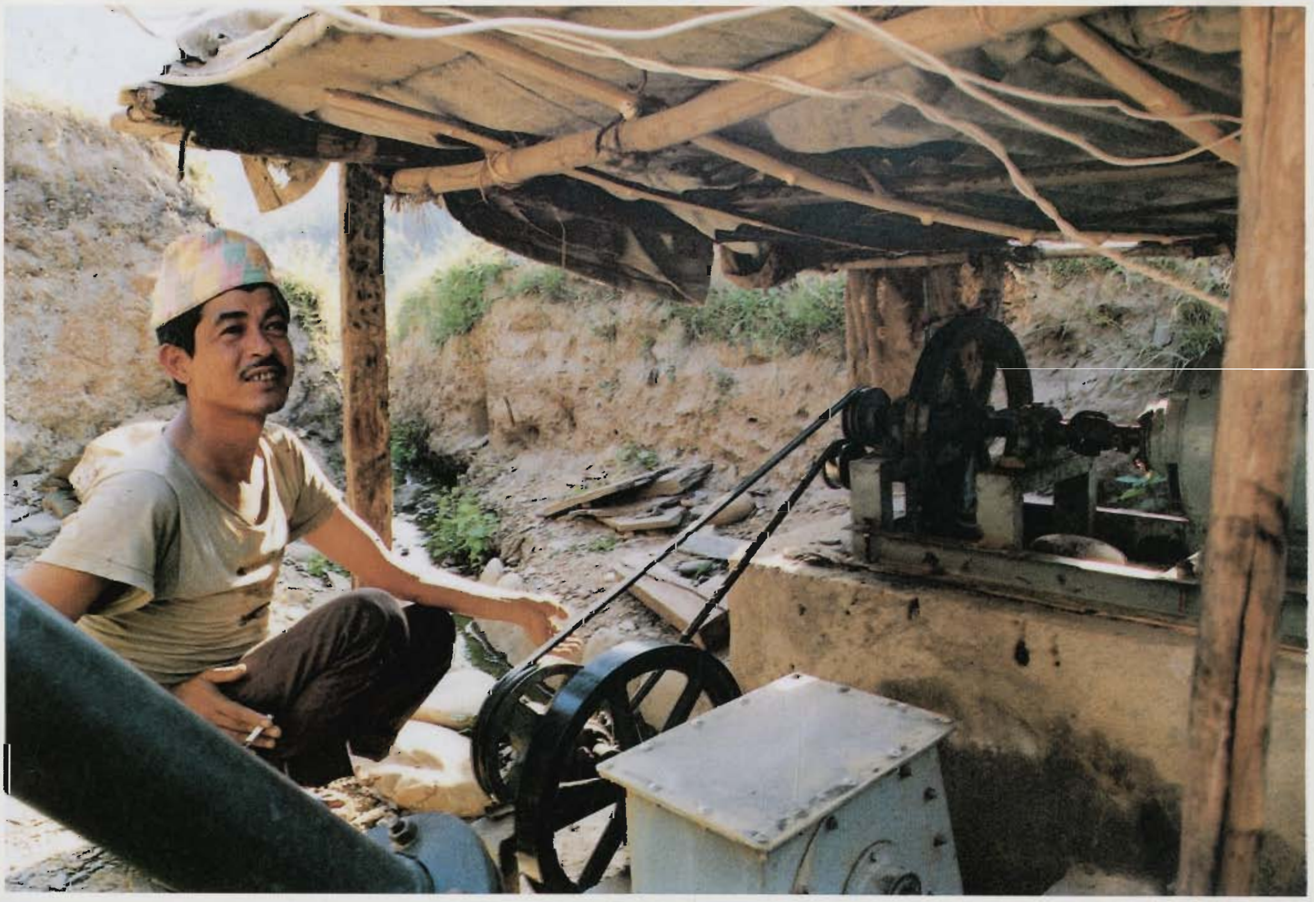
International Centre for Integrated
Mountain Development

DECENTRALISED ENERGY PLANNING AND MANAGEMENT

FOR THE HINDU KUSH-HIMALAYA



Deepak Bajracharya

ICIMOD OCCASIONAL PAPER No. 4

Kathmandu, Nepal

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Cover photograph : Microhydel plant in the mountains.
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Foreword

During the Inaugural Symposium of ICIMOD, in December 1983, and at all subsequent discussions and consultations held in the countries of the Hindu Kush-Himalaya Region on the most urgent priorities in mountain development and environmental management for the concentrated attention of this new International Centre, the subject of rural energy demand and supply in mountain communities has ranked very high indeed.

It was frequently observed in these discussions that government and research attention in the field of rural energy seem to have focused almost exclusively on the design, testing, and dissemination of alternative technologies in rural energy supply and use -- 'alternative' of course, to the excessive dependency on wood fuel, which is so obviously one of the prime causes of environmental damage in the mountains. Without underestimating the importance of appropriate and innovative technology in this field, our many consultations with development experts throughout the Region, in and out of government, have strongly underlined the need for a more systematic and integrated approach to rural energy planning and management.

Our own growing understanding in this field over the last two years at ICIMOD has led us increasingly to focus on the **district level** (or the equivalent 'county' in China) as the most appropriate governmental level for the development of such an integrated approach, with the central focus on 'the energy components' of progressive and sustainable economic development with effective environmental resource management for mountain communities, both rural and urban, within an overall development system. These evaluations of existing knowledge and experience in rural energy, undertaken in collaboration with selected institutions in India, China, Nepal, Bhutan, Pakistan, and Bangladesh, culminated in May this year in a major International Workshop on District Energy Planning and Management in the Hindu Kush-Himalaya.

Based on the stimulating exchange of ideas and experience between the participants of this Workshop, and on his own direct participation in field research in rural energy in a number of countries of the Himalaya Region, Dr. Deepak Bajracharya has now made a significant new contribution to the formulation of this more integrated approach, which ICIMOD is most pleased to publish in its Occasional Paper Series.

His interesting, and very necessary, attempt to set rural energy planning and management within a comprehensive development framework is most welcome. It is hoped that this study will form one of the key contributions to the design and implementation of a major programme of regional cooperation in these mountains of practical research and training in Decentralised Energy Planning and Management for integrated mountain development. For this, ICIMOD owes special thanks to Dr. Deepak Bajracharya.

Colin Rosser
Director

Acknowledgements

Inspirations for writing this paper came while listening to stimulating presentations and discussions at ICIMOD's International Workshop on District Energy Planning and Management for Integrated Mountain Development, 3-5 May 1986, Kathmandu. I have unabashedly used many fundamental concepts expressed at the Workshop and tried to weave them into a comprehensive framework. Where credits are due, I have cited the authors of specific papers. I would like to express my gratitude to them and also to other Workshop participants who contributed during the discussions.

Sincere thanks are due to Dr. Colin Rosser, ICIMOD Director, who encouraged me to undertake this task. For reviews, criticisms, and helpful suggestions, I am grateful to my colleagues at ICIMOD, particularly Binayak Bhadra, Vinod Kumar, Shankar Sharma, Anis Dani, Prodipto Roy, and Richard Tucker. I would also like to thank the Editorial and Publications Unit of ICIMOD for assistance and suggestions on style.

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Acronyms

ADB/N	Agricultural Development Bank of Nepal
ATDO	Appropriate Technology Development Organization
ATU	Appropriate Technology Units
CAS	Chinese Academy of Sciences
DAS	Development Assistance Committee
DEPM	Decentralised Energy Planning and Management
HMG/N	His Majesty's Government of Nepal
NWFP	North Western Frontier Province
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
PAR	Participatory Action Research
SFDP	Small Farmers Development Programme

Introduction

At the heart of the rural energy concern lies a paradox. In the last ten years, the importance of energy's role for rural development and environmental management has been amply emphasised, and is now well recognised. Yet adequate action programmes to overcome pressing problems have not been forthcoming, and the impact on enhancement of the rural quality of life has been marginal at best. This is evident not only in the severely limited allocation of financial resources and other efforts for rural energy development, but also in local people's hesitation to readily accept suggested solutions and approaches.

I argue in this paper that a fundamental shift in the paradigm of planning and implementation is necessary for effecting desired changes. For viable alternatives to be implemented, it is necessary to reflect seriously on existing politico-administrative structures, and research and development frameworks, as well as socio - organisational set-ups in the rural areas. Structural changes cannot be brought about overnight. There are, however, ample opportunities in countries of the Hindu Kush-Himalaya Region for creative initiatives. Reactivation of decentralisation is a case in point. Pradhan (1985) has rightly argued that in spite of limitations and constraints in Nepal, for instance, "the seriousness with which HMG/N [His Majesty's Government of Nepal] is implementing the decentralisation process gives some indication of HMG's commitment to rural development." The challenge is to make this political commitment instrumental in mobilising sectoral agencies who, as Pradhan says, "have not yet demonstrated a serious commitment." Similar arguments can be made for other countries in the Region.

At another level, there are indications that villagers, who are the primary beneficiaries of planning and implementation efforts, are experiencing so much pressure for survival that they are preparing themselves for major shifts in lifestyles. Frustrations and distrust notwithstanding, their capabilities can be strengthened for the transition. The task is by no means simple, but alternative approaches for action programmes are essential if the status quo is to be transformed.

One other contention of this paper is that the energy crisis in the mountains is not, as popularly believed, linked solely with the environmental problems caused by fuelwood shortage and deforestation. While this is undoubtedly an important dimension, it is also crucial to recognise that the "crisis" is intricately intertwined with the severe shortage of energy inputs that constrain such rural development activities as: (1) increasing agricultural productivity, (2) pumping drinking and irrigation water, (3) promoting small-scale industries for extra-farm income generation, and (4) introducing time-saving techniques to reduce present workloads and particularly those of women. Energy planning makes sense only if these broader concepts are considered and thus integrated with mountain development.

This paper is organised into the following parts :

- o Why Decentralised Energy Planning and Management?
- o Examples of Decentralised Efforts from Selected Countries
- o Towards a Framework
- o Questions for Reflection
- o Conclusions

Why Decentralised Energy Planning and Management?

The last ten years are remarkable for the progressive increase in realisation among national policy makers and planners, as well as international donor countries and agencies, that energy plays a critical role in rural development. It is now well known that production capability in rural areas is severely limited by shortage of energy input. In response to population increase, for example, agricultural production is correspondingly raised by extending cultivated area to the forest rather than by increasing the productivity per unit area through additional energy input. This phenomenon, compounded by the extraction of fuelwood and fodder from the forest area, has contributed largely to rapid deforestation, and hence, to the imbalance in natural resource systems. To avert pressure on natural resources and also to increase productivity, there has been near unanimity in the two-fold approach to rural energy planning and management, i.e., (1) to increase energy input into the rural systems, and (2) to establish a pattern of energy conservation without undue decrease in productivity (Bajracharya).

Despite this awareness, little enhancement in the rural quality of life has been achieved. What are the reasons for such a paradox?

Low Investment Priority. Part of the problem is that most energy assistance efforts have focused on production of energy for the modern sector and commercial energy use, ignoring the fact that most rural and many urban people, and especially the poorest, will continue to rely on forest - and farm - based fuels for the foreseeable future. As shown in Table 1, external support for energy development (which serves as a proxy for national investments in the developing countries) is mostly for electricity generation and fossil fuel development.

Although official development assistance from all sources for energy development in the developing countries rose from US$ 1.2 billion to US$ 4.0 billion between 1976 and 1980, the components that bear immediate relevance to rural areas are largely ignored. Moreover, 65 per cent of total investment in the forestry sector in 1979 (see Table 2) was

Table 1. External Support for Energy Development by Subsector, 1979-1982 Average (Per Cent)

	DAC ODA	Multilateral Concessional	Multilateral Nonconcessional	DAC Export Credits
Energy Planning and Technical Cooperation	14	-	2	-
Oil	8	6	14	27
Gas	2	7	6	2
Coal	9	22	8	3
Nuclear	-	-	-	17
Hydropower	28	12	30	11
Electricity Transmission	19	43	30	4
Fuelwood, Charcoal, Geothermal, Biogas, Solar	2	4	3	1
Other and Unallocated	17	6	6	31
TOTAL	100	100	100	100

Source : OECD 1984, Table 8, Quoted by Cecelski 1986, p. 34.

devoted to industrial processing plants that could potentially cause greater deforestation. Only 11 per cent was for any kind of afforestation and reforestation schemes, and 14.3 per cent was allocated to integrated development. The emphasis on large-scale, capital-intensive schemes is presumably due to the fact that they produce measurable outputs that are relatively easy to monitor and evaluate (Cecelski 1986). Whatever the reason, the consequence is neglect in promoting relevant projects for rural areas.

Table 2. Forestry - Related Projects : Ongoing and Proposed, 1979 (Thousands US$)

	Thousands US$	Per Cent
Industrial	1,581,892	64.4
Conservation	114,611	4.6
Education	88,046	3.5
Research	32,658	1.2
Afforestation and Reforestation	270,687	11.0
Integrated Development	351,022	14.3
Technical Assistance	24,074	1.0
TOTAL	2,454,915	100.0

Source : Christopherson *et al* 1982. Quoted by Cecelski 1986, p. 35.

While little enough investment goes to the rural areas, the mountain region receives only a small share of this. The level of rural electrification and the number of pumpsets installed in the Indian states bordering the Himalaya (Table 3) may be used as indicators (Kumar). Compared to the Indian average of 64 per cent of villages electrified, the percentage in most of these states (with the exception of Himachal Pradesh and Jammu and Kashmir) is well below average. In Assam, Uttar Pradesh, and West Bengal, the relatively high figures become much smaller if the mountain villages are considered separately. Similarly, the number of electric pumpsets installed provides an even more glaring disparity. Compared to the Indian average of 52 per cent potential pumpsets installed, the percentage in the states along the Himalaya is insignificant. Both cases above indicate the smaller proportion of investment in the mountain region; other countries of the Region share similar situations.

Table 3. Electrified Villages and Number of Pumpsets in Indian States Bordering the Himalaya

States	Electrified Villages		Pumpsets Installed	
	Number	Per Cent of Total No. of Villages	Number	Per Cent of the Total Potential
Assam	11,805	53.7	2,736	1.4
Himachal Pradesh	14,594	86.3	2,324	23.2
Jammu and Kashmir	5,705	7.7	1,355	9.0
Manipur	602	30.9	39	0.4
Meghalaya	1,262	28.0	56	0.6
Nagaland	603	61.5	6	0.1
Sikkim	189	46.7	0	0.0
Tripura	1,865	39.5	944	9.4
Uttar Pradesh	63,064	56.4	507,998	21.1
West Bengal	19,201	50.4	39,492	7.9
All India	368,804	64.0	5,677,264	52.0

Source : Government of India, Planning Commission 1984, Quoted by Kumar.

Ineffective Diffusion. The villages in the mountain region are characterised by isolation from the mainstream market, inadequate infrastructural support systems, socioeconomic diversity, cultural heterogeneity, and agro-ecological variation. Although the principle of the problem is universal, the solutions require that location specificity be carefully taken into account. Unfortunately, the current paradigm of research, development, and extension within the scientific and research community, as well as extension service, assumes the applicability of uniform designs and approaches. A mass production mentality comparable to that of Western industrial economies pervades. Targets are set to disseminate specific products through uniform directives to inadequately trained extension agents. Very little emphasis is placed on the process of "fine tuning" in correspondence with local circumstances or on market surveys to suit users' preferences. Little or no flexibility is given to field officers and extension agents. The consequence is that technological successes are sporadic at best. In the absence of adequate assurance against failures, rates of rejection are high. Furthermore, lack of follow-up services results in high rates of abandonment after targets are met. The overall impact on the rural quality of life is, therefore, less than desirable.

Whose Responsibility? A third problem relates to the question of jurisdiction. Whose responsibility is it to look into rural energy? The subject has multiple facets. Seen from the conventional sense, parts of it fall into such sectors as agriculture, irrigation, forestry, power, and cottage industries. The irony is that when rural energy is fragmented, its significance and priority are lost in the midst of other activities within each of the sectors. With the exception of India, where the Department of Nonconventional Energy Sources was established in 1983, no other country in the Region has a single agency to advocate and implement rural energy schemes in a coordinated and integrated manner.

Inadequate Data Base vs. Urgency of Action. Yet another complication arises from a double-edged problem: the absence of systematic data bases for purposes of planning and decision making on the one hand, and the urgency of immediate action programmes to avert the impending crisis of subsistence, on the other. Aggregates and average figures sometimes used in macromodels disguise the heterogeneity and diversity of the mountain areas. A few village studies exist but they are so dispersed and the methods used are so incomparable as to render them inadequate for deriving lessons on a wider basis. The present circumstances therefore warrant innovative and nonconventional approaches that combine action and research, and mutually reinforce each other in an interactive mode.

Opportunities in Decentralisation. Given the state of affairs indicated above, it is apparent that planning, implementation, and management of rural energy development in the mountain region has to be reassessed and redirected in fundamentally different ways if its recognised role is to be realised. In that pursuit, the principle of decentralisation holds promise to operationalise planning, implementation, and management more effectively and in a more relevant fashion. This concept is now gaining increasing acceptance in overall development schemes within the Region.

Although the concept is not new, the Planning Commission in India, for instance, has been promoting and giving additional impetus since 1982 to the establishment of decentralised planning bodies at the district level. Guidelines are provided in the Seventh Plan (1985 - 1990) to strengthen district planning machinery by establishing appropriate information systems, promoting training programmes, conducting pilot projects for technical guidance, and developing monitoring mechanisms (Kumar). In Nepal, the

Decentralisation Act, which was approved by the Rastriya Panchayat (national legislative body) in 1982, became operational in December 1984, and was adopted as a guiding principle in the Seventh Plan, 1985 - 1990 (Pradhan 1985). The *gewog* development scheme being pursued in Bhutan has similar principles (Bajracharya). Acceptance of decentralisation is also apparent in other countries of the Region. Such revival of interest reinforces the value of decentralisation ; legislative enactment, as in the case of Nepal, provides greater strength for furthering its goals.

The challenge now is to seize the opportunity to put decentralisation into practice for development planning in general and energy planning in particular. Many innovations are needed for coordinated implementation with reference to, for example, administrative and technical sanctions, release of funds, reappropriation procedures, and intersectoral transfer of funds. District plans will have to be dovetailed with state plans and sectoral plans. Participation of local beneficiaries and indigenous organisations will have to be ensured. Technological research and development will have to be oriented in relevant ways. Appropriate procedures for monitoring, review, and evaluation will have to be designed. All these components need to fit within the conceptual framework for decentralised energy planning and management. I will examine these aspects in greater detail. Before that, it will be useful to examine ongoing innovative efforts in three countries concerning decentralised dissemination of energy technologies.

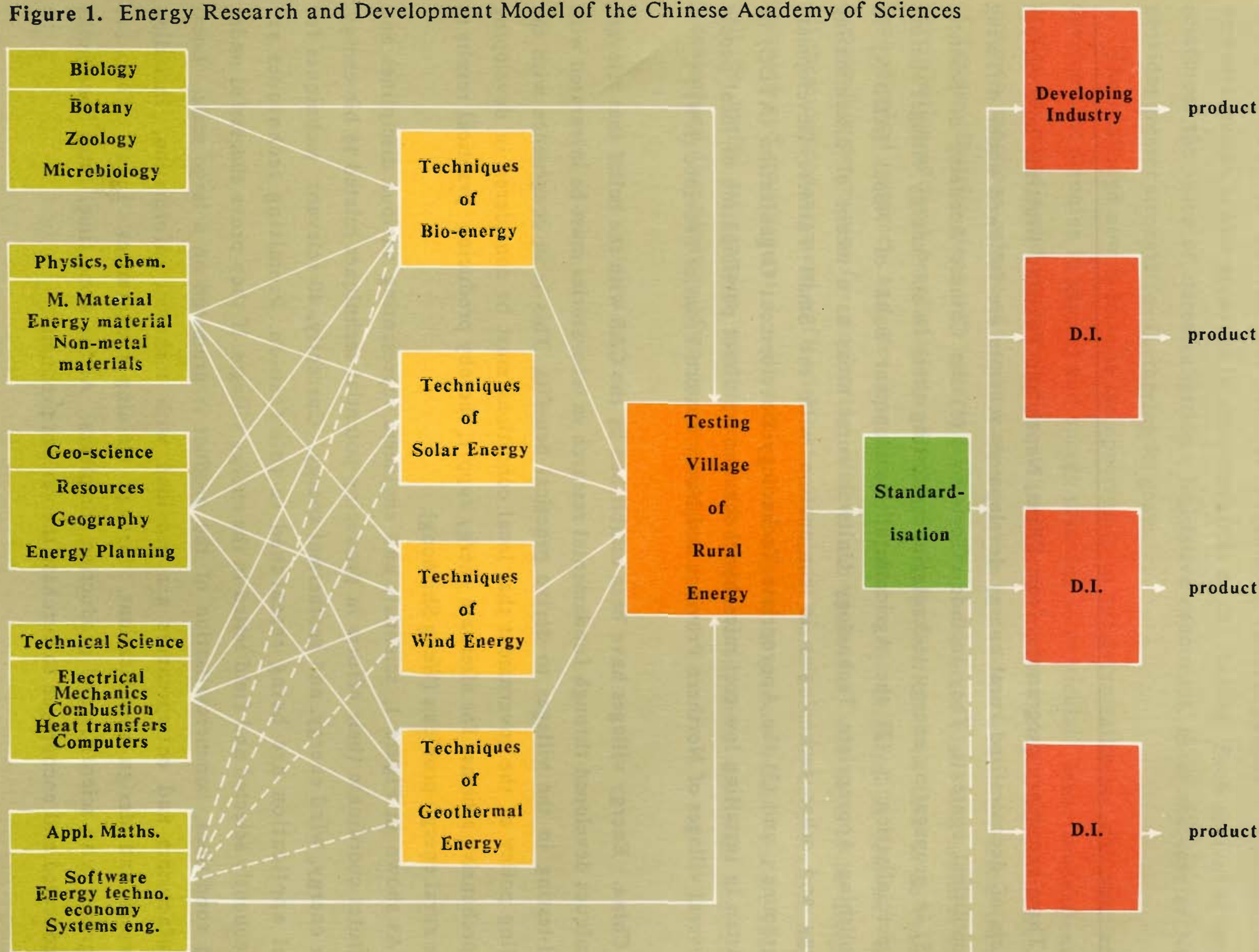
Examples of Decentralised Efforts from Selected Countries

Three exemplary programmes from China, Nepal, and Pakistan illustrate how various models of decentralised rural energy development schemes are followed under differing sociopolitical contexts. They include efforts by : (1) the Chinese Academy of Sciences (CAS) in propagating energy technologies by testing them in six "energy villages" before commercialisation ; (2) the Agricultural Development Bank of Nepal (ADB/N) in establishing Appropriate Technology Units in rural areas as a means of disseminating energy and other technologies in conjunction with the Small Farmers Development Programme ; and (3) the Appropriate Technology Development Organization (ATDO) of Pakistan in installing low-cost microhydel schemes by direct participation of local people in several villages of Northern Province and North Western Frontier Province (NWFP).

China. Energy villages have been established by the CAS with the belief that relevant techniques developed through fundamental research in laboratories must be integrated with field-testing in the villages to derive practical benefits. This is in congruence with the guiding policy of the government that local conditions must be considered in developing comprehensive schemes for alternate energy supply, thereby producing practical results to solve rural energy problems (Wang Shizhong).

As shown in Figure 1, scientists and engineers representing various disciplines and institutes coordinate their efforts in producing potential techniques related to bio-energy, solar energy, wind energy, and geothermal energy. Currently, 40 relevant techniques for rural application are being researched in this fashion. Promising techniques are subsequently selected and field tested in the energy villages. If they prove successful under field conditions, commercialisation of the product is promoted on a large scale. Local manufacturers and entrepreneurs are provided with technical information, including drawings and design specifications, through training programmes. Local efforts are integrated with scientific and production complexes. At the same time, rural households are educated and encouraged to purchase the various products.

Figure 1. Energy Research and Development Model of the Chinese Academy of Sciences



Source : Wang Shizhong

The six energy villages of different provinces of the country, include: Xin Fu, Shunde County, Guangdong Province; Nie Jia Zhuang, Luan Cheng County, Hebei Province; Shuang Quan Chun, Hai Lun County, Heilongjiang Province; Shuang Liu, Chengdu, Sichuan Province; Yi Li, Xinjiang Province; and Gu Zhen County, Anhui Province.

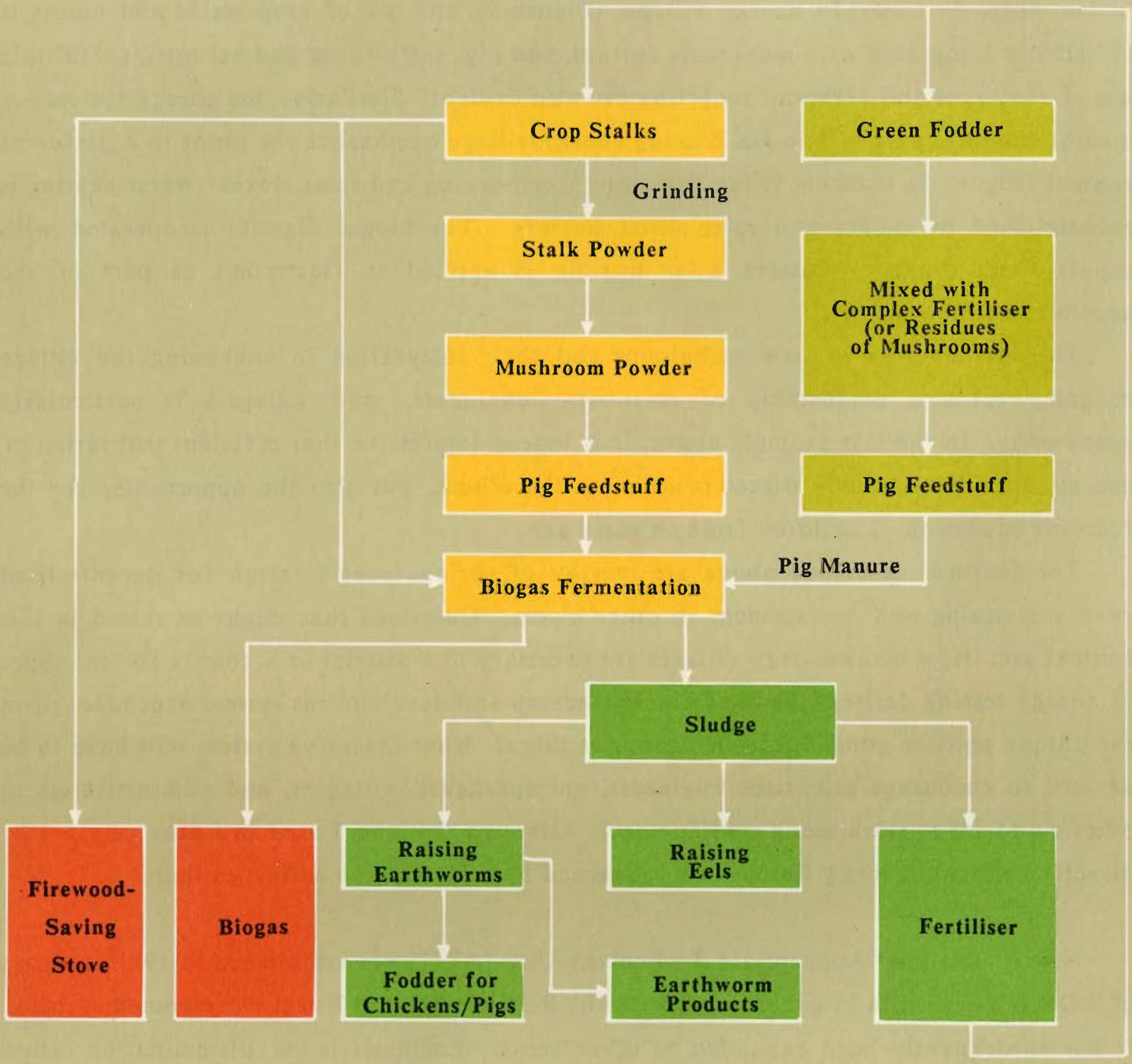
Comprehensive use of energy resources is the fundamental concept pursued in all the villages. Emphasis on specific combinations vary from one area to another: forest, wood gas, and biogas in Shuang Quan Chun; coal and wood gas in Yi Li; biogas and solar energy in Gu Zhen. In Chengdu energy village, (Figure 2), the use of crop stalks and biogas is efficiently integrated with mushroom culture, and pig, earthworm, and eel raising. Multiple use of resources and efficient recycling are also evident. Similarly, the energy system for a rural school as part of Nie Jia Zhuang energy village emphasises the point in a different context (Figure 3). Cooking is facilitated by wood-saving and solar stoves. Water heating is accomplished by biogas and solar water heaters. The biogas digester is operated with inputs from toilets. Passive solar heating is applied to classrooms as part of the architectural design.

The introduction of new techniques and their integration in enhancing the village economy through partnership of scientists, engineers, and villagers is particularly noteworthy. In the last example above, it is indeed impressive that efficient utilisation of energy provides not only direct benefits to the school, but also the opportunity for the relevant education of children from an early age.

The features described above are worthy of serious consideration for decentralised energy planning and management in other places. Questions that might be raised in this context are: How many energy villages are necessary in a district or a county for the types of energy testing desired? Is the Chinese research and development system dependent upon the unique politico-administrative structures there? What incentive system will have to be devised to encourage scientists, engineers, entrepreneurs, villagers, and administrators in other countries to work along similar lines? Although the model used in China may not be directly applicable, many lessons can be learned by reflecting on activities there.

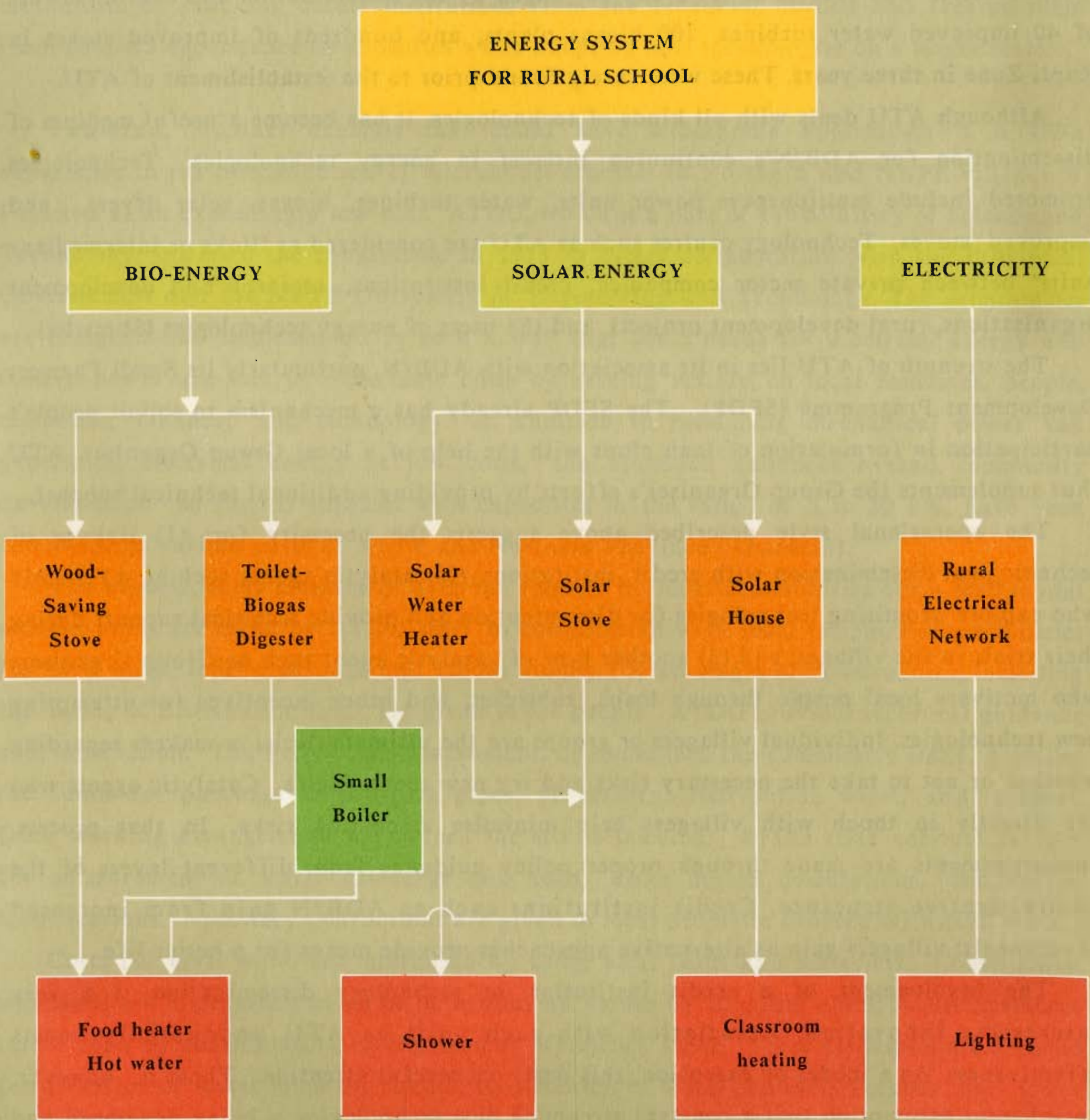
Nepal. The first Appropriate Technology Unit (ATU) was established in 1981 as a part of ADB/N's activities in conjunction with the Rapti Integrated Rural Development Project. It has subsequently been expanded to other areas. Emphasis is on dissemination rather than development of appropriate technologies (ADB/N 1985). New products and/or designs are sought and field-tested in the service area. Samples are given to farmers for trial under local conditions. The results are then closely monitored to determine their usefulness, reliability, economic viability, and most importantly, acceptance by the farmer. During the test period, ATU pays for part or all of the costs in order to get a new product into the

Figure 2. Energy and Ecological Cycle in Chengdu Energy Village



Source : Wang Shizhong

Figure 3. Energy System in a Rural School of Nie Jia Zhuang Energy Village



Source : Wang Shizhong

field quickly and to cover the farmer's expenses, in case of failures. After it is proven, ATU arranges to supply and distribute the product with little or no financial subsidy.

Where relatively large investments (by the farmer's standards) are required, ADB/N arranges loans for acquisition of the product. As interest and demand grow, ATU assists in training local businesses and craftsmen to manufacture the devices. This generates new sources of income and a reliable supply of desired appropriate technologies for purchase by local farmers. The success of ATU can be judged by the dissemination and continuous use of 40 improved water turbines, 100 biogas plants, and hundreds of improved stoves in Rapti Zone in three years. These were rarely found prior to the establishment of ATU.

Although ATU deals with all kinds of technologies, it has become a useful medium of dissemination for ADB/N's continuing interest in energy technologies. Technologies promoted include multipurpose power units, water turbines, biogas, solar dryers, and improved stoves. Technology centres such as ATU are considered as "links or intermediary units" between private sector companies, credit institutions, research and development organisations, rural development projects, and the users of energy technologies (Shrestha).

The strength of ATU lies in its association with ADB/N, particularly its Small Farmers Development Programme (SFDP). The SFDP already has a mechanism to solicit people's participation in formulation of loan plans with the help of a local Group Organiser. ATU thus supplements the Group Organiser's efforts by providing additional technical support.

The operational style described above suggests the necessity for: (1) linkage of technological dissemination with credit institutions; (2) catalytic agents such as ATU staff who explore promising technologies for dissemination and provide technical support during their trials in the villages; and (3) another type of catalytic agent such as Group Organisers who motivate local people through loans, subsidies, and other incentives for attempting new technologies. Individual villagers or groups are the ultimate decision makers regarding whether or not to take the necessary risks and try new technologies. Catalytic agents who are directly in touch with villagers help minimise associated risks. In that process, encouragements are made through proper policy guidance from different layers of the administrative structure. Credit institutions such as ADB/N gain from increased investments; villagers gain as alternative approaches provide means for a better life.

The involvement of a credit institution in technology dissemination is a very interesting innovation. Association with such units as ATU undoubtedly boosts effectiveness. As a model of extension, this deserves careful attention. There is, however, an inherent assumption that a constant stream of new technologies is being developed and that these are ready to be disseminated with slight modifications. How the feedback from field experiences is introduced for further improvements or new developments is not clear. It is a drawback that there is an absence of association with an integrated research and development system as in the case of the Chinese Academy of Sciences, where field experiences, fundamental research, and private efforts are closely interlinked.

Two other questions are also pertinent. One is related to the relevance of the present scheme to the needs of the very poor. What is the assurance that these needs are reflected in the choice of technologies for dissemination? The second question concerns the role of subsidy. If subsidies are used as incentives in testing new technologies, what is the mechanism of relieving credit institutions from the financial burden and freeing them from people's dependence on subsidies while adopting new technologies on a larger scale?

Pakistan. Another example that could have widespread application is ATDO's experience in the dissemination of microhydel schemes in Northern and NWFP villages of Pakistan at an exceedingly low cost. ATDO, which is a part of the Ministry of Science and Technology, initiated the programme in 1975 in direct collaboration with the Provincial Governments and the NWFP University of Engineering and Technology. The programmes are designed and implemented in such a way that basic needs for electrical energy and motive power are met at reasonable costs by relying mainly on local resources, people, materials, finance, and technology. In addition to producing mechanical power and generating electrical energy at low costs, the approach enhances overall community development. So far, 57 schemes with capacities in the range of 5 to 30 kW, have been completed in various parts of NWFP and Northern Province (Abdullah).

The process starts essentially with the request by local communities for a microhydel scheme. Plans are made by ATDO staff in consultation with local people. Responsibilities for civil work, local materials, and labour supply for all stages of construction, including the laying of distribution lines, are given to the people. ATDO provides technical guidance and supervision. The Provincial Government, or sometimes the community itself, provides the funds for purchase of penstock pipes, generators, distribution wires, and turbines. Once working arrangements are agreed the site is selected. ATDO staff conduct surveys for measurement of water discharge and head, make design calculations, and define specifications. Necessary instructions are given to local people to proceed with civil work.

Costs for civil work are minimised by using local skills and materials. Construction standards are maintained in terms of utilitarian values by studying specific circumstances rather than by consideration of engineering efficiency alone. These principles are adopted for diversion of water from the stream; construction of water channels, forebay, and power house; selection of penstock pipes and generators; design and fabrication of turbines; and installation of distribution lines. On this basis, total cost in 1984 for installation of a 20 kW scheme was about PRs 65,000 (US$1 = PRs 15.00). The distribution lines cost an additional PRs 60,000. The unit cost per kW of power generated (excluding the transmission) is thus

PRs 3,250. When transmission costs are included, the unit cost per kW delivered is PRs 6,250. This figure is very low compared to the usual cost range of US$1000 to 3000 per kW (1980) for microhydel schemes.

Operation and maintenance are usually organised by a villager associated with all stages of the work. On-the-job training is provided by ATDO staff. For the maintenance of the power channel, a village group is sometimes called upon. Community residents decide who is entitled to receive electricity. Tariff rates are determined by the community and are charged on the basis of the type of bulb used, rather than by using the meter.

Motive power of the turbine shaft is used in some instances to operate small machines during the daytime (e.g. grain grinders, rice hullers, cotton ginners, electric saws, lathes, and grinders). The generator, in this case, is started only during the night.

Many innovations are evident here. One that is particularly noteworthy is the collaboration among ATDO, Provincial Government, NWFP University of Engineering and Technology, and local community members towards a common cause. Such collaboration yielded significantly low-cost designs and comprehensive work plans that meet the requirements of the village communities in question. To be sure, the quality of the schemes is not comparable to scaled-down versions of large hydel schemes. But, does the sacrifice in quality matter as long as the beneficiaries have a scheme that provides desired services at an affordable cost? This illustrates a new approach to technological design and implementation at the village level, through interactions and shared responsibilities among technologists, administrators, and beneficiaries.

Several questions come to mind. What are the limitations of the system described above? Can the same approach be applied if the capacity is greater than 30 kW? What are the possible technological, organisational, and coordination constraints if the scale is increased? The rate at which installation in the area has taken place is 57 schemes in about ten years (i.e. an average of five to six schemes per year). Can this rate be increased? Are the constraints related to demand from the people, manpower, and technological limitations for extension, or funding problems? There are also questions concerning operation and maintenance. Are all 57 schemes working satisfactorily? What happens when parts are broken or need repair? Is there a regular servicing facility? Another important dimension may also be brought in here. Can microhydel development be integrated with other energy schemes so as to align them with a comprehensive energy plan?

The examples from China, Nepal, and Pakistan cited above are mainly technology - focused. Can the lessons learned extended to the district level for energy planning? What should be the focus in district energy planning and how can it be effectively implemented? These queries constitute the subject for discussion in the next section.

Towards a Framework

The basic concept of an energy planning process is fairly straightforward. As shown in Figure 4, an energy plan consists of three components, namely, supply-demand management, financial planning, and impact analyses. These are derived from an analysis of the supply - demand balance based upon demand projections and economic growth scenarios on the one hand, and resource assessment and technology evaluation on the other.

A good data base is clearly a prerequisite for formulation of a good plan (Islam). The process is, however, incomplete until it is implemented and the objectives of planning are accomplished, as confirmed through monitoring and evaluation. How do we integrate these ideas in the decentralised energy planning and management (DEPM) scheme?

To start with, it is necessary to be clear that the principal objective of DEPM is to formulate and implement energy strategies in order to achieve development goals with particular reference to rural areas while at the same time recognising important rural-urban linkages. From this perspective, DEPM must be directed towards accomplishing the following objectives :

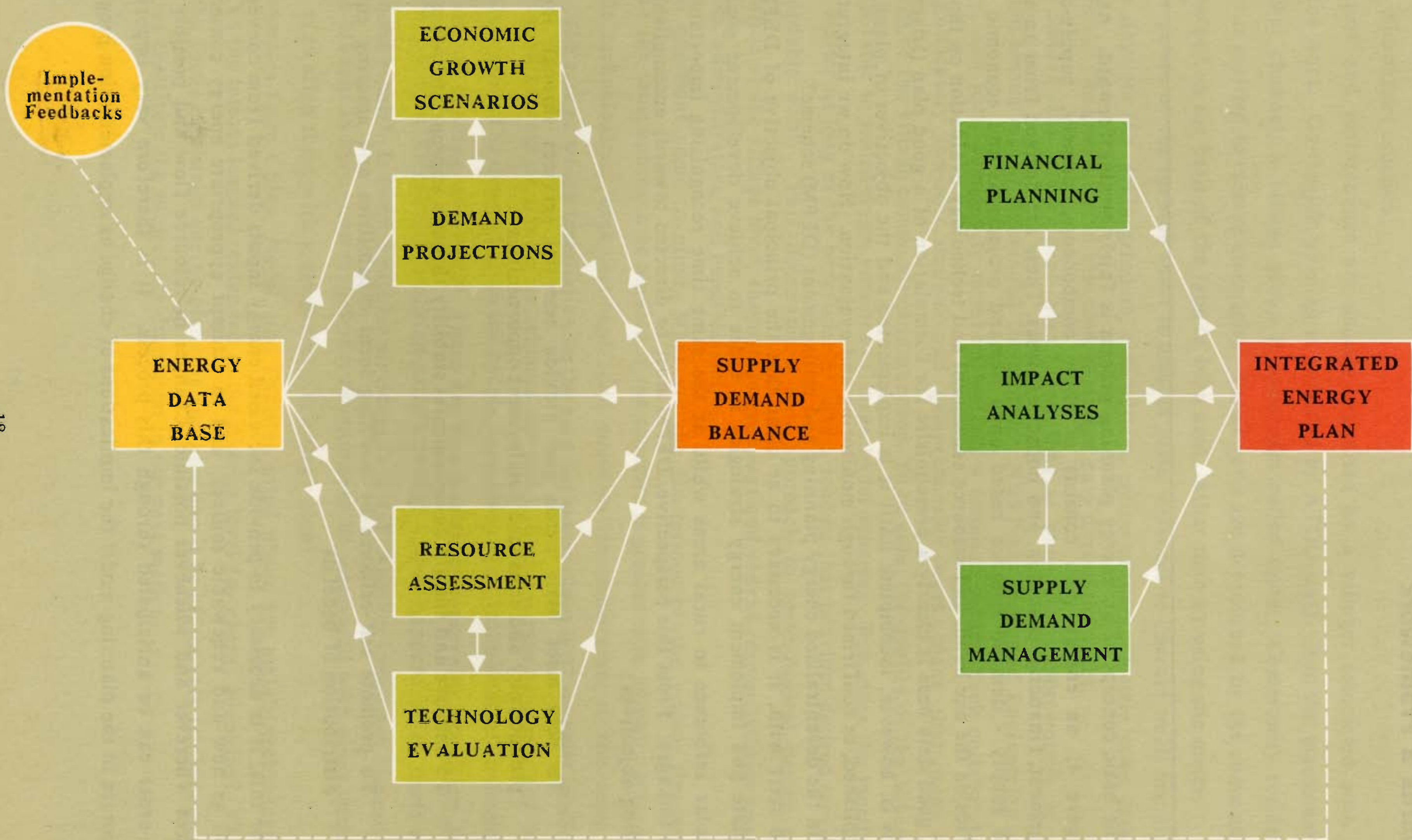
- To help meet basic needs and provide essential services through increased productivity and enhanced employment opportunities

- To improve and sustain environmental stability through appropriate measures

- To promote self-reliance by building local capabilities and assuring equitable distribution of benefits

For this, it is necessary to provide increased energy inputs derived from conventional as well as new and renewable sources, and to attempt appropriate energy conservation practices wherever and whenever possible. Changes in resource flow and possibly in the social order can be anticipated through this process. It is therefore very important to incorporate in the planning model the implications of change as implementation progresses.

Figure 4. Integrated Energy Planning Process



Source : Codoni, Park and Ramani 1985, Quoted by Islam.

CHARACTERISTICS OF THE MOUNTAIN REGION

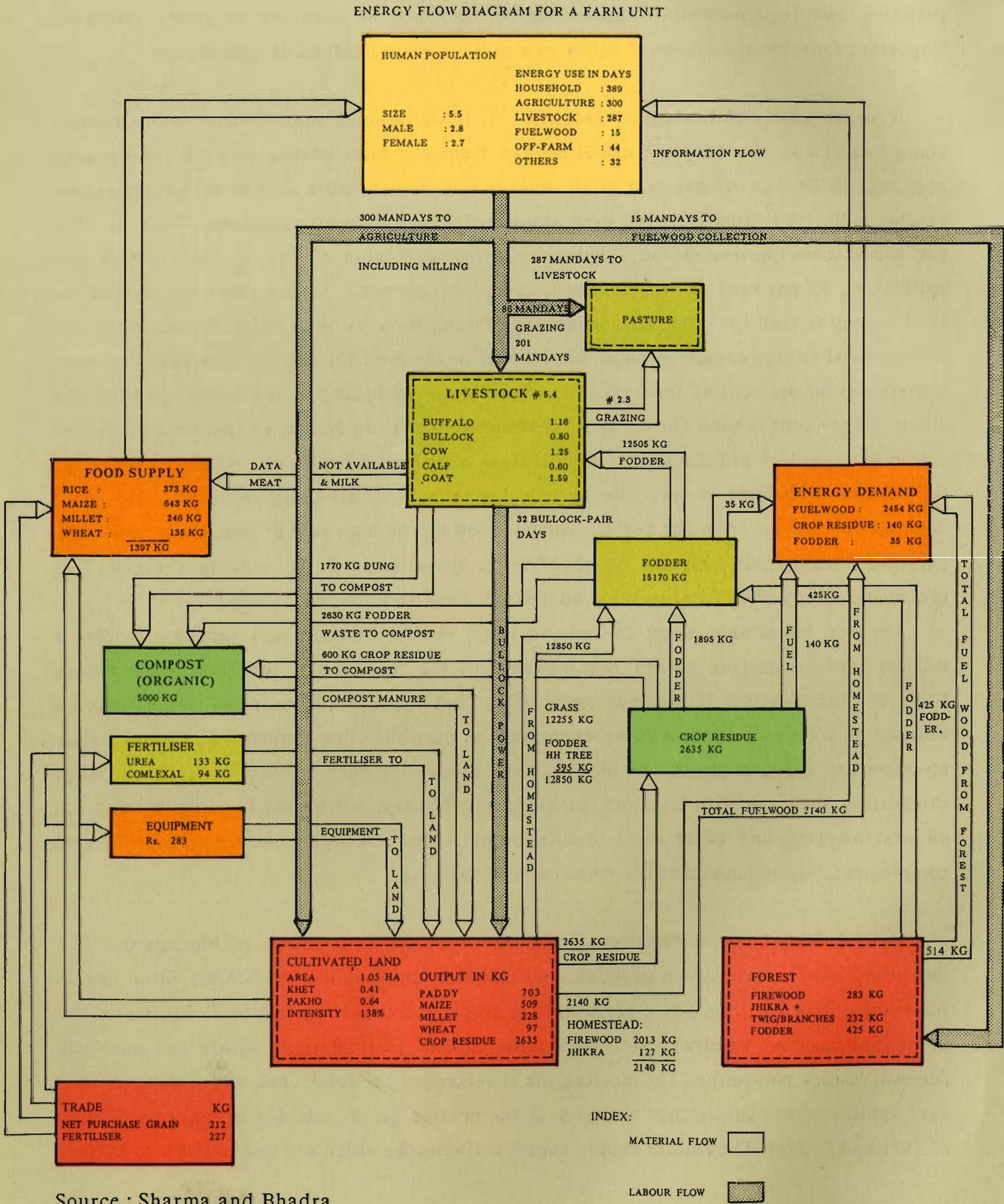
The characteristics of the mountain villages clearly have to be reflected in both planning and implementation approaches, if they are to have the necessary relevance. Important features are discussed below as a prelude to an analysis of approaches.

Biomass Base and Ecological Fragility. It is well-known that biomass is the primary energy source in the Hindu Kush-Himalaya Region. Most energy is used for domestic cooking. In Bhutan, 97 per cent of the energy requirement (0.78 tons of oil equivalent per capita) is derived from biomass, used almost solely for domestic purposes (Tsering). The per capita consumption in the Tibetan Autonomous Region of China is 0.7 tons of coal equivalent, 75 per cent of which is contributed by biomass. Eighty-three per cent of the total energy is used for domestic consumption (Wang Hai). In the Central Indian Himalaya, "almost total energy consumption of the villages depends on the forest resources. Fuelwood contributes 60 per cent of total energy in rural areas including plains districts, and of this about 85 per cent is used for cooking" (Pant and Singh). In Nepal, 93 per cent of the per capita consumption at 0.2 tons of oil equivalent is derived from biomass (Mahat). Although the consumption level is very low by world standards in all these countries, the heavy demand on biomass from the forest, compounded by the high rate of population growth, is exerting considerable pressure on the fragile ecosystems of the mountain region. A protective role is, therefore, strongly advocated (Pant and Singh).

Another important aspect to bear in mind is that biomass will continue to play a critical role in meeting energy requirements in the Region for the foreseeable future. From this perspective, it becomes essential to find appropriate means of using available biomass as efficiently and as comprehensively as possible. For example, in China, serious attempts are being made to use biomass as a source for fuel, as well as fertiliser, while integrating such use with livestock development, fishery, mushroom farming, raising eels and earthworms, and other rural production activities (Huang). The recognition of such complementarity is important for rural energy planning.

Multiple End Uses of Resources. Together with the significance of biomass use, it is important to recognise that a particular resource has multiple uses within the rural system. An energy flow diagram for a farm unit in Nepal (as shown in Figure 5) illustrates this point (Sharma and Bhadra). Here is a clear case of interrelations within the man-land-forest-livestock continuum, for meeting the requirements of food, fuel, and fodder. This is very typical of the subsistence economy in the mountains. Forest, for instance, is a source of fuel and fodder. The fodder supply supports livestock, which are essential for providing

Figure 5. Energy Flow in a Farm Unit in Nepal



Source : Sharma and Bhadra

draught power and compost for crop production. This in turn is crucial for supplying food for human use and fodder for animal use. Human contribution in this system is in terms of labour supply, for example, in crop production, livestock rearing, fuel collection, and post-harvest processing.

In other villages, it is possible to find evidence concerning additional linkages to employment opportunities. Although data from the mountain region is as yet unavailable, it is realistic to assume that the male as well as female labour force find employment both in primary and secondary activities within the forestry sector. A case study from Karnataka suggests that 5.9 per cent of the male and 4.0 per cent of the female labour force were engaged in primary forest sector activities in North Canara. More importantly, the secondary forest sector contributes to employment of 67.7 per cent of the work force (Nadkarni and Samuel 1985, quoted by Pachauri). The relevant question here concerns the fate of the labour force due to deforestation. Clearly the issue goes much beyond that of fuel scarcity alone.

The importance of human labour flow into different sectors has already been noted (e.g. in crop cultivation, post-harvest processing including milling, grazing, and fodder collection from forest). The tremendous labour intensity within the subsistence economy is evident if labour use in other activities (such as water collection, cooking, child rearing, and other occasional domestic activities) is also considered. It would be an understatement to say that most people in the mountains, especially women and the poorer section of the population, are overworked. The condition is worsened by inadequate nutrition among these groups. Such problems have serious implications for labour-saving devices and also for creation of employment opportunities (Pachauri).

The characteristic of multiple end use indicates, on one hand, the interdependency in the utilisation of resources for meeting basic requirements, and on the other hand, the competition for the same resources when physical limitation or scarcity is experienced. How is the household decision-making process affected when such competition is apparent? This is crucial for consideration in energy planning and implementation, particularly when additional interventions are being contemplated. A holistic outlook in energy interrelations is clearly essential.

Many examples show that such a holistic outlook is not yet pervasive. One case is the scant attention given to energy input-output interrelations of the ruminant animal population in the Nepal Himalaya. According to Panday, negative impacts of ruminant animals on the country's fragile environment are overemphasised; at the same time, their positive contributions to the economy in relation to the supply of dung and draught power are undervalued. Moreover, what is often ignored is the important dimension related to the impact on deforestation due to establishment of dairy industries. Although localised in nature, increased stress on the surrounding forests due to cheese and butter factories in high mountain areas has not received necessary attention from planners and policy makers.

The 25-year history of the Thodung Cheese Factory in Nepal shows, for instance, that cheese production capability there has increased from two to three metric tons in 1960 to 18 metric tons in 1985 (Panday). Fuelwood consumption has correspondingly increased from ten metric tons to 58 metric tons annually. Whereas in 1960, deadwood was collected from the forest at a distance of 100 metres within five minutes' walking distance, the situation in 1985 was that live trees were felled for fuel at a distance of 600 metres. The fuelwood is being used at a ridiculously low price of Rs. 0.05 per kg.

Subsistence Living Conditions. A special strategy in energy planning is required to address the fact that people living in the mountains survive on a minimum subsistence base with almost total reliance on traditional systems. Various forms of barter system still exist with minimal commercial economy; usually, there is little contact with the outside world.

The *jhum* (shifting) agricultural system, practised extensively in the northeastern Indian Himalaya provides a good example (Ramakrishnan). Because of the high accumulation of biomass in relation to actual economic yield, a ten-year *jhum* cycle is proven to be self-sustaining and highly efficient. Furthermore, the system meets diverse needs of the tribal farmer, namely, cereals, vegetables, tubers, and even fibres. Multiple cropping is also practised as an insurance against crop failure due to uncontrollable factors.

Traditional systems of this kind are, however, under tremendous pressure. Population increase and dispersion have, for example, been instrumental in reducing *jhum* cycles to four or five years. The ecological balance is consequently distorted. Serious and urgent attempts are needed to bring appropriate transformation, such as economic diversification, perhaps by promotion of horticulture and plantation crops, intensification of animal husbandry practices, and improvement of agroforestry systems. For these purposes, Ramakrishnan recommends public intervention schemes in which government agencies act as catalysts and local people participate in design and implementation.

Other important dimensions are the existence of noncommercialised economies and hesitation on the part of local people in taking risks. Village economic activities can, to a large extent, be explained by the underdevelopment of markets in small isolated communities in which the gains from the division of labour based on the market are severely limited. The village community governs these activities by coordinating the use of scarce resources through customary rules and institutions. Decentralised planning and management at the village or community level can play a great role in strengthening these rural institutions and making them more productive. Conviction and internal capability will have to be built within the communities.

Heterogeneity. Whereas the general principles of rural energy problems are similar, it is necessary to recognise that heterogeneity exists in the mountain region. Altitudinal and climatic differences, for example, have obvious influence on agricultural and ecological patterns. Whereas rice production predominates at lower elevations, the higher elevations are characterised by production of maize, millet, and potatoes. Similarly, *Shorea robusta* and other tropical species are prevalent in the lower reaches; subtropical species such as *Schima wallichii*, and *Castanopsis spp* are dominant at higher elevations; and others like *Quercus*, *Rhododendron* and *Pinus* become more prevalent at still higher altitudes.

Economic patterns surrounding pastoral and transhumance activities are important at high elevations, but sedentary agriculture constitutes the base of economic activities at lower elevations. These conditions are further influenced by heterogeneity in human settlement patterns, indigenous institutions, organisational behaviours, and other socio-cultural patterns. The flexibility required in energy planning to respond effectively to all these diversities cannot be overemphasised.

ELEMENTS OF AN APPROACH

Given the objectives and characteristics described above, the principles involved in the decentralised energy planning process may be summarised as follows:

- Energy planning has to be consistent with both mountain development and national development objectives.

- Intersectoral relationships of the resource base, in general, and the biomass base, in particular, have to be recognised. This requires a holistic outlook and multisectoral integration in plan formulation, as well as implementation of action programmes.

- Transformation of subsistence living conditions is essential, but the process must include the principle of partnership between the beneficiaries and outside resource people.

- Considering the agro-ecological variation, sociocultural heterogeneity, and economic diversity, there cannot be a uniform master plan. Rather, the approach should be to maintain a great deal of flexibility within a framework of appropriate principles and guidelines.

- o The urgency of problems within the mountain region suggests that the planning process cannot wait for a good data base. Action programmes have to start as soon as possible and a systematic data base can be developed as part of the process.

Within this general framework, essential components of an approach can be identified.

Planning Unit. A " district " is considered here as the basic planning unit. The district connotes the smallest politico-administrative boundary that has the presence of elected representatives from several smaller political divisions, as well as officers from government line ministries, who are authorised to decide on policies and formulate programmes on behalf of the people and the administration. The actual size and nomenclature of such a unit varies from one country to another. The essential principle is to have a mechanism for integrating local people's priorities with those of the administrative machinery in as small a unit as practicable. It is understood that decisions on formulation and implementation of specific activities would also take place as appropriate at smaller units, such as villages or clusters of communities.

The advantage of the district is that it is small enough to encourage local participation in decision making, yet large enough to provide a mechanism of exchange (of goods and services) among villages and market centres and maintain effective liaison with national planning and policy making bodies. It is important to note that not all energy plans can be decentralised. Some large-scale energy projects will have to remain directly within the jurisdiction of national agencies (e.g. the Electricity Board, the Coal Board, and the Petroleum Corporation). What is required is the linkage of district energy plans with these national agencies so that supply-demand management reflects realities in the districts while preparing national plans for large-scale projects. This signifies the necessity to distinguish between different levels of planning and to devolve responsibilities as required.

Integration with Development Activities. Energy planning is not an independent exercise, but has to be linked with ongoing and planned development activities. It needs to be oriented towards removing energy constraints by providing more efficient ways of utilising energy, or, when necessary, by providing alternative sources of energy. The advantage in a separate emphasis on energy planning is complementarity in the use of energy in many sectors. For example, use of electricity from a hydropower plant can be integrated with replacement of diesel in milling and lift irrigation, and of kerosene in domestic lighting. At the same time, it can be used in promoting additional activities such as power looms, poultry raising, production of fertilisers, and other small-scale activities.

When integrated in this fashion, electricity generation becomes economically viable. However, the potential of electric use for multiple activities will not materialise unless necessary commitments and material support from all related sectors are forthcoming.

Three points are particularly noteworthy in this regard. The first is that lessons can be learned from the history of development activities at the district level. By applying these to energy planning, mistakes could be avoided. This can be done by careful perusal of all available documents on such activities and also through discussions with government officers and community people. Second, an assessment of energy end use patterns in development activities from all sectors would give a comprehensive view of energy constraints. Energy strategies can thus be formulated to overcome those constraints. Also, an assessment of energy resources by district could suggest favourable sources of inputs to be used in development activities. Consultation with concerned authorities would be required to examine whether additional plans could be made within the various sectors to absorb the extra energy. Related to the above two points, the third point concerns the mechanism of coordination. Those involved in decentralised energy planning will have to think at the outset about an acceptable approach to proper coordination both in generating additional energy supply and meeting projected demands.

Typologies. Even a unit as small as a district is characterised by diversity within the mountain region. In view of this, it is important for decentralised planning to establish a basis for formulating energy strategies in correspondence with the opportunities and constraints presented by different types of resource base. Typologies can, for example, be formulated using the following parameters :

- Physical characteristics, i.e., elevation, climatic conditions, soil characteristics, land use, water resources, etc.
- Agricultural patterns including types and intensity of crop cultivation, seasonal variations, and land holding and tenure practices
- State of the forest and patterns of its utilisation, both for meeting basic requirements and providing employment opportunities
- Patterns of livestock holding and contribution to the village economy
- Annual labour use patterns with special emphasis on peak and slack seasons

- Forms of local institutions and organisations including human settlement patterns, indigenous skills, and knowledge systems

- Types of economic activities such as the extent of subsistence, interaction with the market, levels of economic disparity

- Extent of infrastructural supports including access to government services (extension opportunities, credit schemes, etc.) as well as market and urban centres

- Experiences in recent innovative efforts including the propensity of the people to take risks, try new ideas, and mobilise local resources

The list above is neither exhaustive nor necessarily appropriate under all circumstances for the specific district being considered. There may also be data limitations that prevent the inclusion of all desired parameters. The important thing, however, is that an understanding of even broad classifications (though the finer, the better) is necessary to help identify various rural development priorities and the corresponding energy implications in relation to a variety of conditions within the district. A combination of several activities, as illustrated below, can be selected based upon resource availability and limitations, harmony with national priorities, and other factors.

- Intensification of crop cultivation through increased energy inputs such as pumping for irrigation and provision of fertilisers

- Encouragement of horticulture and agroforestry schemes for diversifying traditional agriculture

- Development schemes for utilisation of under-exploited resources such as hydropower and forest

- Promotion of alternatives for protection of critically degraded forests

- Introduction of labour-saving devices for domestic activities and promotion of income-generating activities

- Market development for large-scale dissemination of new technologies and alternate schemes

- Establishment of demonstration units and development of indigenous capability for their production and dissemination

Responses to specific typologies, if classified systematically, can provide opportunity for comparison with other districts. Lessons can thus be derived in a systematic manner for national policy formulation or plan extension and other relevant activities.

Multilevel Spatial Planning. Emphasis has been placed on the idea that decentralised efforts in the village and the district need to reflect national development priorities. A harmonious working relationship at different levels of the planning mechanism, from the village to the central planning body, is thus a prerequisite for achieving development goals. A multilevel spatial planning approach provides an opportunity for this process to take place. With particular reference to the administrative structure in India, Figure 6a furnishes an example of the potential extension structure and possible extension functions at different administrative levels (Kumar). Modified versions of a similar structure can be designed to suit particular conditions in other countries.

Experiments and innovations in rural energy are envisioned as taking place in the village through the participation of the farmers for their own benefit. Efforts in the village are directed towards bringing changes in the internal resource flows through the application of additional sources of energy. Such a change is deemed necessary for better access to basic needs, more employment opportunities, and equitable income distribution. Positive change in the existing social order is also anticipated during this process.

Different types of support services are provided, depending upon the mandate and capability of various personnel at the service centre, block, district, state, and national planning level. Various components of the iterative process are shown in Figure 6b.

A Process for Partnership. Rural energy planning and development presume external inputs for mobilising internal resources and capabilities. From this perspective, it is important that all involved parties interact with one another so as to make each feel like a winner in a positive-sum process. In the process, the principal parties are : (1) policy makers, planners, extension officers, agents, and others representing government and international donor agencies ; (2) scientists, technologists, and researchers representing the research and development community, including those from private voluntary organisations, as well as manufacturing and consulting firms ; and (3) residents of the village who are, in the final analysis, the primary beneficiaries. At present, these parties operate in disparate ways and their interactions are minimal. This accounts for many obstructions to effective diffusion. A fundamental concept in decentralised rural energy

Figure 6 (a). A Multilevel Spatial Approach for Rural Energy Planning and Development

PLANNING LEVEL	EXTENSION FUNCTION	EXTENSION STRUCTURE
NATIONAL	To develop policies, educational programmes, training programme materials, and publications in all languages	National rural energy extension agency
REGIONAL (STATES)	Expert group to advise and train according to regional characteristics and needs ; preparation of training and extension aids	Regional rural energy extension agency
DISTRICT	Relates extension to the needs of the district according to five year plans; monitoring and evaluation	District rural energy extension agent
BLOCK	Achieve annual plan target for rural energy extension, identify and service village leaders on rural energy ; monitoring and evaluation	Block energy extension assistant
SERVICE CENTRE	Establish rural energy service and extension centres, record keeping ; supervision of field activities ; research and extension supply of inputs	Energy services centres managed by voluntary agencies / panchayat
VILLAGE	Village experiments and innovations in rural energy	Farmers

Figure 6 (b). A Planning Process at the Village Level

COMPONENT	PLANNING PROCESS
Land use, demography, livestock, resource use, and capacity including energy potentials, policies, constraints, opportunities	Identification of components of village system
Change of resource use, labour use, income	Extrapolation for change and alternate scenarios
Time budgets, life cycle, benefit-cost, financial analysis, environmental impact	Impact assessment
	Organisational requirements
Short, middle, and long range physical plans, financing plans, cash flow	Action planning

Source : Kumar

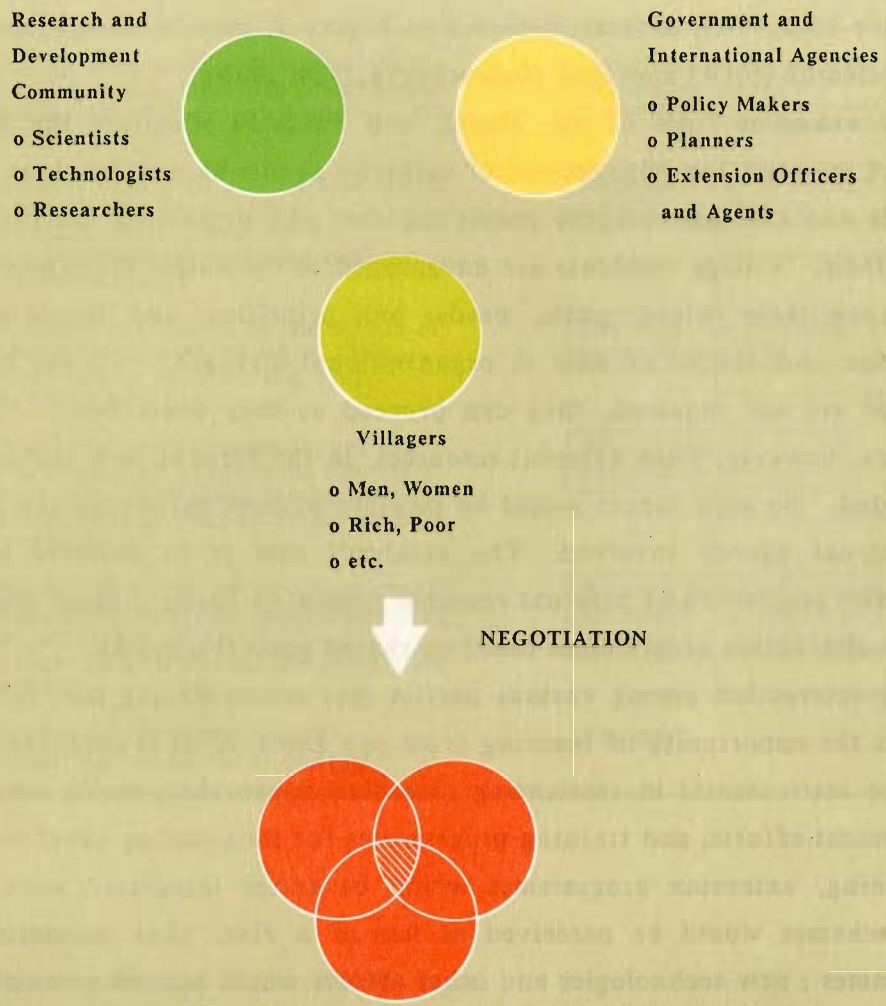
planning and development is therefore a transformation process in which the three parties **negotiate as partners** for a common goal. The action that follows is thus the consequence of this shared goal and the understanding of the parties' interdependence and their respective roles. This process, depicted in Figure 7, may be designated as a participatory action research (PAR) approach (Bajracharya 1984, 1985).

The examples from China, Nepal, and Pakistan illustrate the PAR process. The approach suggests the engagement of catalytic agents as matchmakers in bringing village residents and external resource people together and promoting the process of negotiation among them. Village residents are encouraged to formulate plans and action programmes based upon their values, goals, needs, and priorities, and their indigenous technical knowledge and skills, as well as organisational strength. To the extent that external resources are not required, they can proceed as they deem best. Negotiation becomes necessary, however, when external resources in the form of new technology and/or credit are needed. No such inputs would be possible without satisfying the process required by the external agency involved. The catalyst's role is to promote interaction between community residents and external resource people, to foster mutual understanding, and to help develop action programmes based on shared goals (Figure 8).

The interaction among various parties that ensues during the process of negotiation provides the opportunity of learning from one another. It is conceivable that the process could be instrumental in reorienting extension approaches, credit schemes, research and development efforts, and training programmes for long-lasting benefits. As a consequence of learning, extension programmes would be better integrated with people's priorities; credit schemes would be perceived as less of a risk, thus promoting new investment programmes ; new technologies and other efforts would become more acceptable to people; and research and development programmes would be oriented towards adaptive research based on specifications and designs from field experiences. The potential is enormous.

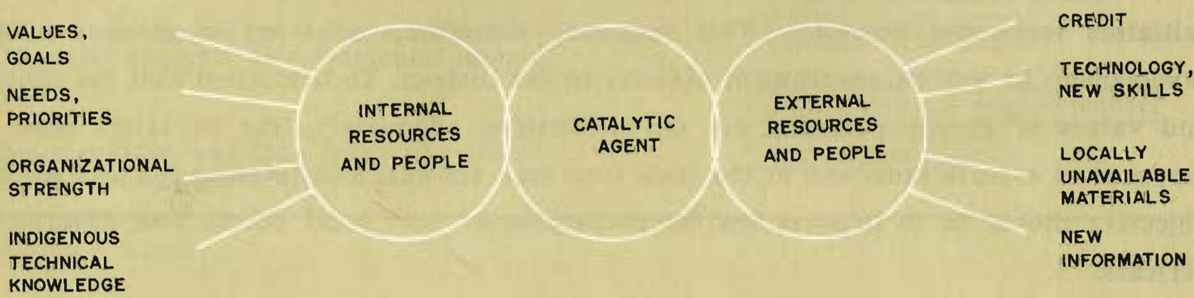
Increasing Local Capability and Building a Data Base. Decentralised energy planning and management must not be perceived as a project with a fixed timeframe for achieving limited goals. It must be developed as a self-sustaining process that will continue after the initiators leave the district. This requires, therefore, a strong emphasis on local involvement as well as government officers in the district. To thee xtent that the concept and values of energy planning are not understood adequately, the initiators must be prepared to explain them and at the same time seek assistance in refining the DEPM. The objective should be to improve the comprehension of both local people and government officers.

Figure 7. The Transformation Process



Source : Bajracharya

Figure 8. Role of the Catalytic Agent



Source : Bajracharya

As already mentioned, DEPM must be integrated with ongoing development programmes so that an action orientation prevails. For that, training programmes of various kinds would be necessary to mobilise local resources and increase local capability. Similarly, in support of action programmes, follow-up services including regular supervision visits, repair, and maintenance must be incorporated as part of the planning and management scheme.

All the elements described above include collection of data already available, and also generation of new data where gaps exist. An attempt is necessary to keep the data on a systematic basis for decision making, not only for the present but also the future. The data base should be in a form which facilitates rapid retrieval and encourages continuous supplements. Lack of a good data base is often mentioned as one of the main constraints in energy planning. Whereas limitations may be felt in this regard, a mechanism must exist to improve the quality and quantity of data as more experiences and new insights are gained. This must be a deliberate effort from initial stages of the DEPM exercise.

Questions for Reflection

Words of caution are appropriate when considering decentralised energy planning and management. Important questions are discussed below to indicate some of the constraints to be overcome. These are challenges that will have to be confronted with tact and innovative activities if decentralised energy planning and management are to achieve success.

Is There the Necessary Political Will? Despite the revival of interest in decentralisation within the Region, this question concerning political will for implementation remains unanswered. Enactment of the Decentralisation Act in Nepal, and administrative support for district planning mechanisms in India, are encouraging signs and important opportunities. Are these steps alone sufficient to ensure that those who have traditionally been in power will be willing to relinquish that power? Can decentralisation succeed while hierarchical structures remain intact within the current sociocultural systems, administrative establishments, and research and development frameworks? Why should the privileged rural elite allow the underprivileged to have a say? What is the possibility that the centralised administrative structure would devolve authority to district officers and extension agents? What are the incentives for researchers, scientists, and technologists to become people - oriented?

There cannot be any clear-cut answers to the above questions. The challenge is to take the opportunities available and try them out as much as possible. If, in due course, constraints can be identified on a case-by-case basis and possible strategies can be formulated by reflecting on how the constraints can be removed, these would be positive steps in the right direction. A fundamental reorientation in approach cannot take place unless all parties affected by the new strategies have something to gain. How can a positive-sum process evolve during the course of interactions? This is clearly an area in which action research can yield important results.

What Is So Important About the Role of Energy? The interpretation of energy's role in rural development is subject to much confusion. The concern for energy had its origin in the industrialised countries as a consequence of oil price increases in the 1970's and was later exported to developing countries in the context of the fuelwood crisis and deforestation. The concern therefore carries with it a certain enigma that conveys conservation of commercial energy and substitution by alternative forms of energy. The argument is that these concepts have limited significance in such areas as the Hindu Kush-Himalaya Region where a majority of the population is struggling for survival. Why should energy planning be given high priority when there are pressing problems in meeting such basic requirements as food, shelter, and employment?

The above question implies that if energy is to gain recognition, it is important to advocate its linkages with ongoing development activities. These linkages are not necessarily clearly understood by the villagers or the sectoral planners. The broader concept of energy as expressed in this paper has to be communicated satisfactorily if implementation of energy planning is to gain momentum.

A small but important point has to be noted here concerning inherent difficulties with the terms for energy in local languages. Words such as *shakti, urja, indhan,* and others presently being used to convey the meaning of energy are either too limiting, or unintelligible in everyday conversation. How can these terms be broadened to indicate linkages with rural development? Although this etymological problem may sound minor, there are associated repercussions which deserve serious attention.

From the administrative standpoint, the constraint is that current district development plans do not have a separate budget item for energy as in the case of conventionally recognised sectors such as agriculture, cottage industries, irrigation, drinking water, health, and education. District energy planning and management have, therefore, a hollow ring if seen from the sectoral planners' point of view. How can this be corrected? I have argued in this paper that energy links exist with almost all sectors. From a practical standpoint, can an innovative design be introduced to integrate the energy components in these sectors for strengthening ongoing sectoral efforts? This issue has to be resolved if decentralised energy planning and management are to gain validity.

Renewable or Nonrenewable Sources of Energy? Energy planning for rural areas tends to become preoccupied with renewable sources of energy. Nonrenewable sources are explicitly excluded because they are imported, and hence, a drain on the economy. To the extent that renewable sources are underutilised and can be economically exploited with the available knowhow for intended end uses, the emphasis is understandable. From the perspective of the mountain region, the attention given to development of small hydro -

power plants, water mills, afforestation, and improved stoves is largely appropriate. Total exclusion of nonrenewable sources on the strength of this argument alone is not justifiable. If, for example, they can be proven to be economically viable, if their importation is feasible on a sustained basis because of a large profit margin, and if they can be acquired readily without having to wait for a long time until renewable sources are developed, should the nonrenewable option be ignored? The issue deserves a more open-ended evaluation.

How Can Grass Roots Participation Be Effective? Decentralisation schemes are currently administered with the intent of devolving decision-making authority to the district, block, or county level for planning and policy making. Administrative convenience is evident since government officers are stationed here and elected representatives from different parts of the district, block, or county gather for meetings of various kinds. It is assumed that elected representatives will be able to express the needs and priorities of the people in their respective constituencies and that government officers will be able to respond to these needs and priorities in an efficient manner. Is this arrangement effective in transmitting the benefits of decentralised activities to small communities and in mobilising the participation of community residents?

Undoubtedly, the role of the district administrative centre is important for coordination with national policy making and planning agencies, for intervillage cooperation on various activities, and for technical support and supervision as required. It is also important to recognise that key actions have to take place in villages by fostering mutual cooperation among villagers. The success of decentralisation is dependent on how mobilisation can be effective for such action. What is the mechanism to ensure such mobilisation?

Conceptually, the multilevel spatial planning approach as explained in this paper provides the necessary framework for different types of action from the village level to that of national agencies. The difficulties that are likely to be faced in implementing the concept are dependent on the extent of commitment and flexibility among those who play the catalytic role in decentralisation. Various difficulties will crop up during the course of implementation. The point to bear in mind is that a monitoring and evaluation system has to be in operation to ensure flexibility to overcome obstructions and fulfill decentralisation objectives.

Conclusions

The severity of energy problems in the fragile mountain environment of the Hindu Kush-Himalaya suggests that drastic measures need be taken immediately. A major commitment on the part of all concerned is necessary to move beyond the present rhetoric. Sufficient realisation of the need to do " something " exists, but readiness to face the challenge of alternative approaches does not. The nominal attempts until now have not had significant impact in alleviating problems.

Decentralised energy planning and management have the potential of overcoming many of the constraints faced in the mountain region. The idea is geared towards addressing location-specific problems in the heterogeneous mountain environment and building local capacity to absorb new alternatives for increasing energy inputs, as well as adopting energy conservation practices. Furthermore, the scheme dovetails with the growing awareness in the Region that principles of decentralisation will have to be revitalised and implemented as part of development programmes. To the extent that the revival of interest in decentralisation within the Region provides opportunities, a serious and concerted effort by all those concerned would be worthwhile. Action is required now to confront the crisis. In spite of the limited nature of current technological knowhow and planning approaches, the question is whether the limited political will that exists today is sufficient to put the available technologies and planning approaches into practice. Refinement and further development are possible as lessons are learned from field experiences based on action and research.

In this connection, financial inputs have to be increased. Donors as well as government decision makers should be encouraged to divert their attention from preoccupation with conventional measures that favour commissioning large-scale projects. A new approach to monitoring and evaluation is necessary for making investment designs, if small-scale decentralised projects are to have a chance. Moreover, it is important to bear in mind that the mountain region has until now been so neglected that investment needs to go into a learning process before definitive and replicable plans and programmes are possible.

A combination of action and research that goes towards developing more refined plans and policies has to be promoted. Flexibility is a necessary ingredient in this process.

Another important aspect is the question of coordination. Establishment of a coordinating agency for energy planning and management is clearly a necessity. However, this is only part of the answer. An innovative approach is also necessary to promote a holistic outlook for assessing energy demands from various sectors in an integrated fashion, and to supply energy by careful analyses of conventional as well as new and renewable sources.

It has been emphasised that the principle of energy planning is to achieve development goals. Given the current thinking on integrated rural development programmes, decentralised energy planning and management fits in well. It is now important to provide incentives for encouraging government officers from related sectors in assessing present as well as projected demands, based on ongoing and planned development activities in their sectors. Academic institutions and private sector agencies must also be encouraged to participate, particularly in generating innovative ideas for supplying energy to meet the demands. The concept of partnership is clearly relevant. The beneficiaries (i.e. the district residents) must play a central role in that process, while making assessments of energy supply and demand.

Coordination must also exist, not only within the particular district, but at all levels of the administrative structure for policy making, planning, and implementation. Different roles and responsibilities can be distributed to people at various levels (e.g. the service centre, block, district, state, and national levels, as in the case of India). As suggested in the multilevel spatial planning approach described earlier, the distribution of responsibility can be mutually supportive. The tasks include, for example, establishment of rural energy demonstration units, supply of inputs, supervision of field activities, administering of training programmes, formulation of annual plan targets, monitoring and evaluation, and coordination with national plans and policies. A built-in mechanism must exist for continuous refinement of approaches through interaction among people at various levels.

Given the complexity of the subject, compounded by extremely limited experiences in the mountain region, a strong case can be made that decentralised energy planning and management should be tried out in a few selected districts of the Region. An emphasis on selected districts makes good sense because of the limited data base and the constraints on manpower availability. This would give the opportunity to test systematically many of the approaches advocated here, and to refine the associated methods. Based upon on-site experiences, mechanisms of extension can be suggested on more realistic grounds. The type of manpower and technical support required in the district, and the form of liaison with other levels of the administrative structure, as well as research and development institutions, can be better assessed from such experiences. Guidelines and training programmes can be developed in a more relevant fashion to support the expansion of the programme to other districts. Furthermore, an important dimension will be provided by the sharing of experiences among countries with different sociopolitical and biophysical conditions.

The emphasis on a few districts may appear to be an anomaly from the perspective that a quantum jump is needed to avert problems in the mountains. Yet, this attempt should be seen as a part of the continuing process for which long-term commitments are required. A quick-fix approach will not work. Systematic, deliberate, and sustained efforts, that may be gradual at first, are needed to face the enormous problems in the Hindu Kush-Himalaya Region. Careful consideration must be given to radical alternatives for diversifying the economy and creating employment and income-generating opportunities through additional inputs of energy.

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Founding of ICIMOD

The fundamental motivation for the founding of this first International Centre in the field of mountain area development was widespread recognition of the alarming environmental degradation of mountain habitats, and consequent increasing impoverishment of mountain communities. A coordinated and systematic effort on an international scale was deemed essential to design and implement more effective development responses to promote the sustained well-being of mountain communities.

The establishment of the Centre is based upon an agreement between His Majesty's Government of Nepal and the United Nations Educational, Scientific and Cultural Organisation (UNESCO) signed in 1981. The Centre was inaugurated by the Prime Minister of Nepal in December 1983, and began its professional activities in September 1984.

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- Bhutan
- Burma
- China
- India
- Nepal
- Pakistan

Director : Dr. K. C. Rosser

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