V

# INSTITUTIONAL IMPLICATIONS

Rural energy development is not an end in itself but an important input for achieving the objectives of agricultural and rural development. Energy-related decisions, therefore, cannot be made in isolation without giving due consideration to direct or indirect impacts on the rest of the economy. Rural energy planning and implementation, therefore, involve several organisations and institutions. Currently, the Water and Energy Commission and the National Planning Commission are responsible for planning for energy supplies on a sectoral basis. Various government agencies (such as the Ministry of Water Resources, Ministry of Agriculture, Ministry of Forests, and the Ministry of and Local Development) provide policy and programme guidelines for implementation. The Ministry of Finance allocates financial resources to the line ministries. Rural energy programmes are then implemented through (a) relevant government departments under different ministries, (b) semi-government institutions, such as the Agricultural Development Bank and the Small Hydroelectric Development Department of the Nepal Electricity Authority, and (c) private sector organisations, such as the Biogas Company and turbine manufacturing firms. At the village level, those involved actively in the implementation of rural energy activities include individual entrepreneurs such as mill owners and biogas plant operators, small farmer credit groups, self-help organisations, and other formal/informal associations.

## Current Institutional Arrangements

*Government Institutions*

Since the Sixth Five Year Plan (1980-1985), increasing importance has been given to the development of new and renewable energy sources. A number of decentralised rural energy projects have been undertaken in the rural areas but with limited impact on the rural population. The Water and Energy Commission Secretariat (WECS) was created by His Majesty's Government in 1980 under the Ministry of Water Resources to provide planning guidelines for the development of the water and energy sector. In the initial years, the efforts of WECS were mainly concentrated on the planning and monitoring of operational problems in big hydropower projects and very little on renewable energy activities. This is not surprising because WECS is an institution under the Ministry of Water Resources where priority is given to the development of hydropower. In addition, WECS does not have a formal functional responsibility vis-a-vis the National Planning Commission (NPC) which is responsible for the overall planning of the energy sector. Its role is, therefore, limited as an advisory body. In spite of these institutional limitations, WECS has recently taken some initiatives in renewable energy development, for example:

- preparation of an annual plan for rural energy projects with the help of an "Energy Task Force" consisting of representatives from relevant government and semi-government agencies, and

- development of a plan to promote alternative energy resources.

The fact remains, however, that the representatives are not obliged to implement the proposed plans. They do, nevertheless, serve the function of helping the concerned members to initiate possible action programmes in their respective agencies.

*Financial Institutions*

As already explained in the previous chapters, the Agricultural Development Bank of Nepal (ADB/N) has been actively involved since the mid-1970s in the promotion and dissemination of a number of renewable rural energy technologies, for example, micro-hydro for agro-processing and rural lighting and biogas for cooking, lighting, agro-processing, and water lifting. ADB/N has been effective in mobilising its resources for financing these energy systems through its nationwide network. The efforts of the bank alone are not, however, adequate. The ADB/N experience shows that many of these activities, centred around rural energy, are technically and economically feasible and socially adaptable. Rural entrepreneurs, village residents, technology manufacturers, and the ADB/N have all benefitted from such undertakings. The irony is that government institutions and other commercial banks have not seriously joined in the efforts towards wider dissemination. The Government, for example, announced a policy in 1985 to provide a 50 per cent subsidy to promote private initiatives in undertaking rural electrification schemes. However, the bank faced difficulties in getting the funds released from the Ministry of Finance.

*Private Sector Organisations*

Commercialisation of some energy technologies has been fairly successful when private manufacturers have been involved in the dissemination effort. Installation of micro-hydro turbines and biogas digesters are examples of successful programmes implemented by such companies as Balaju Yantrashala, Nepal Yantrashala, Kathmandu Metal Works, Butwal Engineering Works, Development Consulting Services, and the Biogas Company. Credit and extension support from ADB/N have helped them in continuing with these activities. They have shown their interest and capability in developing suitable renewable energy systems and extending the services to private entrepreneurs in rural areas. Their organisational network and services would be greatly strengthened if government policies and support mechanisms became favourable and consistent.

*Research Institutions and Technology Centres*

For about a decade, the Research Centre for Applied Science and Technology (RECAST) has been involved in the design and testing of water turbines, improved cooking-stoves, water-lifting devices, and biomass gasification. Several private sector institutes are engaged in product improvement work. The sharing of research findings and opportunities for prototype field testing are, however, limited. In the past, RECAST was active in testing rural energy technologies with users' participation at Village Out-Reach Centres (Shrestha and Singh 1986). These activities were instrumental in creating awareness among village communities in the use of rural technologies. Unfortunately, the project has been discontinued mainly because of funds and other support. The ATU of ADB/N is at present the only institution that is continuing with the field testing and demonstration of rural technologies in the villages and promoting them with credit support. Such activities deserve further intensification.

*Local Organisations, Entrepreneurs, and Artisans*

Local organisations including informal water user groups, forestry groups, and village residents, including artisans and entrepreneurs, have knowledge and skills to contribute to the development and diffusion of energy technologies. In areas where SFDP and PCRW programmes are launched,

institutional mechanisms exist to mobilise the participation of local beneficiaries in planning and implementing programmes including rural energy projects. In other areas, a number of informal local organisations have existed for centuries. Progress in rural development programmes and energy projects are, however, lagging behind expected targets because of the lack of institutional support, the inefficiency of active extension agents or catalytic agents, and the absence of adequate encouragement to enhance the involvement of local informal organisations. Formally sponsored organisations such as "forest users' committees", and "water users' committees", and set up as a part of government programmes, have yet to demonstrate effective operational and management capabilities. Appropriate organisational mechanisms need to be developed to assist farmers, artisans, and entrepreneurs in strengthening their capabilities in mobilising their own resources, seeking the assistance of government programmes, as appropriate, and obtaining financial and technical assistance, if necessary, in order to increase the input of energy and thereby increase rural productivity.

*Donor Agencies*

Donor agencies, until recently, have been more interested in centralised multi-megawatt hydropower projects with high environmental risks than in decentralised multipurpose micro-hydro development programmes. Huge investments and grant assistance, poured into large projects, have usually resulted in substantial cost overruns and delays in project completion. While large energy projects cannot be neglected, it is important to recognise that renewable energy technologies have been valuable in improving the rural economy. At the same time, the recipient agencies must emphasise institutional capabilities and favourable policy conditions for the effective planning and implementation of renewable energy programmes. In this context, it is encouraging that an "Alternative Energy Task Force" has already been established to monitor project implementation and coordinate annual project planning. However, because of the ad hoc nature of the Task Force and the absence of a government agency with the mandate to plan, implement, and monitor renewable energy activities, coordination among institutions and organisations is very weak.

**Towards an Appropriate Institutional Framework**

*Need for a Government Agency*

Realisation has existed for some time that the absence of a government agency responsible for planing, programming, and oversee energy activities in Nepal is a problem. In view of the absolute dependence on traditional energy sources such as fuelwood for domestic and rural consumption, there is a growing need to search for alternative options. The development and widespread dissemination of new and renewable energy sources and their efficient use will provide major solutions. On the other hand, consumption of commercial energy will continue to grow in the future and significant substitutions of petroleum products seem unlikely. The role played by commercial energy sources such as petroleum products, coal, and electricity in the Nepalese economy is vital although the consumption is only about 4 per cent of the total energy. Irregular and inadequate supplies of such energy sources have led to economic stagnation. Furthermore, Nepal's vulnerability is evident from the most recent incident when India refused the entry of petroleum products and coal to Nepal after the expiry of the trade and transit treaties in March 1989. This experience has brought about a greater realisation of the need to reduce the dependency on imported energy sources such as kerosene, petrol, diesel, and coal, and the need to substitute imported commercial fuels with locally available sources. The emphasis,

therefore, is on increased supply and effective use of electricity from both big hydropower projects as well as decentralised micro-hydro schemes.

Effective implementation of such a strategy calls for the reorganisation of the existing government institutions towards the creation of a "Ministry of Energy (MOE)." This institutional set-up is based on the growing realisation that there is no single agency to coordinate energy planning and programme implementation. At least two departments within the ministry should be considered. The " Department of Renewable Energy (DORE)" can be responsible for assisting institutions and organisations for the appropriate supply management of traditional and non-conventional energy sources, such as fuelwood and biomass/agricultural residues, and for promoting greater energy generation and the efficient utilisation of alternative sources such as bio-gas, hydropower from micro-turbines, solar and wind energy, and energy from biomass gasification.

Secondly, the "Department of Commercial Energy (DOCE)" can deal with the supply of electricity, petroleum products, and coal, and can explore options for inter-fuel substitution. The major function of such a ministry will be to coordinate energy planning and implementation with the National Planning Commission (NPC), related line ministries, and bilateral or multilateral donor and financing agencies. To strengthen energy planning and implementation, each ministry and semi-government corporation would benefit from the establishment of an internal "energy cell", so that it could provide a coordinating link with the Ministry of Energy for a more meaningful inter-agency relationship. Another important function of MOE will be to integrate the energy component in all sectoral plans and monitor operational problems. Concurrently, an important activity would be to build a systematic database to enhance the formulation of feasibility studies and impact assessment of energy programmes.

The Ministry would benefit from the formation of a "Renewable Energy Coordination Committee" with representatives from institutions such as the Agricultural Development Bank, the Department of Agriculture, Department of Forestry, Department of Industry, National Planning Commission, Nepal Electricity Authority, Nepal Oil Corporation, Nepal Fuel Corporation, Research Centre for Applied Science and Technology, Royal Nepal Academy of Science and Technology, Biogas Company, and turbine manufacturers. There is also a need to establish an "Energy Planning Division" at the National Planning Commission to formulate renewable energy policies and plans. Within the institutional framework as suggested above, the implementation of energy programmes can continue to be the primary responsibility of various agencies that already exist. The major functions of the two departments are outlined below.

Department of Renewable Energy (DORE)

- To coordinate the preparation of plans and assist various energy-related organisations in the implementation of programmes on renewable energy.
- To establish necessary linkages between macro-level planning and micro-level implementation through the cooperation of energy-related organisations.
- To monitor progress and provide policy guidelines and support mechanisms for research, development, training, demonstration, and dissemination of energy technology systems for rural areas.

- To develop and assess the productive application of renewable energy technologies in agriculture and rural industries and to recommend site-specific options that are cost-effective, environmentally sound, and sensitive to the local resource base.

- To assist and provide incentives for private sector organisations involved in R & D, manufacturing, marketing, operation, and maintenance of renewable energy systems.

- To arrange financing through internal and external sources for research, development, extension, and training on renewable energy systems and for encouraging entrepreneurial ventures.

Department of Commercial Energy (DOCE)

- To coordinate the preparation of plans for the import of commercial energy and to assist in the arrangement of its timely supply and distribution.

- To formulate relevant policies concerning the conservation and effective use of commercial fuels and to monitor the progress of their adoption.

- To provide energy pricing guidelines and to assist agencies in formulating strategies for the substitution of imported fuels by hydroelectricity and other renewable energy sources.

- To develop a realistic schedule for hydro-electric schemes, both big and small, to take advantage of the huge water resources available in the country.

- To arrange the systematic exploration of hydro-carbon deposits such as petroleum products, coal, and gases.

- To assist and provide incentives for R & D on commercial energy.

- To arrange financing through internal and external sources for R & D, extension, manpower training, project design, and implementation.

*Emphasis on Private Sector Development*

Experiences with renewable energy programmes suggest that the promotion of the private sector in production, marketing, sales, and services can be very effective. Programmes undertaken by government agencies and public sector organisations are usually constrained by the relative inefficiency of the outreach capability and management system. The cost of running small hydro projects at the district or village level, for example, is considerably high for the Small Hydroelectric Development Department. Private companies are likely to provide better alternatives for the same type of work. Evidence shows that mini- and micro-hydro projects are profitable when organised by the private sector. This is equally true for other rural energy systems such as agroforestry, biogas, and stove production. Economic gains through cost-effective technologies can be assured if the organisational and management capabilities of producers and users are enhanced.

A shift in government policy is necessary if private sector involvement is to materialise. This means, for example, (a) a more positive attitude towards small energy systems, (b) willingness and

commitment to use the private sector in the planning, implementation, and management of projects, (c) protection against the import of energy technologies that can be produced locally, (d) assistance in the financing and marketing of energy technologies, and (a) development of an appropriate pricing policy and other incentives to encourage the adoption of renewable energy technologies in place of fuelwood and petroleum products. The important point is to increase the interaction, among government agencies, private sector organisations, rural entrepreneurs, and local communities.

Participatory action research as described by Bajracharya et al. (1987) provides a sound methodology for promoting the interaction. The current administrative structure within government agencies is unlikely to implement the required measures in the immediate future. In the context of Nepal, it is more conceivable that a private agency be created to mobilise the interaction of various parties as mentioned above. The major function of the agency would be to provide the services of well-experienced "catalytic agents" to public agencies for implementing government programmes. Training may be provided to staff to organise users and ensure their participation in rural energy activities. "Catalytic agents" of this agency should have the following qualifications:

- experience in motivating rural farmers to form cohesive groups for the planning and implementation of rural energy systems;
- skill in understanding local energy problems and the ability to suggest practical options;
- ability to train programme staff from various government organisations on the use of participatory approaches for problem solving in rural areas;
- capability to coordinate the contributions of technologists, researchers, manufacturers, financiers, and government officers in order to meet the requirement of village residents;
- skill in analysing field results and compiling progress reports; and
- the capability to undertake feasibility studies and organise training programmes for rural entrepreneurs and village residents on rural energy systems and on the technical aspects of operation and maintenance.

*Strengthening Regional Organisations*

Government ministries and semi-government institutions have regional set-ups that are relevant for the development of renewable energy sources. The purposes of these offices are to execute national policies and to supervise and monitor programme execution in the concerned districts. For example, agricultural and related energy technologies are tested and demonstrated in regional or district farm research stations by the National Agricultural Research and Service Centre, Ministry of Agriculture. If the concerned technology shows promise, it is certified for promotion and extension to the farm level through the Agricultural Development Office in the districts. Courses on the operation and maintenance of the technology are provided regularly to farmers by many training centres under the jusisdiction of the District Agricultural Development Office. A case in point is the demonstration of solar dryers at the Jumla Apple Farm in order to encourage farmers to process dried apples. At Malepatan Livestock Farm, Pokhara, hydraulic rams supply the water requirements. Lots of improvements are, however, possible and desirable. A much

stronger link with these research farms can be developed to promote more energy technologies, along with their current involvement with farm mechanisation and irrigation technologies. The present emphasis on the use of diesel in farm technologies can, for instance, be shifted to the use of locally available renewable energy sources. This would in the long run benefit the farmers in view of the high diesel cost and its unreliable supply. Similar innovations can be instituted through the network of regional training centres and Appropriate Technology Units of the Agricultural Development Bank, the regional training centres for the development of cottage industries run by the Department of Cottage and Village Industries, and the Forestry Training Institutes in Pokhara and Hetauda. These efforts can also be effectively linked to the Integrated Rural Development Projects administered, with bilateral and multilateral assistance, by the Ministry of Local Development. Many of these projects have already realised the need to look into the question of rural energy supplies in order to supplement their development activities.

There are many possibilities for strengthening these institutions to support and provide better services to rural entrepreneurs, farmers, and local communities. Some specific suggestions are worth exploring.

- "Rural Energy Development Cells" may be created to plan and implement the energy component as a part of integrated development programmes. They would benefit from the assistance that the private extension agency can provide (as described above).

- Appropriate Technology Units of the ADB/N will be expanding their network of technology testing and demonstration. Emphasis should be given towards strengthening these ATUs to adopt the integrated approach as in Karma Singh *Phant* where SFDP groups and private entrepreneurs cooperated together in establishing the "Irrigation and Rural Energy Development Model" (see Fig. 2).

- Schools and colleges have been effective in demonstrating the importance of increased energy input for enhancing rural development. Regional training centres could be playing a valuable role in assisting them by providing training and relevant information. Concurrently, emphasis should be placed on designing special curricula and conducting regular training courses for farmers and village entrepreneurs on the operation and maintenance of energy technologies.

- Forestry training institutes in particular can be instrumental in developing agroforestry schemes and encouraging private farm forestry. Training and other technical support could be easily provided by them. Financing support from credit agencies could be linked to these activities. Integration of horticultural crops could also be integrated into the scheme to generate sustained income for rural residents.

*Strengthening District and Grassroot Organisations*

The Decentralisation Act of 1982 is an encouraging step towards strengthening district and grassroot organisations. Village and district development plans can now be formulated through the participation of rural residents. Under the Decentralisation Act, sectoral plans are prepared by concerned agencies on the basis of projects identified by Ward Assemblies and recommended by Village Assemblies. These plans are subsequently discussed and approved by the Sectoral Plan Formulation Committee as a part of the process for drafting the District Plan under the aegis of the District Secretariat. The Draft Plan is then reviewed by the District Assembly and eventually submitted to line ministries and the National Planning Commission for inclusion in the National Plan. Currently, there are five Sectoral Plan Formulation Committees, none of which deals

directly with energy. Not surprisingly, rural energy development is usually not incorporated as a priority item. Considering the importance of energy for rural development, it is worthwhile considering the energy component. The following institutional mechanism is suggested with the objective of enhancing local capabilities to plan and implement rural energy programmes.

- Strengthening the organisation of farmers, artisans, and entrepreneurs is vital for carrying out rural energy programmes. Mechanisms for developing local cooperation need to be encouraged. To this effect, the efforts of the Small Farmers' Development Programme (SFDP), the programme on Production Credit for Rural Women (PCRW), and other non-formal organisations might be consolidated to deliver services and provide support mechanisms for initiating rural energy programmes. Ongoing government programmes might consider the provision of catalytic agents for training local development agents from among the rural communities. A deliberate effort should be made to identify informal organisations that are actively engaged in cooperative activities in the community. Many organisations of this kind have been functioning effectively with self-made rules for proper management and control. They have demonstrated the capability to mobilise their own local resources and skills without external assistance. With the emergence of government-sponsored organisations, the traditional ones are gradually disappearing. Recognition of their existence might facilitate the identification of effective ways to mobilise the local participation of the villagers.

- Rural energy programmes will not get any prominence unless they are integrated with the District Development Plan. A separate Sectoral Plan Formulation Committee on energy is not necessarily an important consideration. What would be important is to establish a District Coordination Committee for Energy Planning and Management. The responsibility of this committee would be to study the five sectoral plans and assess how the energy components could be integrated into each sector. From this perspective, it would be essential to provide proper orientation and training to district officers on the technical, economic, and management aspects of rural energy systems and on how the identification and selection of technology systems could contribute to achieving district development goals. For example, a joint institutional arrangement can be initiated with the District Forest Controller's office and the Agricultural Development Bank to provide technical and credit support for developing private farm forestry or agroforestry schemes on a commercial basis. Similarly, financial and training support may be provided to rural entrepreneurs to set up a demonstration centre with a special focus on decentralised energy production, maintenance, and repair.