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HISTORICAL SETTLEMENT PATTERN OF ANJUNAD: AN EXPLORATORY ANALYSIS USING GIS

Abstract: In ancient and medieval Tamil Nadu, the territorial unit nadu played an important role in the administration of the state. In brief, it was the supra-village-unit, primarily consisting of ur villages or agrarian settlements, where Vellala landholders functioned their assembly. However, the historical role of nadu has ended by the end of the fifteenth century C.E. Interestingly, the settlement of Vellalar in the five ur villages, collectively known as Anju (Five in Tamil) nadu (Anjunad) found in the valley region between the Western Ghats and the Palani hills of the southern part of India. They claim their migration from Madurai in time immemorial, which needs further study to fix the migration and settlement chronologically. However, to understand the underlying influences of the environment in the choice of the areas for the settlement of the villages, settlement pattern analysis has been done by using GIS. An investigation has been done on the villages of Anjunad with relation to their geospatial information of their distribution, route, elevation, soil types, slopes and water sources for deriving the similarities among them by using QGIS Open Source Software, version 3.38.1. The results contribute to inferring the settlement history of Anjunad in relation to the environmental conditions.

Keywords: agrarian history, anjunad, historical settlement, migration studies, settlement pattern analysis, vellalar

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Introduction

Nadu was the basic areal unit at the supra-village-level in ancient and medieval Tamil Nadu in the southern part of India (Karashima, 2011). Historically and etymologically, the term nadu has been connected to the agricultural region (Stein, 1980). The measurements of the territorial unit nadu ranged from 10 square miles to 300 square miles during the medieval period, and they were mostly located on the banks of a watercourse (Subbarayalu, 1973). Each nadu consisted of about ten villages on average, where different communities had their residential areas, and mostly Vellala landholders served as the representatives, known as nattars, to whom the royal orders were addressed first (Karashima, 2012). Among the villages of nadu, the prevalent one was the ur type (traditional peasant villages), where the ur assembly of Vellala landholders usually functioned (Karashima, 2014). During the later stages, the composition of nattars changed and even in the hilly and semi-arid areas, other communities also formed the nadu assemblies by imitating the practices of the central area of the state (Karashima, 2014). By the end of the fifteenth century C.E., the historical role of the nadu has had ended as a result of the social changes (Karashima, 2009).

Interestingly, in the contemporary period, the settlement of Vellalar with the attributes of the historical nadu was found in a fertile valley region between the Western Ghats and the Palani hills of the southern part of India. The region is locally known as Anjunad (Anju Nadu), which comprises five ur villages, as the term indicates anju, meaning five in Tamil. Anjunad Vellalar are traditional agrarians and remain landlords of Anjunad. In the five villages, they have a similar social structure, and they strictly follow endogamous tradition in marriage within the five villages only. This structure shows similarity to the assembly found in all the villages. Along with Anjunad Vellalar, the communities of Kammalar, Muduvar, Mala Pulayar, Karavazhi Pulayar, Vellan Chettiyar, and others were also found in the villages of Anjunad. Although the earliest documented report about Anjunad with reference to Vellalar settlement dates back to 1822 (Nelson, 1868), the oral tradition of Anjunad claims their migration from Madurai (Tamil Nadu) in time immemorial. Since archaeological evidence has yet to contextualize the settlement of Anjunad spatially and temporally, the antiquity of the settlement of Anjunad Vellalar or the formation of the study area is not clear.

However, the underlying influences that might have led the people to choose certain areas (villages) in the valley to settle after their migration can be ascertained through the study of the settlement pattern. This paper inquires into the distribution, route, elevation, water sources, soil types, slopes and hill aspects of the five villages of Anjunad using GIS to assume the similarities among them, which presumably is the ideal choice in the settlement of the villages. This also helps in understanding the historical role of the environment in the formation of Anjunad as a nadu. This work has used QGIS Open Source Software, v3.38.1 (QGIS Development Team, 2025) for the study.

Materials and methods

Location of study the area. Anjunad is currently located in the border districts of Idukki and Theni of the states of Kerala and Tamil Nadu (reorganized in 1951) in the southern part of India (Figure 1). It mainly comprises the five villages named Marayoor, Karayoor, Keezhanthoor, Kanthalloor and Kottakkudi. Among them, Kottakkudi was historically known as Kottaiyoorkudi (Subbarayalu et al., 2014) and is situated in the Theni district of Tamil Nadu, whereas the rest of four villages are situated in the Idukki district of Kerala.

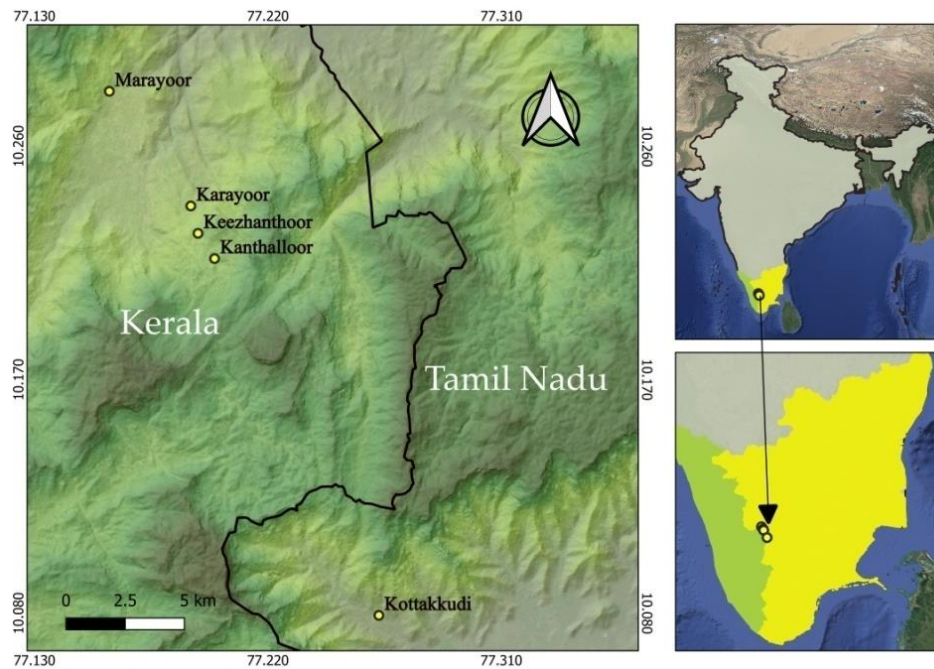


Figure 1. Location map of Anjunad

Source: Own creation

Soil and Water sources. Anjunad, as mentioned above, is located in a fertile valley region, where water sources are available nearby as rivers and streams. The data source for water sources has been downloaded from the India-WRIS portal (National Water Informatics Centre (NWIC), 2025). Kottakkudi Ar flows in Kottakkudi, Pambar flows in Marayoor, and Sengalar flows in the villages of Karayoor, Kanthalloor and Keezhanthoor. On average, the cost distance from a village to the nearby water source is ~2 KMs, calculated using the OpenRouteService (ORS) plugin in QGIS (Heisenhuber et al., 2013), utilizing OpenStreetMap data (OpenStreetMap contributors, 2025). Although this is related to one of the significant characteristic features of the historical nadu, water sources are also found in the areas beyond the villages is noteworthy. The soil data has been accessed from the FAO/UNESCO Soil map of the world, scaled 1:5 000 000 (FAO, 1977), showing that Anjunad is mainly covered by the soil types of Ah (humicacrisols) and I (lithosols). The latter is a raw soil of bedrock, whereas the former is a strongly weathered soil (Ahnert, 1998). The map (Figure 2) shows that soil

and water sources do not have much variation between the villages and the surrounding areas in the valley.

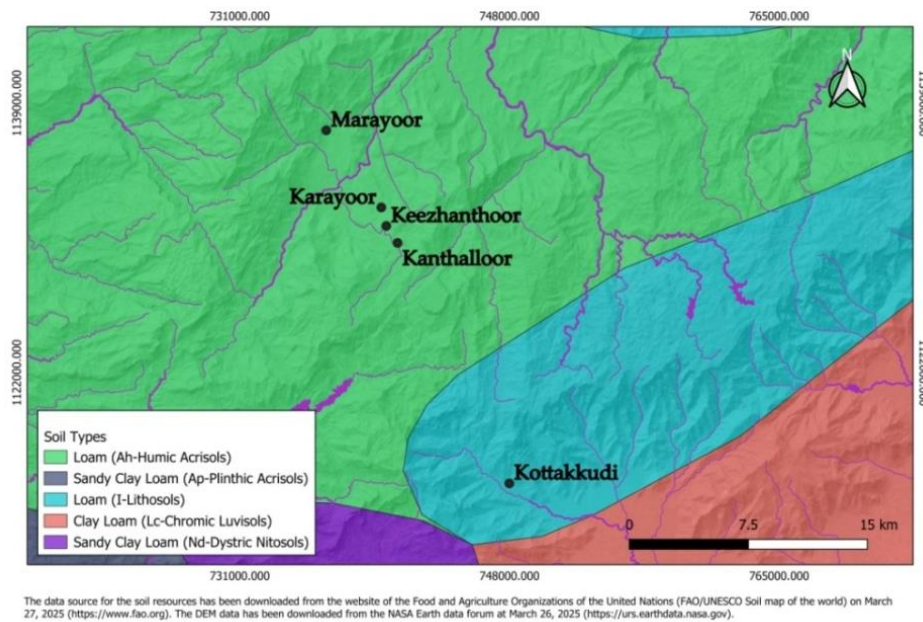


Figure 2. Soils and Water sources of Anjunad

Source: Own creation

Distribution of the villages. The spatial distribution of the villages of Anjunad shows, moreover, a linear pattern. To understand this, the least cost distance route from the first to the last village in the south-north orientation has been calculated with the help of OpenRouteService (ORS) plugin in QGIS (Heisenhuber et al., 2013), which utilizes OpenStreetMap data (OpenStreetMap contributors, 2025) to compute least-cost paths. The result showed the influence of the route on the settlement, as evidenced by the distribution of the villages near the route. Here, the route derived is the same being used in the contemporary period by the people of Anjunad to navigate from one village to another village by walking. The total length of the route calculated from Kottakkudi to Marayoor is ~45 KMs. In it, ~31 KMs (i.e., 68 percent) has been covered in the distance from Kottakkudi to Kanthalloor alone. Hence, it can be observed that there might be some challenges or factors that hindered or disrupted people from settling in the area between Kottakkudi and Kanthalloor (Figure 3).

Elevation. Anjunad, as mentioned earlier, is situated in the valley region between the Western Ghats and the Palani hills. To understand the correlation between the settlement and the elevation, a digital elevation map has been generated. The digital elevation model (DEM) data (SRTMGL 1) for the map were obtained from the NASA Earth data portal (NASA Jet Propulsion Laboratory (JPL), 2023) accessed through QGIS. It has the spatial resolution (1 arc-second) of approximately 30m, referenced to the WGS 84 coordinate system. The observation from the map reveals that the highest elevated area in the region measures 2555 meters, whereas the settled villages strictly fall under the elevation of less than 1700 meters (Figure 4). The interconnection between the elevation and the settled villages shows the influence of elevation on

settlement. Further, it helps to understand the factor behind the previously mentioned gap between Kottakkudi and Kanthalloor, which hindered people from settling there.

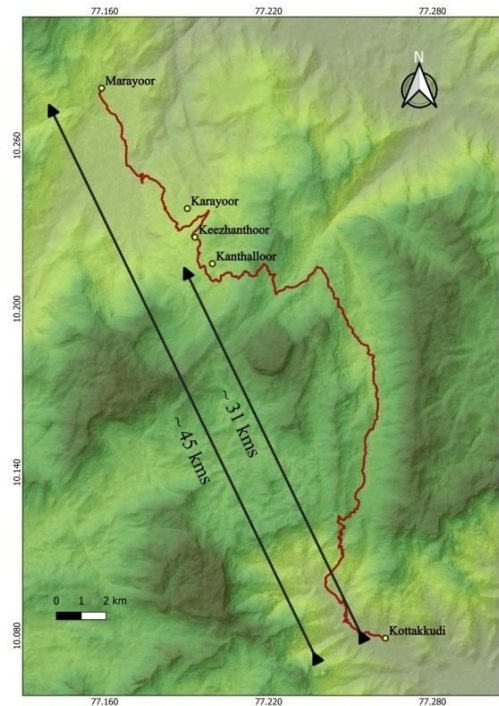


Figure 3. Distribution of the villages in Anjunad

Source: Own creation

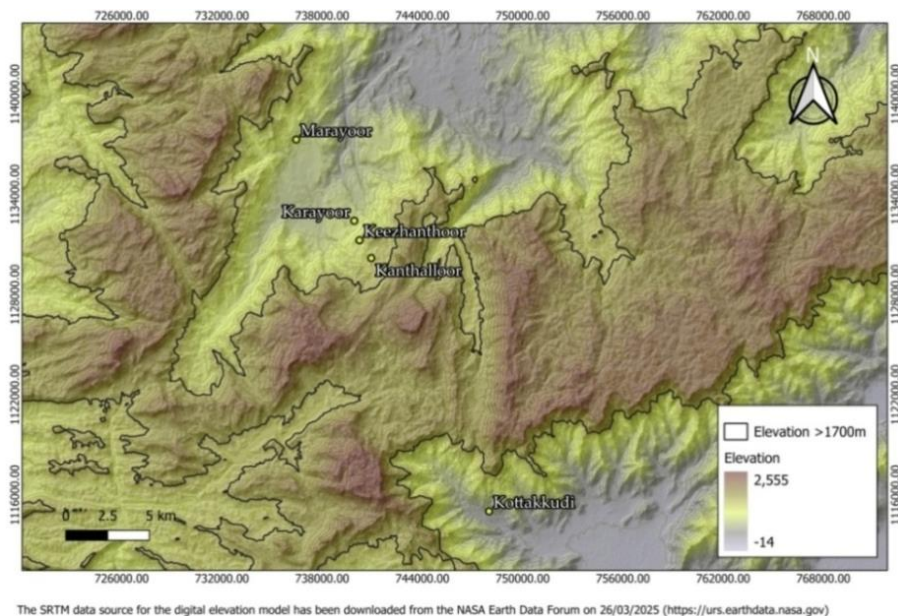


Figure 4. Elevation map of Anjunad

Source: Own creation

Slopes. To understand the spatial variation among the villages and other areas of the <1700m elevation, further exploration has been done with relation to the slopes and aspects in the study area. The slope map was derived from the SRTM DEM (SRTMGL 1,

30m resolution, same as mentioned before) using the terrain analysis tools available in QGIS. The slope was calculated in degrees using the standard Horn's method algorithm. The result showed that the villages of Anjunad fall under the areas where the slopes are found less than 40 degrees. The topographical features, digitized from Survey of India topographical maps (Survey of India, 2017), show that the route from Kottakkudi to Marayoor covers areas where the slopes are found less than 40 degrees (Figure 5).

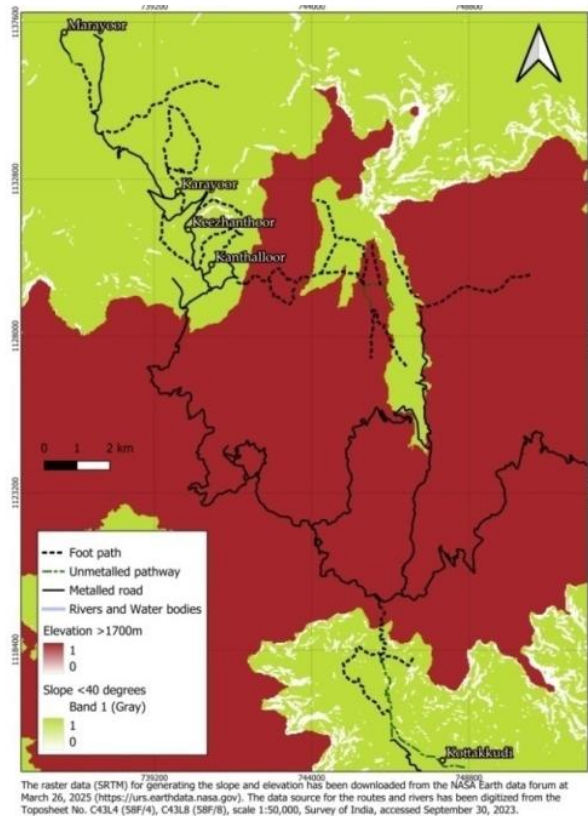


Figure 5. Slopes map of Anjunad

Source: Own creation

Aspects (Slope directions). An aspect map has been generated using the QGIS “Aspect” tool from the SRTM DEM layer (SRTMGL 1, 30m resolution, same as mentioned before). The map (Figure 6) shows that except Karayoor, situated in the western slope, the other villages are situated in the southern slopes of the hill.

Integrated model of terrain and hydrological features. To get a comprehensive understanding of the influences of the environment on the settlement of the villages, an integrated model of terrain and hydrological features, along with the least cost route, has been generated. As mentioned earlier, soil type and water sources are not showing much variation between the village areas and the surrounding areas; they have not been added in the integrated model. Since the elevation model showed that the areas located <1700m have been chosen for the settlement, the areas of >1700m have been removed in the layout. In the remaining area, zones with slope angles greater than 40 degrees, which have been avoided in the settlement, were also removed. Further, aspect (slope direction) representing south and west facing directions, where the villages are found,

were only included to differentiate them in the areas of <1700m elevated areas and in the areas where the slopes found <40 degree angles. By adding these different layers, the integrated model was generated (Figure 7).

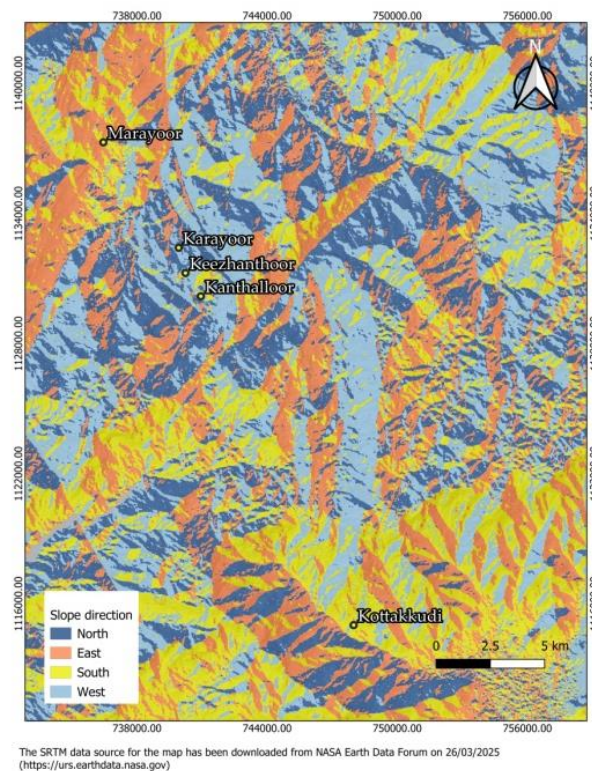


Figure 6. Aspect map of Anjunad

Source: Own creation

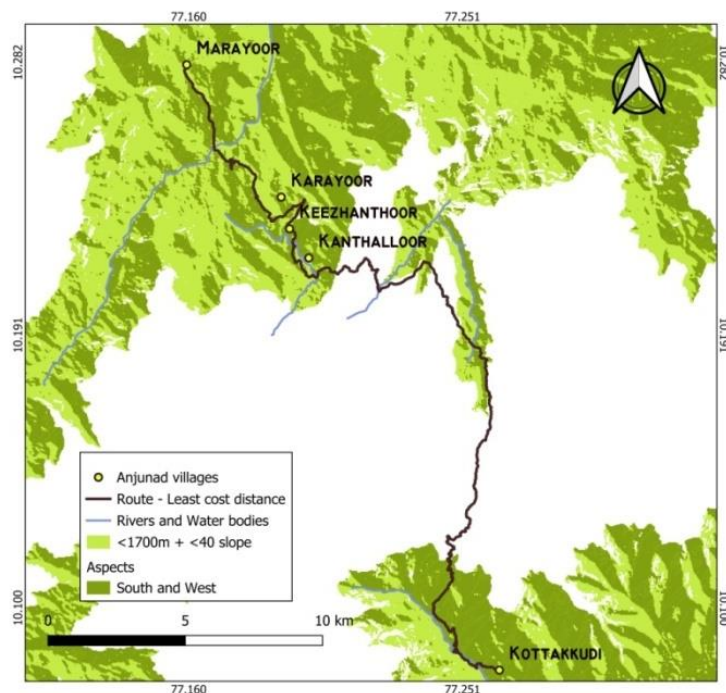


Figure 7. Integrated model of terrain and hydrological features

Source: Own creation

Results

The integrated model shows a clear visualization of the different spatial information in relation to the settled villages. The study area being discussed here has no defined boundaries to demarcate. This made to choose the study area covering five villages arbitrarily in the layout. It is to be mentioned here that the oral tradition of Anjunad traces that Kottakkudi was the first village settled by Anjunad Vellalar, after they migrated from Madurai. Here, the route connecting Kottakkudi to Marayoor shows that the remaining three villages are also located near the route, where from Kottakkudi (747974.334, 1115014.636) to Kanthalloor (740944.352, 1130188.725) ~31 KMs of elevated area have been neglected to advance towards the apt region for the settlement. Further, the villages are situated in the southern slopes of the hill, except Karayoor on the western slope, also substantiating the oral tradition of Anjunad Vellalar that the settlement of Vellalar in Kottakkudi has been expanded towards the northern direction, which made them settle in the southern slopes. Soils have a loamy texture in the five villages, which are of two types and are geographically spread vast. So it is not clear about the role of soils in influencing the choice of areas for settlement. The villages are situated near the water sources of ~2 KMs. The above results are tabled below (Table 1), which are ultimately related to the environmental influences in the settlement pattern. As mentioned earlier, Anjunad Vellalar are traditional agrarians, and they practice terraced cultivation in the hilly areas of Anjunad.

Table 1. Observed results

Villages	Elevation (meters)	Water (KMs)	Aspect	Slope (Angles)	Soil (Type/Texture)
Kottakkudi	800m	1.129	South	10-20	Lithosol/Loamy
Kanthalloor	1600m	1.213	South	20-30	Humic Acrisol/loamy
Keezhanthoor	1300m	0.281	South	20-30	Humic Acrisol/loamy
Karayoor	1100m	0.206	West	10-20	Humic Acrisol/loamy
Marayoor	1100m	0.507	South	10-20	Humic Acrisol/loamy
	<1700m	~2 KMs	South and West	<40	Loamy

Source: Own observation

So the environmental conditions suitable for practicing agriculture might be an important criterion for the choice of the areas to prefer to settle. In that aspect, the highly elevated areas between Kottakkudi and the other villages have been neglected for settlement, possibly be to their extreme cold climatic condition. This can impact crop cultivation and also human health, potentially. Also, the highly elevated area is prone to landslides, challenging for water irrigation and especially in temperatures, sometimes unfavorable for some crops. The choice of the surrounding areas, where the slopes of

<40 degrees are found, might be related to managing soil erosion and water retention for practicing terraced cultivation. Regarding the soil resources, in Anjunad, soils are found to be loamy, which can be ideal for agriculture. Besides, acrisols are found with the humic substances, which help to increase the soil fertility with the higher organic content, whereas the lithosols have limited water holding capacity and are susceptible to soil erosion. So, enough source of water is needed for practicing agriculture. Therefore, the settlements, where the water sources available nearby have helped in practicing agriculture.

Conclusion

The work has demonstrated that the environmental influences played an important role in the settlement of Vellalar in Anjunad. It has been observed that from the village of Kottakkudi, the settlement has been expanded to the other villages. Although further studies are needed to fix the time period of the settlement in the study area, the people of Anjunad Vellalar, after expanding their settlement to the five villages, might have made a nadu assembly for their social regulation and administration by imitating the historical nadu. The geospatial information helped generate the integrated model shows that the agrarians, after their migration, have preferred the areas that are suitable for practicing agriculture, which helped to be self-sufficient and also preferred the areas having better transportation accessibility, demonstrated by the distribution of the villages near the route. This also reflects the interconnection between the villages, since the people of the five villages of Anjunad are kin. This model can be extended by adding some more information to provide more insights. Further research should also focus on the comparisons with the historical and ethnographical data to better understand this historical migration and settlement of Tamil agrarians in Anjunad.

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