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Application of Cost effective technology in Low cost Housing and their propagation/impact in the Kerala scenario

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Abstract

The study was carried out to assess the economics of various cost effective technology in comparison with the conventional technology. Cost effective technology means, from the given resources of funds, materials, land and skills, we should be able to build the maximum number of houses of good quality at an affordable cost.. The economy achieved in savings, during the adoption of various Cost Effective Technologies was compared and reviewed in detail in the research work. A detailed questionnaire survey has been carried out at various strata of the society, Economically Weaker Section (EWS), Low income groups (LIG) and Middle income groups (MIG) to investigate the awareness of cost effective technology about the concepts, myths and practices in Kerala. A comparative evaluation of the various cost effective materials and methods has been done through data collection across that state from owners, vendors, contractors and construction workers. The sample of the study consists of respondents residing all over Kerala, covering. LIG, MIG and HIG. by the Random Sampling Method and the results were analyzed and interpreted by statistical tools. The target grouped aimed for the survey also consists of data collection across the state of Kerala from owners, vendors, contractors and construction worker

1. Introduction

Various research organizations such as Nirmithi Kendra, COSTFORD, CBRI, RRI have made notable contributions to developing low cost technologies such as fly ash bricks, sand lime bricks, cellular concrete, dry - hydrated lime pozzolona and rice – husk ash pozzolana as binding agent which are not only cost effective and eco friendly as most of them are produced from industrial wastes.

The study focused on the impact of various organizations through which the propagation of cost effective technology is carried out at the grass root level. A comparative analysis have been carried out to assess the propagation/impact made by several organizations like Costford, Habitat and Nirmithi Kendras who are pioneering the works of cost effective technology in low cost housing. The role of Housing & Urban Development Corporation (HUDCO), a Govt. of India Enterprise in the promotion of building centre movement in Kerala was also analyzed in the study

Various hypothesis were formulated, based on objectives and also applying various research methodologies. The questionnaire survey was designed in such a way to ensure the participation of the layman to offer their remarks without any further consultation. Expert interviews have been carried out from professional experts such as Architects, Engineers, Contractors, Technicians, Masons and questionnaire to be framed after consultation with these professionals relating to their study area. These data have been collected through group discussions and interviews. The final version of the questionnaire contains prominent aspects of life. The questionnaire survey focused at the relationship of the choice of the technology selected by various beneficiaries with respect to the marital status, annual income and academic qualifications. It is also intended to gather the variations of the tastes of different groups belonging to varying income, LIG, MIG and HIG.

The questionnaire is divided into three parts. The first part deals with the personal perspective of the beneficiaries. The second part is related to the various modes of construction and materials preferred, in the contemporary context. The last and final phase of the questionnaire is entirely set apart for the technical and technological aspects. A kind of economic observation was also added.

2. Procedures

The method of computing the different stages of research work was solely on the basis of the search conducted in line with the different factors and aspects associated with the system of house construction already in progress and new patterns emerging in the field. The basic idea behind the research was to control the expenditure to the maximum possible extent enhancing use of cost effective materials for the construction of houses,without any adverse effect on the durability of the buildings. The researcher interacted with personalities dealing with Low Cost Housing programmes in Kerala, Teachers / Experts in Civil Engineering, visited the institutions of District Nirmithi Kendras, Kerala State Nirmithi Kendra (KESNIK), Costford, and had discussions with them about data collections pertaining to the beneficiaries including their addresses. More than 600 specimen questions were mailed enclosing self addressed envelopes to reach the data to the people under different categories/sections available in different parts of Kerala and also to those who are associated in the field of Cost Effective Technology. Even though answered Questions reviewed directly and indirectly exceed more than 400, it was reduced to 201 for final considerations

3. Results and Discussions

For derivation of the results, the following statistical methods were adopted – Viz. percentage, frequencies, mean, median, mode and cross tabulation. The cross tabulation process with the aid of SPSS computer package would adopted for comparative studies. 23 tables were depicted for the research study. Each table has specially mentioned the computer results also. All the answers to the questionnaire survey were evaluated by all possible means and comparison strategies with the help of SPSS. Consequently the research scholar could derive at certain results and conclusions. Various tables were depicted by comparing the various data obtained. Each table is mentioned specifically for comparison of each data. These tables were finally prepared only on the basis of the responses projected in the data.

3.1 Table 1

This table was depicted for the analysis on the basis of marital status (Q5) and the fact of constructional experience of own house (Q9) and the inferences are given below. Out of the 201 individuals, 196 are married and the percentage of married persons will cover 97.5%. The unmarried section covers 2.5% only. It is quite amazing to see that 98.4% of the selected persons possessed their own houses and only 2% of the selected were having no dwelling places of their own. The calculated value of the data is (3.84) and the same is higher than table value (0.05). Therefore the research arrives at the conclusion that the number of persons being constructed annually relies on the number of persons getting married in that particular society during the specified period.

3.2 Table 2

This table was depicted for the detailed study of the construction type (Tile/Concrete/others,) (Q10) and the status of residential house (Own/Rented/Others) (Q8) .In this category, the calculated value is lesser than the table value. It implies that the reasons are independent. Another pertinent aspect discovered by the research is that the type of house is hardly related to the choice of the persons. The percentage of consumers contacted, with the usage of ordinary flooring tiles is below 7% and at the same time, the major share of people excluding 98% have a craze for concrete construction.

3.3 Table 3

This table was depicted for the analysis of the plinth Area of the residential houses (Q3) and the Statistics of individuals with their own dwelling houses.(Q9) Since 62% of the total population selected for the purpose are reluctant in constructing houses with Plinth Area exceeding 1000 sq.ft., this concludes that there is no need of spending money unnecessarily for a larger area. A dwelling house, with a plinth area of 1000 sq.ft is sufficient to meet the requirements. A house with the area of 2000 sq.ft is hardly affordable for a single family in all scenarios.

3.4 Table 4

This table was depicted for comparing the Own construction of Houses (Q.4) and Loans taken for house construction (Q.12) Out of the 201 persons who have chosen for the purpose, only 4 persons have purchased constructed houses from others. On the contrary 98% of the total (the actual number is 197) have constructed houses of their own. The research has come to the conclusion that the loan facilities are the main indicators to the number and style of the dwelling houses**.**

3.5 Table 5

This table was depicted the preference with locally available materials (Q9) and construction of houses. 91.9% of the beneficiaries are inclined to consume locally available materials. The calculated value is not higher than table value. The attributes are not associated.

3.6 Table 6

This table was depicted for the analysis of Application of Academic competence in the construction sphere Educational qualification (Q2), Knowing construction technology (Q14). In this context, calculated value is much higher than the table value and as such we inherently accept HI. It also implies that attributes are associated obviously with any kind of information and piece of knowledge acquired by any means will lead him to better selection process in any field including that of moulding a dwelling shelter.

3.7 Table 7

This table was depicted for the Implication of Educational Expenditure in the intervention in the mode design of construction Educational Qualification (Q2) with house construction (Q15). It occurred well and good to the research scholar that the actual number of few persons selected are much eager and interested to undertake the construction work voluntary.

3.8 Table 8

This table was depicted for the Analysis of the Low Cost Housing techniques with the firm support of the educationally competent persons. Educational Qualification (Q2), Knowledge of Low Cost Technology (Q16). The calculated values become lesser than table values and thus it is clear that the attributes are not associated. The research has to conclude with the pain that the educational qualification is not at all related to the Low Cost Housing Technology put forth by the institution like Nirmithi Kendra and Costford.

3.9 Table 9

This table was depicting the Construction work of Residences and Thorough Awareness of Nirmithi, Own Constructed House (Q9), Awareness of Nirmithi Kendra (Q18). It is fortunate that 94.5% of the selected persons are aware of the Nirmithi Kendra phenomena. It is an indication of wide recognition and popularity. The welfare schemes of Nirmithi Kendra were acquired by their activities hitherto. The calculated values are evidently lower than the table values. In this respect attributes are not associated.

3.10 Table 10

This table was depicted for analyzing the Sources of Information about the construction activities of Nirmithi Kendra (Q18) and the far reaching consequences of Low Cost Housing (Q19). 86.3% of selected few had become aware of Nirmithi Kendra though newspapers and other media. This reveals that the cultural and intellectual graph of Kerala is having its up and down in accordance with the publicity given by the media. The calculated value is higher than the table value. The attributes are associated. That means the knowledge about the Nirmithi Kendra and the different sources and the achieved score are closely related.

3.11 Table 11

This table was depicted the structural variation of Land and the construction of basement in turn with the nature of land Own Construction of House (Q9), Construction of basement (Q20). The question compels the beneficiary to make a self evaluation of the foundation of the houses to be constructed perfectly in tune with the lay out and nature of the land. The calculated value is evidently smaller than the table value. The percentage of the attributes are not related. The ordinary educated people in Kerala are not much concerned in orienting the basement of their residential house perfectly in turn with the nature of the land.

3.12 Table 12

This table was depicted the consumption of solar energy for electrification Educational qualification (Q2), House electrification with solar energy (Q29). Details from 201 individuals were selected regarding the solar set up only in anticipation of its gradual increase especially if the cost and investment is comparatively cheaper and it the consumption is self regulated. The available details are given in table 12. The calculation value is higher and their attributes are closely associated. The educated competent persons prefer the new substances of solar systems.

3.13 Table 13

This table was depicted the Expenditure on external appearances ignoring the financial liabilities. Loan taken (Q12), Wall painting (Q 30). Out of the 201 individuals selected for the study, about 90% are in search for loan facilities about 60% opt for emulsion paint. But in the case of those who have not availed the loan and construction, those consumers are comparatively satisfied with other cheaper methods. In this context the calculated values is evidently lesser than table value. It is quite automatically to see that there is no relationship of availing loan amount and spending money on external painting.

3.14 Table 14

This table was depicted the Making use of locally available materials for external beautification and illumination and Local availability of construction materials (Q13) Wall painting (Q30) . It is highly pathetic to know that only 106 persons prefer emulsion paint out of 201 beneficiaries. Table 14 shows the graphic in favour of the table value which is higher than the calculated value. The Research scholar projected table 14 for the purpose of establishing the fact that the use of locally available materials is well related to the materials chosen for enhancing external appearance of houses.

3.15 Table 15

This table was depicted the Construction of Lintel for modern houses and the proposals put forth by Nirmithi hundred in this aspect. Awareness of Nirmithi Kendra (Q18), Type of Lintel House (Q22). Out of 201 individuals, the majority are having a slight inclination of whereabouts of Nirmithi Kendra. 96.3% of selected few are choosing the Reinforced Cement concrete.. The calculated value is higher than the table value and accordingly they are correlated. The gradual familiarity with the beneficial and convenient

methods of construction wisely put forth by Nirmithi Kendra is related strongly with new types of lintels that appeared in Kerala.

3.16 Table 16

This table was depicted the Changes frequently occurring in the style of Roofing – Eg: Filler slab Roofing Awareness of Nirmithi Kendras (Q18), Roof Type (Q23) Out of the 201 persons whose datas were examined, about 97.4% have already abandoned the former style of wood and tile roofing. The tiles are again used to spread on the concrete roofs for savings in concrete. The details available from the table shows that the calculate value itself is much higher.

3.17 Table 17

This table was depicted the Study on the materials applied for the construction of basements and windows. Awareness of Nirmithi Kendra (Q 18), Type of material Used for windows (Q 24). Out of the 201 individuals whose responses have been accepted for the research, study has disclosed the fact that the people of Kerala still have a concealed desire for wood and wooden products. The calculate value is lesser than actual value and higher than 10 and they are correlated. It is implied that the general acquaintance with Nirmithi Kendra has some strong tie with the habit of reducing the use of wood for windows and casements.

3.18 Table 18

This table was depicted the Plastering a sine que non factor for dwelling independent house Awareness of Nirmithi Kendra (Q18), Wall plastering (Q 25). Out of the 201 individuals selected for research study, 190 persons have already acquired knowledge of Nirmithi Kendra. The calculated value as per the verification of table 18 is higher than the table value.

3.19 Table 19

This table was depicted the Different models and methods adopted for the present style of plasteringAwareness of Nirmithi Kendra (Q 18), Plastering of materials (Q 26) The recent trend among the contractors, builders and beneficiaries is to reduce the cost of construction by deleting unwanted plastering, wherever possible and there by saving the maximum possible amount from the cost. The calculated value is higher than the table value and there is apparent correlation. While choosing the appropriate method and material for plastering, the practical know how about the programmes of Nirmithi Kendra will help the beneficiaries.

3.20 Table 20

This table was depicted the guidelines suggested by Nirmithi Kendra and experts conducted by it in the matter of flooring Awareness of Nirmithi Kendra (Q 18), Flooring materials such as terracotta (Q 27)Flooring and plastering are inter related and people go after costly materials for both only to get the maximum beauty and durability for their houses. There is general trend to go after luxury in all sphere of life. The calculated value in this context is higher than table value. There is no general trend to accept natural substances for flooring, the awareness of the lessons excluded by Nirmithi Kendra will transform the present position.

3.21 Table 21

This table was depicted the tie with low cost technology and eco friendly technology. Knowledge of Low Cost Technology (Q16), Percentage of earning profit by use of Cost Effective Eco friendly Technologies (Q32). Out of the 201 individuals, 194 are still out of the orbit and ambit of new phenomena. Otherwise they would also have reaped benefits. The contemporary crisis is how to impart education and awareness among the ordinary people about the scope and profit of eco friendly technology compatible with low cost technology propounded by Nirmithi Kendra and others. The calculated value is higher than table value and as such there is correlation also. The Research scholar feels that it is an indication that there should be a harmony of theories and practices of house construction.

3.22 Table 22

This table was depicted the gradual increase in the cost of materials required for the construction purpose. Stoppage of work (Q34) with rise in the price of building materials (Q 35). Out of the 201 individuals selected by the Research scholar from among who have furnished the required details in the questionnaire. 194 beneficiaries had to with hold the construction work due to the expected life in the cost of material and labour charges and also due to the shortage of funds. The Research scholar keenly observed the responses and the precautions taken by the house builders in the event of frequent like in the material costs. The persons who were not compelled to with hold the construction are negligent in number and the percentage of the sames 3.5. So the calculated value in this respect is obviously higher than the table value and as such there is association.

3.23 Table 23

This table was depicted the gradual increase in the cost of materials required for the construction purpose. Stoppage of work (Q34) with rise in the price of building materials (Q35).Out of the 201 individuals selected by the Research scholar from among who have furnished the required details in the questionnaire. 194 beneficiaries had to with hold the construction work due to the expected life in the cost of material and labour charges and also due to the shortage of funds. The Research scholar keenly observed the responses and the precautions taken by the house builders in the event of frequent hike in the material costs. If there is any cause for the temporary stoppage of construction work, it will be only due to the hike in the materials and labour costs. The persons who were not compelled to with hold the construction are negligent in number and the percentage of the same s 3.5. So the calculated value in this respect is obviously higher than the table value and as such there is association.

4. Interpretation and Results

The research focussed upon many of the scattered realities dominating over the imaginations of an average Keralite in the contemporary firmament. The statistics and reliable datas with graphic representation and models were used to depict the correlation between the various datas were obtained during the survey.

The study concluded for adoption of the following characters in cost effective housing.

- Strength
- Durable
- Functional&Aesthetic
- Environment friendly
- Ecologically appropriate
- Energy efficient

- Affordable and adoptable
- Usage of cost effective materials
- Practice of appropriate technologies in construction

The estimated cost savings on using innovative/cost effective Building materials/ technologies were also determined, in place of conventional options.

References

1. C.S. Vargheese (2000) – " Graha Nirmathiyil, Ariyenda Karyangal" *Vidhyarthi Mihtram publishers.*

2. Chandrarasekharan C(1975). : "Wood use in kerala and its implications on forest land use and development" *Kerala Forest Research institute Trivandrum* .

3. Dr. Anantha Bose IAS (2002)
   - Housing in Society Kerala
   - Chemistry of Building material
   - Glimpses of Architecture

4. Dr. Achuthan, Vincent Paul & Balagopal(2002) – is "Ninglkoru Veedu" (Malayalam) publishing house.

5. Laurie Baker(2002) - Mud, Bricks work, Common buildings

6. Laurie Baker (2001) - Schools,Hospitals

7. Appropriate technology for low- cost housing, *A.G. Madhava Rao & D.S. Ramachandra Murthy*
8. Cost effective technology for the 21st century**.** *Nirmithi National Institute of habitant management.*
9. Laurie Baker(2002) , "Houses - How to reduce Building costs**,"** *Costford*
10. G.C. Mathur (2001) Low cost housing in developing countries
11. M.B.Achwal (2003) Laurie Baker the Master craftsman**,**