

# Influence of Occupation on Rural Built Form through Correlation Statistical Test in the State of Andhra Pradesh, India



Abhay Malik, Srinivas Daketi, Veronica Dorcas

**Abstract:** *Influence of occupation on built form can be traced with the adaption of the ancestor's occupation by present generations and planning to take further with their upcoming generations with the organized built form environment. Rural housing emerged in the current scenario lack consideration of living needs and spaces required for better living. The Culture (occupation) is a product of cumulative and commonly shared experiences of group of people which is transmitted downwards through the generations and also as consisting of transmitted and created pattern of values, ideas and meaningful system that shape human (Michael, 1989). In the present scenario of Andhra Pradesh state, India where Agriculture is the major occupation, it is noted that the houses were evolved with the different styles and typologies based on their socio cultural and occupational influences. The paper aims its focus on analysing the influence of culture (occupation) on rural built form through Correlation statistical test in the state of Andhra Pradesh. The importance of agriculture can be determined by the adaption of agriculture as an occupation by the 70% of the population of the state which resides in rural areas and depends on agriculture for their livelihood. Hence, agriculture is chosen as the occupation to understand and analyse the influence of occupation on rural built form in selected case areas. The paper aims at proving the research hypothesis; there is a relation between occupation and built form and also derive occupational area requirements for better development*

**Keywords:** *Culture, occupation, built form, rural, correlation*

## I. INTRODUCTION

Culture (occupation) is a product of cumulative and commonly shared experiences of group of people which is transmitted downwards through the generations and also as consisting of transmitted and created pattern of values, ideas and meaningful system that shape human behavior (Michael, 1989) [1]. Research and studies of the built environment, more so rural built forms, where people lived in multitude over time, have not received the due attention. Though large number of households lives in rural settings even today, more particularly in countries like India, architectural studies on evolution, diversities, determinants and impact of rural built forms are limited and rare.

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It was also argued that “architecture is a social activity that has to do with some sort of communication or places of interaction and that to change the environment is to change behavior” (Thom Mayne) [2]. This perspective of changing the behaviors through change in environment also emphasizes the need to understand the built forms in the rural areas. It is strongly believed that “Culture” as a phenomenon is a critical determinant and played a vital role in deriving and understanding the rural built forms. Culture, however, represents the characteristics of a particular group of people defined by everything from language, religion, cuisine, social habits, music, and arts.

It can be argued that a person's usual principal work or business, especially as a means of earning a living, is a principal determinant and thus one of key components in shaping the built form. Occupation always played pivotal role in the existence and evolution of human life. Housing is universally acknowledged as the second most essential human need after food and is considered major economic asset of every nation. Internationally, housing is recognized as a factor for the assessment of human development and societal civilization (UNO, 1976) [3]. The new development happening in the rural environment does not reflect the spatial quality of the varied occupations practiced by the people. Rural built environment have been discussed generally in the literature suggesting that these areas are contested spaces with reference to housing development (Scott, 2006; Satsangi et al., 2010; Murdoch et al., 2003; Sturzaker & Shucksmith, 2011) [4] [5] [6] [7]. The highly sensitive architecture and behavioral patterns are slowly getting transformed into architecture and attitude that are irrelevant to climate and customs of Andhra Pradesh (Indraganti, 2010; Hanaoka et al., 2009) [8] [9]. However, not many studies from Indian perspective focusing to address the issue from a perspective that is specific on occupation is done. Therefore, there is an urgent need to study from the factor of occupation that influence the built environment in the rural area.

## II. METHODOLOGY

In order to prove the existence of the relation between occupation and built form, the correlation statistical test is selected. The correlation statistical test is most commonly used to test the relationships and associations between the variables. According to Ibanga, the two terms (i.e “relationships” and “association”) “are often used interchangeably; and they refer to the extent to which one variable changes (in quantity or quality) in response to change in another variable” [18].



# Influence of Occupation on Rural Built Form through Correlation Statistical Test in the State of Andhra Pradesh, India

Correlation is a statistical technique that can show whether and how strongly pairs of variables are related. The data collected through various sources such as questionnaires and case studies were divided into parameters and the relation between two parameters is analyzed through correlation. The data is divided into variables like percentage of occupational influence at plot level, percentage of occupational influence at unit level, total occupational influence, plot size, built up area, number of acres owned and this data is analysed by separating them into two variables to understand the association and the strength between these variables. Correlational techniques are utilized to reveal the associations amongst variables with the use of techniques such as correlation or cross-tabulation (Simon & Goes, 2011) [11]. The key objective for using a correlational method is to understand the association amongst variables and in case there is an association, understand the regression equation which could be utilized to offer predictions to populations (Simon & Goes, 2011) [11]. The data is collected from 72 respondents from 09 case study villages to prove the existence of the relation between occupation and built form, which in turn helps to prove the hypothesis - There is a relation between occupation and built form. The test is undertaken for 03 villages individually by checking the influences of the occupation on the built form. The variables considered for correlation is as follows:

1. Area under occupational influence at Unit level
2. Area under occupational influence at Plot level
3. Total occupational influence
4. Plot area
5. Built up area
6. Number of acres owned

Correlation will always fall between -1.0 and +1.0. If the correlation is positive, we have a positive relationship. If it is negative, the relationship is negative (Table 1).

Table- I: Person's "r" value ranges and relationships

Absolute Value of r	Strength of relationship
$r < 0.3$	None or very weak
$0.3 < r < 0.5$	Weak
$0.5 < r < 0.7$	Moderate
$r > 0.7$	Strong

### III. INTRODUCTION TO CASE STUDY AREAS

The concept of occupation is of key significance in India. As a kind of activity executed by humans, occupation is more about organizing resources and time, the necessity to take action on the environment and also the necessity to explore but is not just a simple deviation from inactivity (Yerxa, 2000) [12]. Built spaces or environment would comprise of definite material components, particularly a base, which enables one to view their boundaries and is looked upon as a whole, caters to functions of humans in terms of habitation, circulation or shelter and is purposely appropriated or built by humans to cater to such functions (Bartuska, 2007) [13]. Built forms in the rural areas are perceived as a text which when interpreted reveals diverse information in the form of economic initiatives, material environment, and social constructs, technological culture of the people who have constructed it (Ambe, 2018) [14].

Andhra Pradesh is the one among the largest states in India prior to its separation into newly formed Andhra

Pradesh and Telangana. The state covers an area of 162,970 km<sup>2</sup> (62,920 sq mi), but before its partition, it was 2, 70,045 sq. kms. (Smart Prep, 2017) [15]. Andhra Pradesh state has a population of 4, 95, 77,103, out of which 1, 46, 10,000 (29.47%) is urban population and 3, 49, 67,000 (70.53%) is rural population. Hence, approximately 70% of the Andhra Pradesh's population lives in rural areas. The new state of Andhra Pradesh after the bifurcation has a reduced geographical area and population wherein the state's economy is generally steered by Agriculture which when compared to other states is relatively high. 70% of the population in the state live in rural areas and depend on agriculture for their livelihood. The agriculture and allied sectors contribute almost 27% of the state's gross domestic product and is directly supporting almost 70% of the state's population, whereas the land used for agriculture accounts for 48% of the geographical area and waste lands accounts for almost 23% of the area (State Agriculture plan for XII Five Year Plan and Projections for 2015-2019) [16]. Major occupation of Andhra Pradesh is agriculture with some other secondary occupations like fishing, weaving, toy making, kalam-kaari works, etc. which are practiced in different-different regions of Andhra Pradesh rural areas for their needs and livelihood.

The study is conducted in three selected villages which are purposefully identified to examine rural built patterns in the major occupational groups of Andhra Pradesh viz., agriculture. These three villages are chosen with agriculture as the major occupation which are near to the coastal region of Andhra Pradesh. The selection of villages is from the districts where agriculture is predominantly practiced and villages with diversified occupation patterns are existing. Velnuthala, Mukkollupadu and Bodiguda are the agricultural based villages which are analysed and exploration on the study of the impact of occupation on the built form (Fig. 1).

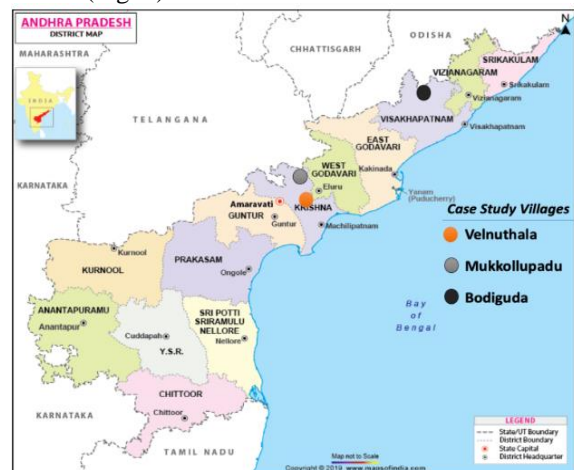


Fig. 1: Location of Case Study Areas

### IV. CASE STUDIES

#### A. A Case of Velnuthala Village

The data of is collected from Velnuthala village through various sources such as questionnaires, case studies and were divided into various parameters and further the relation between two parameters is analyzed through correlation.

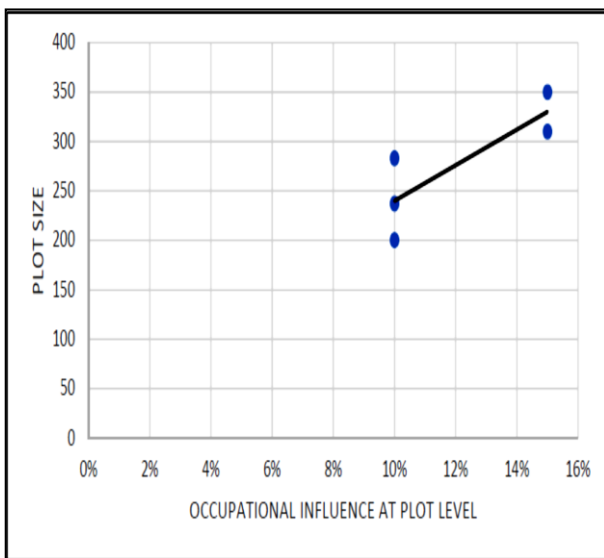


The data is divided into percentage of occupational influence at plot level, percentage of occupational influence at unit level, total occupational influence, plot size, built up area, number of acres owned and this data is analyzed by separating them into two variables to understand the association and the strength between these variables. The data was finally put into correlation method and scatterplots were used to show the trends of relationship between two variables.

Correlation shows relationship between percentage occupational influence at plot level and plot size as shown in below table and figure:

**Table- II: “r” value table**

% Occupational Influence at plot level	Plot Size (sq.m.)
15%	310
10%	283
15%	350
10%	237
10%	200
<b>r =</b>	<b>0.833894</b>
<b>r<sup>2</sup> =</b>	<b>0.695378</b>
<b>r<sup>2</sup> in %</b>	<b>69.53785</b>



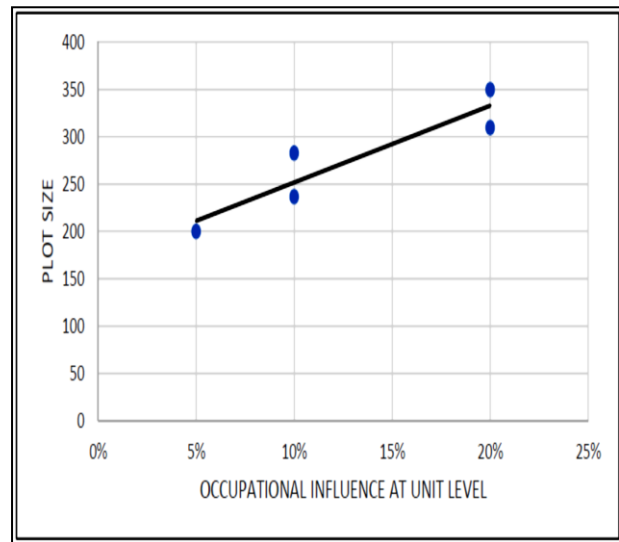
**Fig. 2: Scatterplot and Relationship Trends**

As per the table-II & fig.2, there is strong correlation between percentage occupational influences at plot level and the size of the plot. The scatterplot shows us the trends for the association of relationship.

Correlation shows relationship between percentage occupational influence at unit level and plot size as below:

**Table- III: “r” value table**

% Occupational Influence at unit level	Plot Size (sq.m.)
20%	310
10%	283
20%	350
10%	237
5%	200
<b>r =</b>	<b>0.920437</b>
<b>r<sup>2</sup> =</b>	<b>0.847204</b>
<b>r<sup>2</sup> in %</b>	<b>84.72043</b>



**Fig. 3: Scatterplot and Relationship Trends**

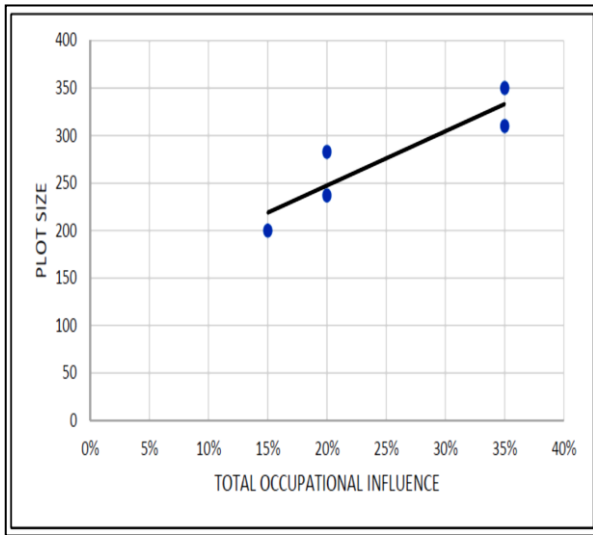
As per the table-III & fig.3, there is strong correlation between total occupational influence and the size of the plot. The scatterplot shows us the trends for the association of relationship.

Correlation shows relationship between total occupational influences and no. of acres owned as below:

**Table- IV: “r” value table**

Total Occupational Influence	Plot Size (sq.m.)
35%	310
20%	283
35%	350
20%	237
15%	200
<b>r =</b>	<b>0.90421864</b>
<b>r<sup>2</sup> =</b>	<b>0.817611348</b>
<b>r<sup>2</sup> in %</b>	<b>87.7611346</b>





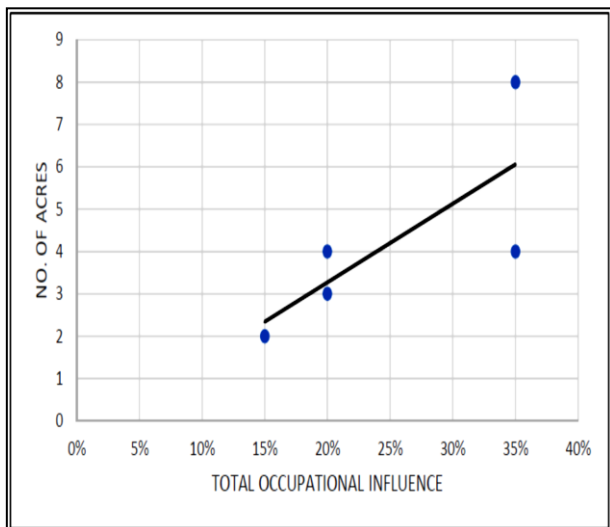
**Fig. 4: Scatterplot and Relationship Trends**

As per the table-IV & fig.4, there is strong correlation between total occupational influence and the no. of acres owned. The scatterplot shows us the trends for the association of relationship.

Correlation shows relationship between total occupational influences and built- up area as below:

**Table- V: “r” value table**

Total Occupational Influence	No. of Acres Owned
35%	8
20%	4
35%	4
20%	3
15%	2
<b>r =</b>	<b>0.76181175</b>
<b>r<sup>2</sup> =</b>	<b>0.580357143</b>
<b>r<sup>2</sup> in %</b>	<b>58.0357143</b>



**Fig. 5: Scatterplot and Relationship Trends**

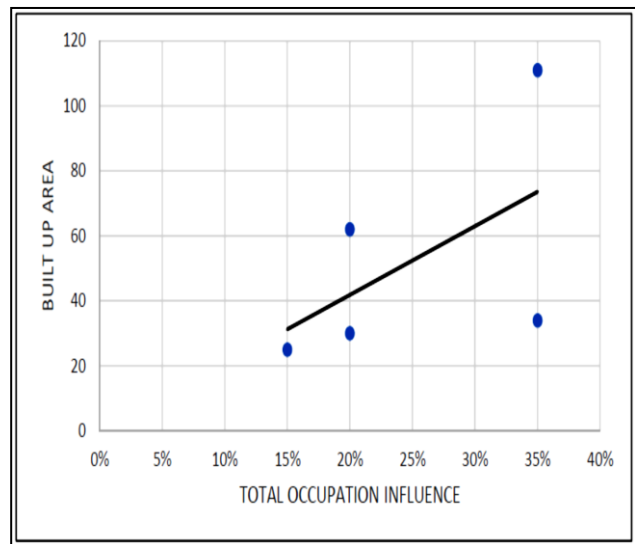
As per the table-V & fig.5, there is strong correlation between total occupational influence and the no. of acres

owned. The scatterplot shows us the trends for the association of relationship.

Correlation shows relationship between total occupational influences and built- up area as below:

**Table- VI: “r” value table**

Total Occupational Influence	Built – up Area (sq.m.)
35%	111
20%	62
35%	34
20%	30
15%	25
<b>r =</b>	<b>0.552944448</b>
<b>r<sup>2</sup> =</b>	<b>0.305747563</b>
<b>r<sup>2</sup> in %</b>	<b>30.5747563</b>



**Fig. 6: Scatterplot and Relationship Trends**

As per the table- VI & fig. 6, there is moderate correlation between total occupational influences and built- up area. The scatterplot shows us the trends for the association of relationship.

**B. A Case of Mukkollupadu Village**

The data is collected from Mukkollupadu village through various sources such as questionnaires, case studies and were divided into various parameters and further the relation between two parameters is analyzed through correlation.

The data is divided into percentage of occupational influence at plot level, percentage of occupational influence at unit level, total occupational influence, plot size, built up area, age of building and this data is analyzed by separating them into two variables to understand the association and the strength between these variables. The data was finally put into correlation method and scatterplots were used to show the trends of relationship between two variables.

Correlation shows relationship between percentage occupational influence at plot level and plot size as below:





Table- VII: “r” value table

% Occupational Influence at plot level	Plot Size (sq.m.)
21%	235
20%	209
12%	115
17%	180
19%	169
<b>r =</b>	<b>0.93528437</b>
<b>r<sup>2</sup> =</b>	<b>0.874708345</b>
<b>r<sup>2</sup> in %</b>	<b>87.4708345</b>

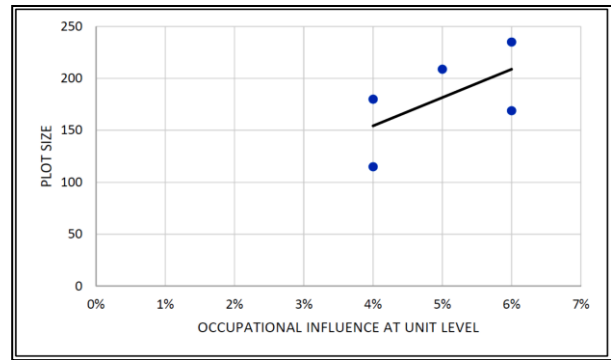


Fig. 8: Scatterplot and Relationship Trends

As per the table-VIII & fig.8, there is moderate correlation between percentage occupational influences at unit level and the size of the plot. The scatterplot shows us the trends for the association of relationship.

Correlation shows relationship between total occupational influence and plot size as below:

Table- IX: “r” value table

Total Occupational Influence	Plot Size (sq.m.)
27%	235
25%	209
16%	115
21%	180
25%	169
<b>r =</b>	<b>0.898006475</b>
<b>r<sup>2</sup> =</b>	<b>0.806415628</b>
<b>r<sup>2</sup> in %</b>	<b>80.6415628</b>

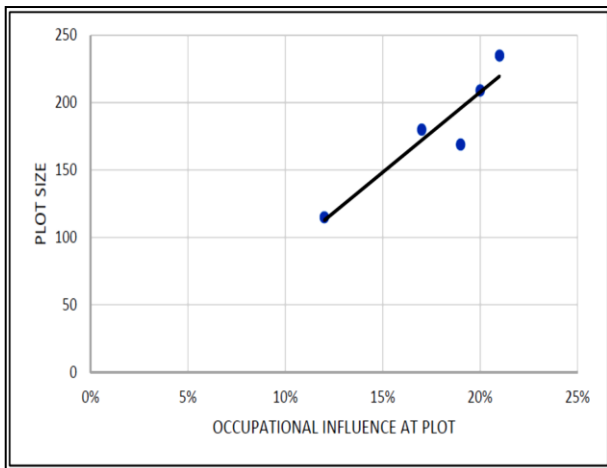


Fig. 7: Scatterplot and Relationship Trends

As per the table-VII & fig.7, there is strong correlation between percentage occupational influences at plot level and the size of the plot. The scatterplot shows us the trends for the association of relationship.

Correlation shows relationship between percentage occupational influence at unit level and plot size as below:

Table- VIII: “r” value table

% Occupational Influence at unit level	Plot Size (sq.m.)
6%	235
5%	209
4%	115
4%	180
6%	169
<b>r =</b>	<b>0.601881178</b>
<b>r<sup>2</sup> =</b>	<b>0.362260952</b>
<b>r<sup>2</sup> in %</b>	<b>36.2260952</b>

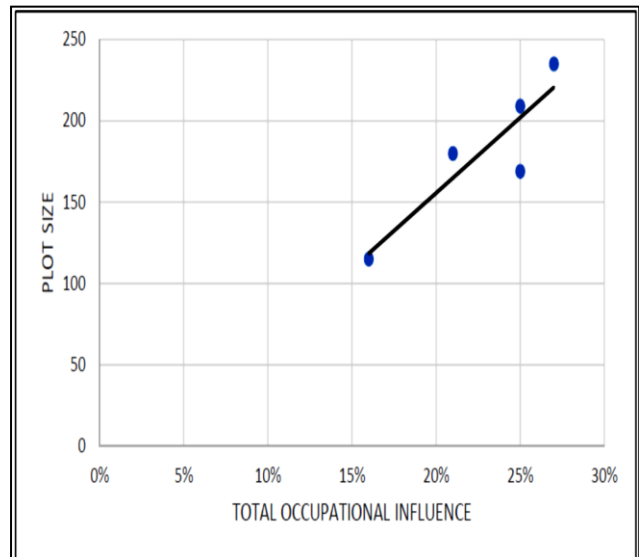


Fig. 9: Scatterplot and Relationship Trends

As per the table-IX & fig.9, there is strong correlation between total occupational influence and the size of the plot. The scatterplot shows us the trends for the association of relationship.

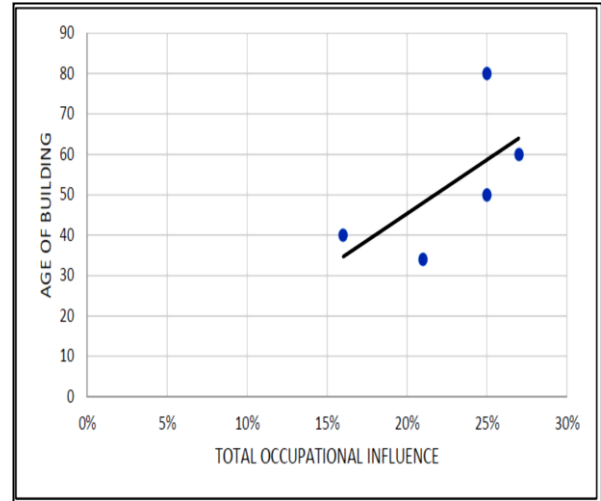


# Influence of Occupation on Rural Built Form through Correlation Statistical Test in the State of Andhra Pradesh, India

Correlation shows relationship between total occupational influences and no. of acres owned as below:

**Table- X: “r” value table**

Total Occupational Influence	Built – up Area (sq.m.)
27%	40
25%	50
16%	30
21%	35
25%	65
<b>r =</b>	<b>0.633278506</b>
<b>r<sup>2</sup> =</b>	<b>0.401041667</b>
<b>r<sup>2</sup> in %</b>	<b>40.1041667</b>



**Fig. 11: Scatterplot and Relationship Trends**

As per the table-XI & fig.11, there is moderate correlation between total occupational influences and age of building. The scatterplot shows us the trends for the association of relationship.

### C. A Case of Bodiguda Village

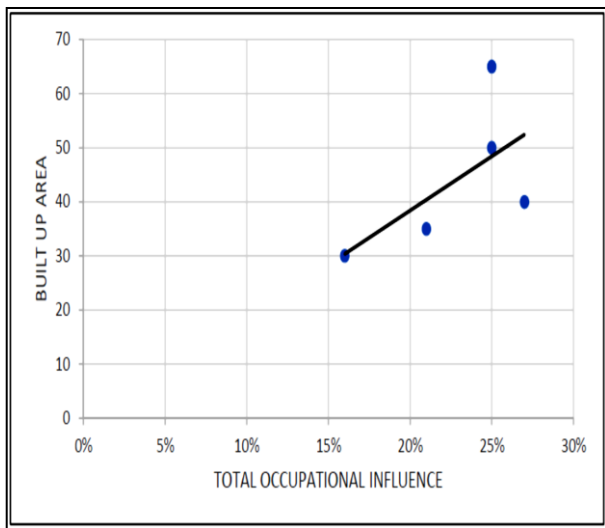
The data is collected from Bodiguda village through various sources such as questionnaires, case studies and were divided into various parameters and further the relation between two parameters is analyzed through correlation.

The data is divided into percentage of occupational influence at plot level, percentage of occupational influence at unit level, total occupational influence, plot size, built up area, age of building and this data is analyzed by separating them into two variables to understand the association and the strength between these variables. The data was finally put into correlation method and scatterplots were used to show the trends of relationship between two variables.

Correlation shows relationship between percentage occupational influence at plot level and plot size as below:

Table- XII: “r” value table

% Occupational Influence at plot level	Plot Size (sq.m.)
19%	200
18%	150
15%	150
18%	150
20%	200
<b>r =</b>	<b>0.731925055</b>
<b>r<sup>2</sup> =</b>	<b>0.535714286</b>
<b>r<sup>2</sup> in %</b>	<b>53.5714286</b>



**Fig. 10: Scatterplot and Relationship Trends**

As per the table- X & fig. 10, there is moderate correlation between total occupational influences and built- up area. The scatterplot shows us the trends for the association of relationship.

Correlation shows relationship between total occupational influences and age of building as below:

Table- XI: “r” value table

Total Occupational Influence	Age of Building (years)
27%	60
25%	80
16%	40
21%	34
25%	50
<b>r =</b>	<b>0.644005288</b>
<b>r<sup>2</sup> =</b>	<b>0.414742811</b>
<b>r<sup>2</sup> in %</b>	<b>41.4742811</b>

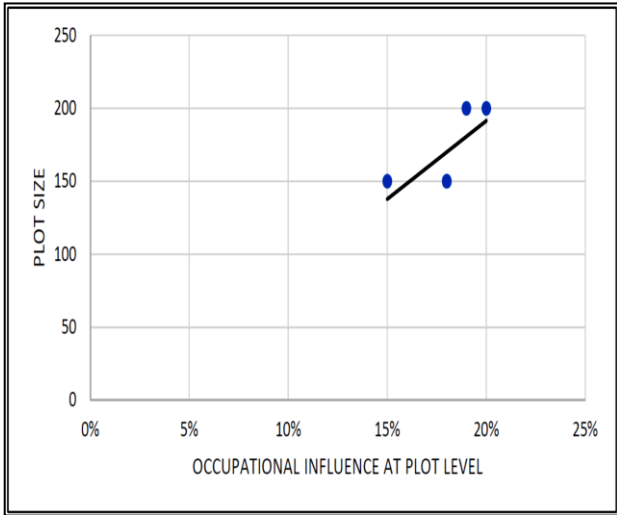


Fig. 12: Scatterplot and Relationship Trends

As per the table- XII & fig. 12, there is strong correlation between percentage occupational influence at plot level and the size of the plot. The scatterplot shows us the trends for the association of relationship.

Correlation shows relationship between percentage occupational influence at unit level and plot size as below:

Table- XIII: “r” value table

% Occupational Influence at unit level	Plot Size (sq.m.)
4%	200
4%	150
4%	150
3%	150
6%	200
<b>r =</b>	<b>0.66666667</b>
<b>r<sup>2</sup> =</b>	<b>0.44444444</b>
<b>r<sup>2</sup> in %</b>	<b>44.444444</b>

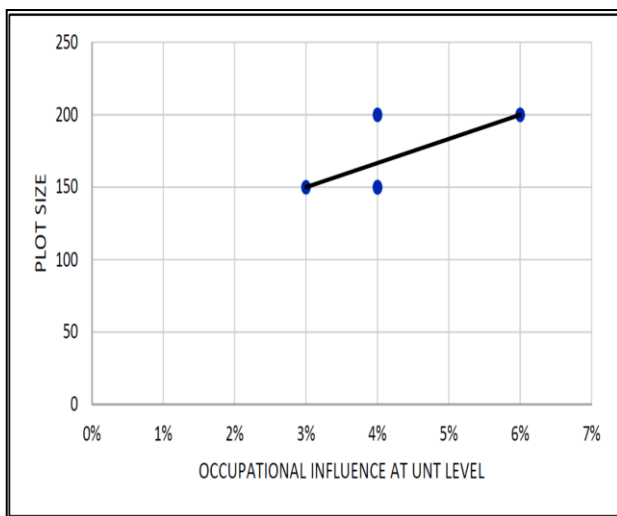


Fig. 13: Scatterplot and Relationship Trends

As per the table- XIII & fig. 13, there is moderate correlation between percentage occupational influences at unit level and the size of the plot. The scatterplot shows us the trends for the association of relationship.

Correlation shows relationship between total occupational influence and plot size as below:

Table- XIV: “r” value table

Total Occupational Influence	Plot Size (sq.m.)
23%	200
22%	150
19%	150
21%	150
26%	200
<b>r =</b>	<b>0.811147458</b>
<b>r<sup>2</sup> =</b>	<b>0.657960199</b>
<b>r<sup>2</sup> in %</b>	<b>65.7960199</b>

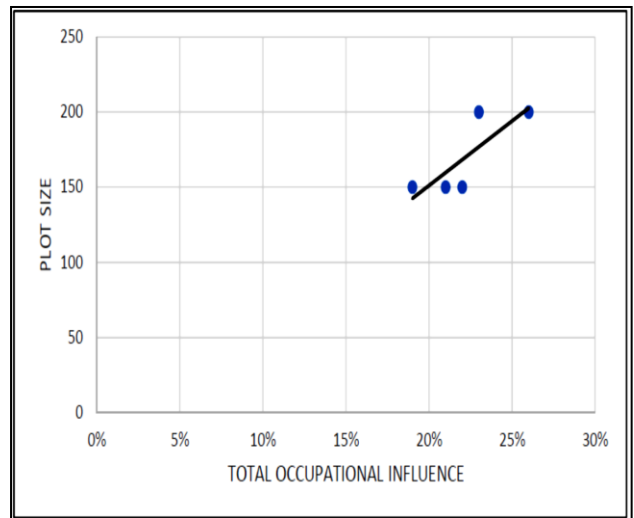


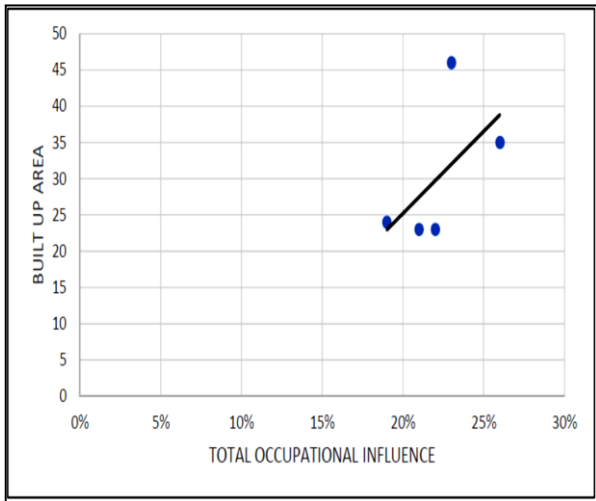
Fig. 14: Scatterplot and Relationship Trends

As per the table- XIV & fig. 14, there is strong correlation between total occupational influence and the size of the plot. The scatterplot shows us the trends for the association of relationship.

Correlation shows relationship between total occupational influences and no. of acres owned as below:

Table- XV: “r” value table

Total Occupational Influence	Built – up Area (sq.m.)
23%	46
22%	23
19%	24
21%	23
26%	35
<b>r =</b>	<b>0.576655991</b>
<b>r<sup>2</sup> =</b>	<b>0.332532132</b>
<b>r<sup>2</sup> in %</b>	<b>33.2532132</b>



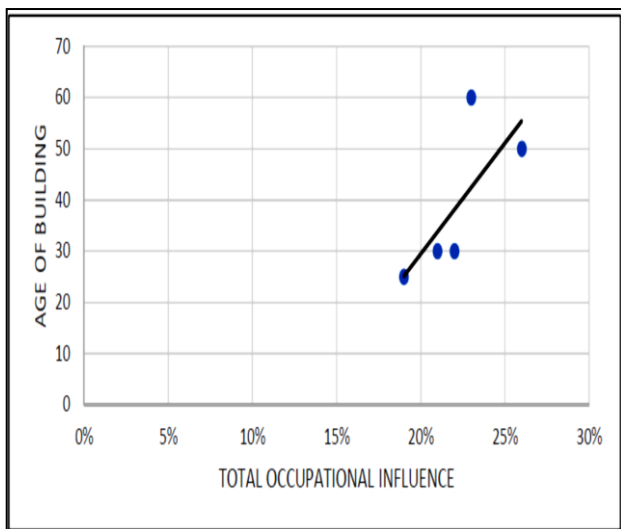
**Fig. 15: Scatterplot and Relationship Trends**

As per the table- XV & fig. 15, there is moderate correlation between total occupational influences and built- up area. The scatterplot shows us the trends for the association of relationship.

Correlation shows relationship between total occupational influences and age of building as below:

Table- XVI: “r” value table

Total Occupational Influence	Age of Building (years)
27%	60
25%	30
16%	25
21%	30
25%	50
<b>r =</b>	<b>0.738748613</b>
<b>r<sup>2</sup> =</b>	<b>0.545749513</b>
<b>r<sup>2</sup> in %</b>	<b>54.5749513</b>



**Fig. 16: Scatterplot and Relationship Trends**

As per the table-XVI & fig.16, there is strong correlation between total occupational influences and age of building. The scatterplot shows us the trends for the association of relationship.

**V. CONCLUSION AND DISCUSSION**

As per the result from “r” value table and scatterplot trends in Velnuthala village, influence of occupation on built form is high. The size of plot area or built- up area is larger, greater is the influence of occupation on the built form. The amount of influence is directly proportional to the plot size or built-up area (table- XVII).

Table- XVII: “r” value table

S.No.	Correlation between Variables	“r” Value	Relationship
1	Percentage of occupational influence at plot level	0.834	Strong
2	Percentage of occupational influence at Unit level	0.920	Strong
3	Percentage of occupational influence - Total	0.904	Strong
4	Percentage of occupational influence - Total	Built-up Area 0.762	Strong
5	Percentage of occupational influence - Total	No. of acres 0.553	Strong

As per the result from “r” value table and scatterplot trends in Mukkulopadu village, influence of occupation on built form is high. The size of plot area or built- up area is larger, greater is the influence of occupation on the built form. The amount of influence is directly proportional to the plot size or built-up area (table- XVIII).

Table- XVIII: “r” value table

S.No.	Correlation between Variables	“r” Value	Relationship
1	Percentage of occupational influence at plot level	0.935	Strong
2	Percentage of occupational influence at Unit level	0.602	Moderate
3	Percentage of occupational influence - Total	0.898	Strong
4	Percentage of occupational influence - Total	Built-up Area 0.633	Moderate
5	Percentage of occupational influence - Total	Age of Building 0.644	Moderate





As per the result from “r” value table and scatterplot trends in Bodiguda village, influence of occupation on built form is high. The size of plot area or built-up area is larger, greater is the influence of occupation on the built form. The amount of influence is directly proportional to the plot size or built-up area (table- XIX).

**Table- XIX: “r” value table**

S.No.	Correlation between Variables		“r” Value	Relationship
1	Percentage of occupational influence at plot level	Plot Size	0.732	Strong
2	Percentage of occupational influence at unit level	Plot Size	0.667	Moderate
3	Percentage of occupational influence - Total	Plot Size	0.811	Strong
4	Percentage of occupational influence - Total	Built-up Area	0.577	Moderate
5	Percentage of occupational influence - Total	Age of Building	0.739	Strong

As per the results from the three case study areas where major occupation is agriculture with correlational statistical test, it is clearly evident that there is significant relationship between occupation and built form. It is also clearly evident that in all the three villages, the influence levels of occupation on built form are majorly high and subsequently medium as seen in table- XVII, table- XVIII & table- XIX. This could also help in deriving appropriate housing designs for different occupational patterns for the proposed rural housing schemes. There is a need for design approach which should take care of various cultural aspects rather than sticking to monotonous repetitive designs.

As per the results through the research, there is a strong need for occupation-context sensitive design, derive occupational area requirements for better development. Focus should also be on preserving the quality and character of rural areas. the guidelines should be prepared with objectives in relation to the future development and scope for future expansion, considering the character of the existing or planned households.

**VI. WAY FORWARD**

After checking the existence of the influence through statistical method, further studies could be taken up with more descriptive approach, which would rather give the physical influences in detail in relation to the occupation and built form. The present research concentrates only on agriculture as an occupation, but the same could be tested with other occupations in different regions.

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# Influence of Occupation on Rural Built Form through Correlation Statistical Test in the State of Andhra Pradesh, India



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