RURAL DEVELOPMENT INDEX (RDI) – A PROPOSAL TO EVALUATE ECONOMIC AND SOCIAL IMPROVEMENTS BASE ON THE RURAL ELECTRIFICATION PROGRAM "LUZ NO CAMPO"
CASE: CELESC UTILITY – PHASE: EX-ANTE (BEFORE THE ELECTRIFICATION)

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Abstract

The main purpose of this paper is to present a methodology to evaluate economic and social improvements of the rural properties residents, before and after electrification. It is based on qualitative variables of the survey questionnaire, regarding four areas: social, economic, technical and environmental. Development factors will be measured according to some criteria by the Rural Development Index (RDI) proposed. At the end, we'll be able to identify and compare social and economic characteristics of each region regarding the program "Luz no Campo".

Keywords: Rural Electrification, LUZ NO CAMPO, Rural Development Index (RDI)

1. Introduction

Recently some studies have been reported that, in the Brazil, there are a considerable number of communities, distributed in all national territory, that doesn't have access to the electric power. In particular, the electric power have become increasingly important for a more egalitarian society, with no differential payoff to effort and ability. In electric power applications, it plays a crucial role in refrigeration, heating, illumination, communication and production. In recent times, since the rise of the agro-business market the electric power have become vital for the rural areas.

This work is a research that carried out a proposal for a development degree measure. For the evaluation of the sustainability process in the rural area, it is being proposed some indexes regarding social, technical, economical and environmental variables. They were defined in agreement with the survey questionnaire of the Rural Electrification Program "LUZ NO CAMPO", accomplished in the Santa Catarina state. A sample of data was formed by 438 properties distributed in eleven cities assisted by the Company of Electric Power of Santa Catarina - CELESC.

2. Objective

It is common to measure the variability of a social phenomenon through an index. Besides, the use of indicators brings the advantage of the dimensionality reduction of the phenomenon studied by a composition of several accomplished measures (variables) in an only index. The processing for that synthesis will depend on the relationships among the considered elements, now no longer more relationships among categories of a variable, but relationships among the different considered variables. An indicator should have the capacity to turn perceptible a phenomenon that is not noticed easily, and that can be presented graphically or statistically.

According to Beaver et al, 2000, the indexes of the sustainability should have or to be:

- Simple of using and easy to be extended;

- Robust;

- Easiness to be reproduced;

- To add information to the other legal accompaniment programs;

- Viable cost;

- Useful as administration tool.

The indexes that will be used to evaluate the National Program of Rural Electrification should (MME & ELETROBRÁS, 1999):

- To take the relative aspects to the offer and demand of energy;

- To estimate the costs, the necessary investments and the payments capacity by the producers and rural residents;

- To estimate the relative aspects of the agricultural activity in terms of production systems, production value, demographic aspects, employment level and income level;

- To supply information about the life's conditions of the local residents.

3. Indexes of the sustainability

In this section it'll be defined fourteen indexes based on qualitative variables of the survey questionnaire. These variables take into account social, technical, economical and environmental characteristics. The survey was made before the electrification (*ex-ante* phase) in the Santa Catarina state in 2001s.

The indexes are listed below:

- Quali_1 – Type of Interviewee - it reveals the relationship of the interviewee with the property: proprietor, caretaker, occupant, administrator and other;

- Quali_2 - Instruction Degree of the Farmer - it presents the educational levels of the farmer;

- Quali_3 – Residence Structure – it presents the material types that are used in the wall, floor and covering, besides of the residence size;

- Quali_4 – Sanitary Conditions - it characterizes the sanitary conditions of the local population, concerning the water supply, sanitary installations, sewer and garbage destiny;

- Quali_5 - Leisure and Entertainment - it presents the types of leisure and entertainment of the family;

- Quali_6 - Rural Work Conditions - it presents the conditions of the farmer regarding vacations, INSS tax (Public Welfare) and the monthly revenue of the farmer;

- Quali_7 - Health Treatment – it presents the access of the local residents to the health treatment places;

- Quali_8 - Safety Conditions - it presents patrimony and life safety's, and it presents if the place is unsafe;

- Quali_9 - Agricultural Production Sales - it presents for whom the product is sold;

- Quali_10 - Credit Conditions and Technical Orientation – it presents whether the farmer possesses agricultural credit and technical orientation on planting techniques;

- Quali_11 - Environmental Concern - it presents the techniques used for the preparation of lands for the planting and pasture, besides the proprietor's concern to protect natural landscapes and local resources, avoiding erosion and also establishing your own protection;

- Quali_12 - Satisfaction with the Energy Resources – it reveals the satisfaction or the proprietor's indifference with the current sources of energy, except the electric power;

- Quali_13 - Potential of Impact in the Property due to the Electric Power - it presents the mainly applications of the electric power;

- Quali_14 -New Activities Development – it presents the activities that will develop by the farmer, after electric power.

The objective of these indexes is capture, at the time, a general point of view (portrait) about the farmer and the place. Besides, it can also be used to evaluate the decisions outcome, taken to solve the social, economical and environmental problems of the local residents.

4. Methodology

Each index was defined accordingly to the analyst perception in the several areas of knowledge, considering just the survey questions. For the qualitative variables, it was attributed for each category a value (weight) in the range 0 to 100, where the value 0 (zero) represents the minimum and the value 100, the maximum. The index can be formed by one or more variables. When it is formed by just one variable, it can be represented by just the category value answered by the interviewee. However, when it is formed by two or more variables, it can be represented by the average of the categories values.

The general index (RDI) will be estimated through the average of all indexes (dimensions), for the State/Company. The objective is to simplify all the survey information in just one index.

Also, the indexes was grouped in 3 categories, through the importance for the sustainable rural development:

- Category 1: weight value = 0,5 (for the indexes 2, 3, 4, 6 and 10).

- Category 2: weight value = 0,35 (for the indexes 1, 7, 8, 9 and 11).

- Category 3: weigh value = 0,15 (for the indexes 5, 12, 13 and 14).

The qualitative indexes can be shown graphically. The categories that reflect the resident's life conditions can be considered as relative aspects for the agricultural activities.

5. Results

In this section we show the outcomes of the Rural Development Index (RDI), where it makes possible a synthetic reading of the actual conditions of the Brazilian rural areas, especially for the ones that already had electric power.

For instance, just consider the index 14 - Development of New Activities, whose result is striped below. This index has seven categories, i.e., whether the farmer will develop new activities such as:

- Irrigation,
- Refrigeration,
- Increase the cultivation area,
- Diversify the production,
- Buy Machines (Mechanization),
- Tourism,
- Apply other techniques.

Each category accept two types of answers: Yes or No. If yes then the weight will be approximately 14,3 (100/7), otherwise it will be zero.

The Figure A shows the relationships between the number of activities and the number of proprieties. The graphic show us the quantity of proprieties that will employ a determined number of activities. The value 0 presents that neither activity will employ; 15 is one activity; 30 is two activities and so on. The outcome reveals that the larger number of activities will employ for smaller the number of properties. This scenery is justified by the absence of electric power in a regular way that impedes the maintainable economical development of the rural areas.

Finally, the equation A2 show us how we can estimate the index 14 and the equation A3 show us how we can estimate the RDI for the CELESC utility.

6. Conclusion

In this paper, we have suggested a methodology to evaluate changes in the rural proprieties resident's life, regarding four areas: social, economic, technical and environmental, before and after electric power, with base in the "LUZ NO CAMPO" program. It has a quite simple form, although the final values are weights dependent chosen by the specialist for each qualitative variables category. However, to claim the validity of the method, more studies have to be performed.

The application showed that, the proposed index is very useful, because the practical approach was especially important. In the above example, it was estimated one index for the CELESC utility. This methodology also must be applied for the others utilities to make comparisons among them. At the end, a general RDI might be estimated for the all utilities, taking the average of the utilities, because, knowing the general behavior of the data is

important in planning and analysis, mainly to know the relative position of the utility in relation to the general index.

In a general way, we concluded that the methodology proposed offers a good point of view of the communities that are assisted by the "LUZ NO CAMPO" program. The electric power is a way to reach social and economic development due to the benefits that are generated.

7. Appendices

Equation A1:

$$Quali\_i = \left[\left(\frac{\sum observed\ value\ of\ each\ property}{total\ number\ of\ properties}\right) \div 100\right] \times w_i$$

$$i = 1,\ldots,14\ \text{(qualitative indexes)}$$

w_i: value associated to each index in agreement with it's impact in the rural development, under the perspective of specialist.

Equation A2:

$$Quali\_14 = [(7886/438)/100]*0,15 = 0,03$$

Equation A3:

$$RDI\_Quali\_CELESC = \frac{\sum Quali\_i}{\sum weights}$$

Where:

Quali_i: qualitative index;

Weights: value attributed to each qualitative index.

RDI_Quali_CELESC = 2,09/[(0,5*5)+(0,35*5)+(0,15*4)] = 0,43

RDI_Quali_CELESC = 2,09/4,85 = 0,43

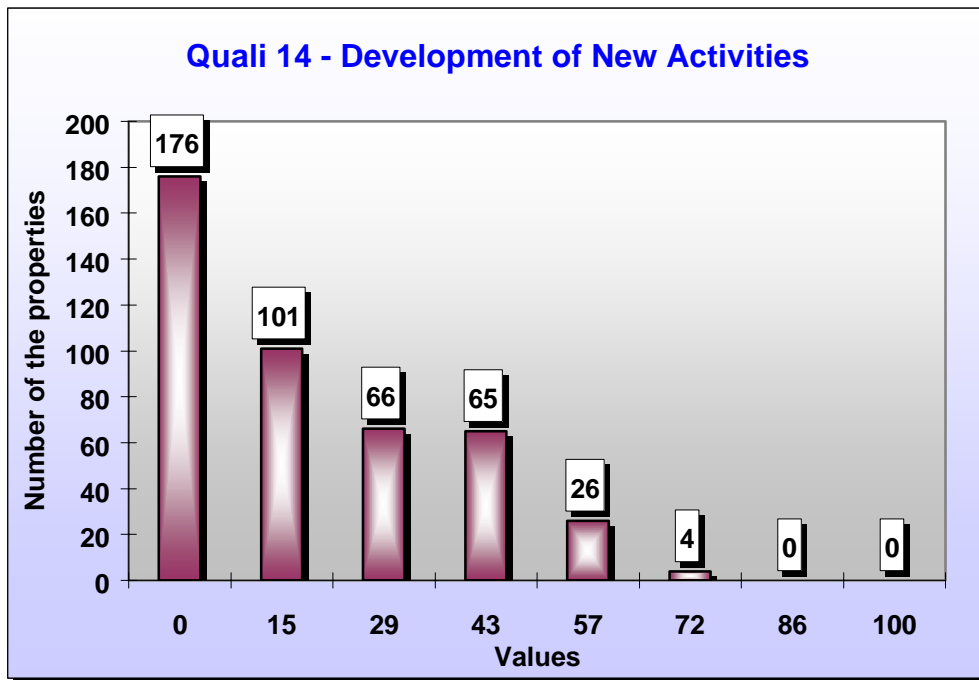## Quali 14 - Development of New Activities

Figure A - Qualitative Index 14 –New Activities Developed - Santa Catarina State

8. References

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