at the sites by using ethnographic model of the present day society might not be necessarily similar to that of the said period under study.

3. On the basis of the availability of the natural resources, the birth and death rates very considerably and hence, the growth rate of population from one site to other and with in one site from one period to other is difficult to estimate.

Further, it is incorrect to think that all the discovered sites at a said area have come up simultaneously and estimate the population accordingly. A few sites might have been occupied continuously while a few sites were abandoned after a lapse of certain time, and a few sites got re-established on the old site after lapse of time. In this context also the population estimates might not focus a true picture.
Though there are several limitations for this type of demographic study for the extinct cultures, which are quite likely and cannot be avoided in the present state of known demographic models, the aim of the present study is confined to estimate the population of early farming cultures in Muneru river valley at a fixed point of time and not over a long stretch of time. In this context, it may be added that the ambiguity can be reduced to a certain extent by postulating the demographic models on the basis of the ethnographic studies (Adam, N.M. 1965) who while estimating population of Diyala plain, took into consideration 3.5 persons per family and 200 persons per hectare. Fairservice W.A. (1967) estimated 6 persons per family while estimating the population of the Indus sites. Lasnik Lawrance (1967) estimated 6 persons per family while estimating the population of the Indus sites. Lasnik Lawrance (1967) on the other hand, estimated 200 persons per hecate on the basis of his study of ethnographic survey in Nimad district of Central India (Madhya Pradesh).

Similar ethnographic studies are absent in Muneru river valley and hence the author himself has conducted demographic studies on ura chenchus at Boyadegumpula and Garikapudi in Krishna and Khammam districts. The estimates of the Boyas at these villages in Muneru river valley by the author have indicated that the horizontal components of the sites come up very close to Lasniks estimates. Hence, the population estimated by Lasnik is taken as key measure here also to estimate the population of early farming cultures of Muneru river valley.
Of the 72 early farming sites discovered in Muneru river Valley 9 sites did not present tangible evidences of the occupational area during early farming cultures because they are either destroyed beyond recognition or buried under the succeeding cultures. The remaining 64 sites, however, preserved the evidences for the occupational area during Neolithic period. The total area occupied during the early farming cultures is hectares. Based upon the estimates that 200 persons for each hectare, the total population during the Early farming Cultures in 72 sites is persons.