RURAL INDUSTRIES DEVELPOMENT USING BIOMASS ENERGY

by

V. K. VIJAY
Centre for Rural Development and Technology

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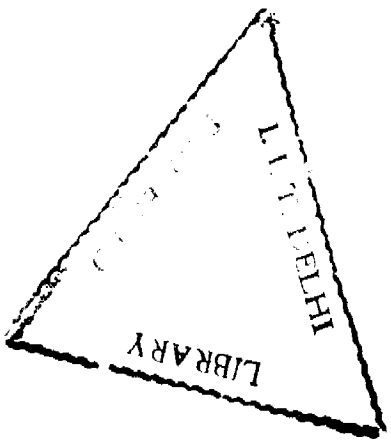

CERTIFICATE

This is to certify that the thesis entitled "RURAL INDUSTRIES DEVELOPMENT USING BIOMASS ENERGY" submitted by Mr. V. K. VIJAY to the Indian Institute of Technology, New Delhi for the award of the degree of 'Doctor of Philosophy' is a record of bonafide research carried out by him. He has worked under our supervision and guidance and has fulfilled the requirements for the submission of this thesis, which has attained the standard required for a Ph.D. degree of the Institute. The research report and results presented in this thesis have not been submitted elsewhere for the award of any degree or diploma.

21/7/97

RAJENDRA PRASAD
Head & Chief Scientific Officer
Centre for rural Development & Technology
Indian Institute of Technology
Delhi

21/7/97

JAGPAL SINGH
Principle Scientific Officer
Centre for Rural Development & Technology
Indian Institute of Technology
Delhi

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(Virendra Kumar Vijay)

ABSTRACT

The research work aims toward formulation of an approach, developing appropriate technology and utilising biomass energy for rural industrialisation. The problems identified are lack of science and technology (S&T) inputs, credit, appropriate technologies and scientific production / organisation / linkages/ networks in the area. Neither institutional mechanism for providing science and technology inputs, nor involvement of research and development (R&D) institutions for the rural sector in a proper way exists in the country. There is a stagnation, and rather a decline in the production activities, and needs some immediate intervention.

The approach suggested, focuses on the poorer sections of the society. It suggests building a *taluk*-wide multi-sectoral production network and a mix of different scales of production to be developed in the form of group enterprises in the rural areas. This is based on local resource utilisation and emphasises primary as well as secondary and tertiary production units with participative management. One main advantage of the approach, focusing on development of group enterprises, lies in pooling the resources and capabilities of the poorer sections, like the artisans, small and marginal farmers, labourers etc., through networking of production processes at different levels of the local economy. The entrepreneurs are linked to the science and technology based field agencies/groups at the *taluk* level, which are in turn, linked to the S&T institutions in towns and cities. The role of co-ordination and linkages of the field groups, and the technical institutions for R&D and appropriate technology generation, is performed by

the lead system group. The structure of local economy has been described in the form of hierarchical networks of settlements and activities like small villages (S), medium villages (M), bazaar villages (B), and nodal village/town (N).

Based on this approach, a programme on rural industries development was initiated at IIT Delhi and various S&T field groups/systems group and technology generators joined hands. Several training programmes and workshops were organised to train the field groups for field investigations, data analysis and area planning for rural industries development in their respective areas. The milk, wasteland and energy sectors have been primarily taken for pilot scale technology development and field implementation.

Milk sterilisation technology was chosen for further investigation, on the basis of field requirements, to enhance the shelf life of milk as part of an enterprise development programme in rural areas. The effect of sterilisation on milk was studied over a period of more than six months, conducting standard tests listed in the literature. The conditions of sterilisation process, like pressure, temperature and exposure time, were optimised. The shelf life of milk could be increased for several months by this process. The milk was sterilised in an autoclave. The commercially available autoclaves are too costly to be adopted by the people in the rural areas. To reduce the costs, a new autoclave had been designed and developed. The autoclave was constructed with a judicious mix of local and non-local construction materials from rural areas point of view. The new autoclave was about one tenth in cost to the one commercially available. Steam supply was also arranged by installing a small boiler. The boiler was got

fabricated, (45.2 kg/hr capacity), specifically to suit the purpose. This boiler could be used with wood or with biogas as a fuel. To use biogas a larger size, new burner had to be developed. The performance of the boiler also, had to be properly adjusted to get higher efficiency. The cost-benefit analysis of a 400 lt. milk sterilisation unit was carried out, and the break-even point was found to be around 0.4.

The area planning focused on rural industries development programme using biomass energy in Karsog I area in Himachal Pradesh. The concept of a *Goshala* (common cattle shed), came out as a basic unit at each village, to co-ordinate the various activities and to provide different community services, as well as to organise various production activities. A suitably large size biogas plant could be suggested to meet the energy requirement of most of the rural industries envisaged, and in addition provide enriched manure for wasteland recovery and agriculture. A small complex could be at Mamel village, which could be feasible if consisted of a few secondary production and processing units for value addition to the primary products available from agriculture, animal husbandry etc., from the small villages around.

The planning of the area reveals large potential for generating employment and income of the people, in the sectors of milk, wasteland recovery, energy and food processing. The impact of this approach will be even more significant by taking into account that it focuses on organising the artisans, labourers, small and marginal farmers into group enterprises and thus giving them tools for self-sustenance and self-development.

LIST OF FIGURES

LIST OF PLATES

CONTENTS