THE USE OF RENEWABLE ENERGIES IN THE PRODUCTION OF GOODS AND SERVICES AS A CONTRIBUTION TO REGIONAL DEVELOPMENT IN THE PROJECT XINGO

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Abstract - This paper describes the action taken to identify possible uses of renewables energies in the production of goods and services as a contribution to the regional development in the project region Xingo. At a first step a market analysis of possible goods and services in the target region has been undertaken. Then the methodology and results were compared to other project areas, where similar actions were carried out by different NGO´s.

Furthermore, the market study resulted in several training efforts such as a seminar for the general public and a training course for those involved in regional market development.

Keywords: Renewables, production of goods and services, market study, training, cost benefit analysis, prouctive

Introduction

The major topic of the project in all target regions is to

- identify goods and services which can be produced at market prices using renewable energies
- allowing short pay-back periods for renewables
- and thus contributing to poverty reduction by generating income

Under this topic, various teams choose different approaches in their target regions.

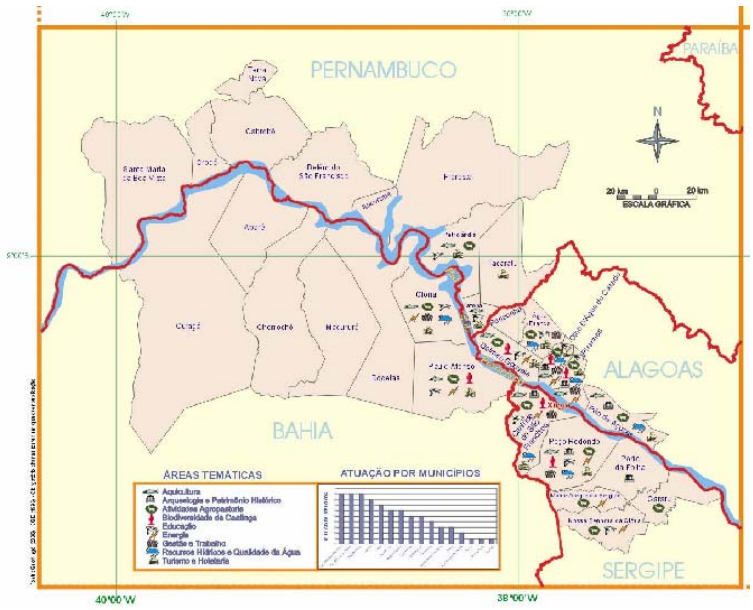
In our target region the largest fully Brazilian river is localized, and the most important one in the Brazilian Northeast region, the São Francisco River. With a length of approximately 3,160 km, it cuts through the northeast semi-arid region, and it is of utmost importance for the economy of the region, because of its significant hydro-electric potential.

However, these resources (power and water supply) are not available for a large number of people. Most of the surveyed places are far from each other and from the conventional electric line (4 to 19 km). These are the inhabitants of small villages located in the surroundings or in

the islands of the São Francisco River, where the conventional power and water supply networks do not reach them.

Aiming at developing the Northeast semi-arid region around Xingó power plant, the Xingó Program was then given birth, in 1998. It is a multidisciplinary initiative, developed jointly by the CHESF, the CNPq- Brazilian National Council for Scientific and Technological Development and the SUDENE - Northeast Development

The Program Xingó region involved 4 states (Alagoas, Bahia, Pernambuco and Sergipe) and it is composted for 30 municipios, about 44,000 km^2 and 600,000 inhabitants.



Xingó Region	
Area (km^2)	40,000
Population (inhabitantes)	600,000

Fig. 1. The Program Xingó region -

Target and methodology of the project

This new advanced training project was designed by InWEnt as a contribution to create employment and hence generate income. It is intended to use locally available renewable energy sources to produce marketable goods and services and to enhance subsistence production within the bounds of possibility. Special emphasis on electricity supply will be laid in those regions which have not yet been connected to the power supply network.

The methodology of the project was:

1. Identifying **possible products and services within a market study.**
   This market study includes the data collection, an analysis of the achieved information, designing the process of the added-value products/services and of the corresponding required renewable energy supply. Then the economic analysis of the production chains has been carried-out, constraints and risks have been identified and further activities have been proposed by the team.
2. The results have been compared with others teams in different target regions.
3. A seminar for the general public in the target region has been carried out.
4. A specific group of future regional market developers is currently been trained on the methodology of this market approach.

Possible productive uses

The analysis of goods and services showed the following applications as most promising for further analysis and final realisation in eleven municipalities in our target region:

- Solar dryer for fruit production (raisins) from cashew fruit, papaya…
- Fruit pulp production, such as cashew fruit , hog plum, red berry, acerola and others
- Handicraft production
- PV lighting of the popular clothing factory;
- PV water pumping for goats and sheep combined with electrical enclosure for goat and sheep breeding.

Special emphasis has been put on the economic evaluation including a sensitivity analysis. The example of a stitching device is shown in the **annex 9.2**.

Next steps

- Identifying the required business development services
- Training the stakeholders
- Identify bottlenecks
- Realising demonstration plants in the target region

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Annex

Project Team

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Example of the cost / benefit analysis for a stitching factory.

The partners have identified stitching as one possible service to be carried –out in the region. The results elaborated are presented in the following way:

- A table showing the production/services and corresponding costs and revenues.
- A table showing the summary of cost benfit analysis using the dynamic calculation. The left columns show the project parameters used, the right one the financial input parameters and corresponding economic results.
  The target numbers are the the financial internal rate of return[5] and the minimum retail price.

Table 1: Costs for installing a stitching unit in Batida. The women are working 8 hours daily, four of them at night.

INVESTIMENTO FIXOS						**Amorticacao/An**
Quant.	**Descrição**	**Custo Unitári**	**Custo total (R$)**		**Vita util (mes)**	**R$**
1	Sala 45 m2, com WC e Pequena cozinha	200,00	9.000,00		120	-109
1	Sistema de Iluminação PV	8.140,00	8.096,00*	(US$2188)		
2	Mesas	150,00	300,00		60	-6
2	Armário	150,00	300,00		60	-6
10	Cadeiras	40,00	400,00		24	-18
20	Máquina de costura manual	100,00	2.000,00		24	-90
Total		8.780,00	3.000,00			
DESPESAS FIXAS - MENSAIS						
Quant.	**Descrição**	**Custo Unitári**	**Custo total (R$)**			
3.520	Tecidos e linhas diversas	1,00	3.520,00		1	-3.543
	Manutenção		200,00		1	-201
20	Retirada dos cooperados	120,00	2.400,00		1	-2.416
PRODUTO FINAL - MENSAL						
Quant.	**Descrição**	**Preço de venda(R$)**				
3.520	Camisas, calça, bermuda, blusa, short	2,00	7.040,00		1	7.040
Lucro mensal in R$						649
Annual profit in €						2.226 €
PRODUTIVIDADE						
A cooperativa tem 20 cooperadas.						
As mulheres trabalham em média 8 horas por dia das quais 4 horas são no período noturno.						
Uma mulher produz cerca de 20 peças por dia						

[5] The FIRR is based on the annual calculation of nominal costs and revenues depreciated with the inflation rate (6%).

Table 2: Cost-benefit analysis of the stitching service

Project Parameters				**Financial Parameters**			
Costureira				1 Euro = R$	3,5	**Promotion**	
Begin of project	2001			**Project Parameters**		without	with
System service lifetime	20	years		Initial Costs - Total	€	2.331	-
System Size				Initial Costs without import tax	$	n.a.	
System Size	0,15	kWp		Annual Costs - Total	€	300	
Initial Costs - Total	2.331	€	Lifetime yr.	Annual Costs - Energy	€	-	
Installations	143	€	1	Annual Costs - Others	€	300	
Battery	248	€	3	Annual Revenues - Total	€	2.226	
PV module	900	€	20	Added value	€	2.226	
Inverter	1.000	€	10	Others	€	-	
Controller	40	€	4	**Economic Parameters**		units	value (€)
Avoided other installations		€		CO_2 avoidance	n.a	n.a.	n.a
Annuity costs	503	€/a		NO_x avoidance	n.a	n.a.	n.a
Installations	154	€/a		SO_x avoidance	n.a	n.a.	n.a
Battery	96	€/a		Long Run Marginal Cost (LRMC)			n.a
PV module	92	€/a		**Financial Parameters**		without	with
Inverter	149	€/a		Debt ratio (debt/equity)		100%	
Controller	12	€/a		Debt interest rate (effective)		8,00%	
Avoided other installations		€/a		Debt payments (Cost Annuity)	€	309	-
Annual Costs - Total		€/a		Inflation index		6,00%	
O&M, construction	257	€/a		goods/services index		6,00%	
O&M, labour costs	43	€/a		**Financial Feasibility**		without	with
Energy		€/a		Pay back period (static)	yr	1,2	
Others		€/a		Financial Internal Rate of Return (FIRR)		**88,6%**	
Annual Revenues - Total				Minimu retail price to achieve FIRR > 15%		**1,87**	**R$/item**
Costureira	2.226	€/a		Net Present Value (NPV)		14875	-
Retail price: camisas etc.	2,00	R$		PV of annual costs	€	-5013	-
				PV of annual savings	€	19888	-

n.a. not available

At this level of investigation these data do not include local taxes such as ICMS, COFINS, IPI e PIS, which can easily reach a value of 20-25% of the profitability. Moreover, transaction costs such transportation, retailer margin arre not considered.

All values are calculated in € if not mentioned otherwise.

This example of a stitching device results in an very favourable value of internal rate of return (IRR). The key factor is the retail price for the t-shirts, shirts etc. The project is very sensitive on this retail price. A reduction of the price of only 6.5 % (to 1.87 R$ per item) reduces the FIRR to 15%.