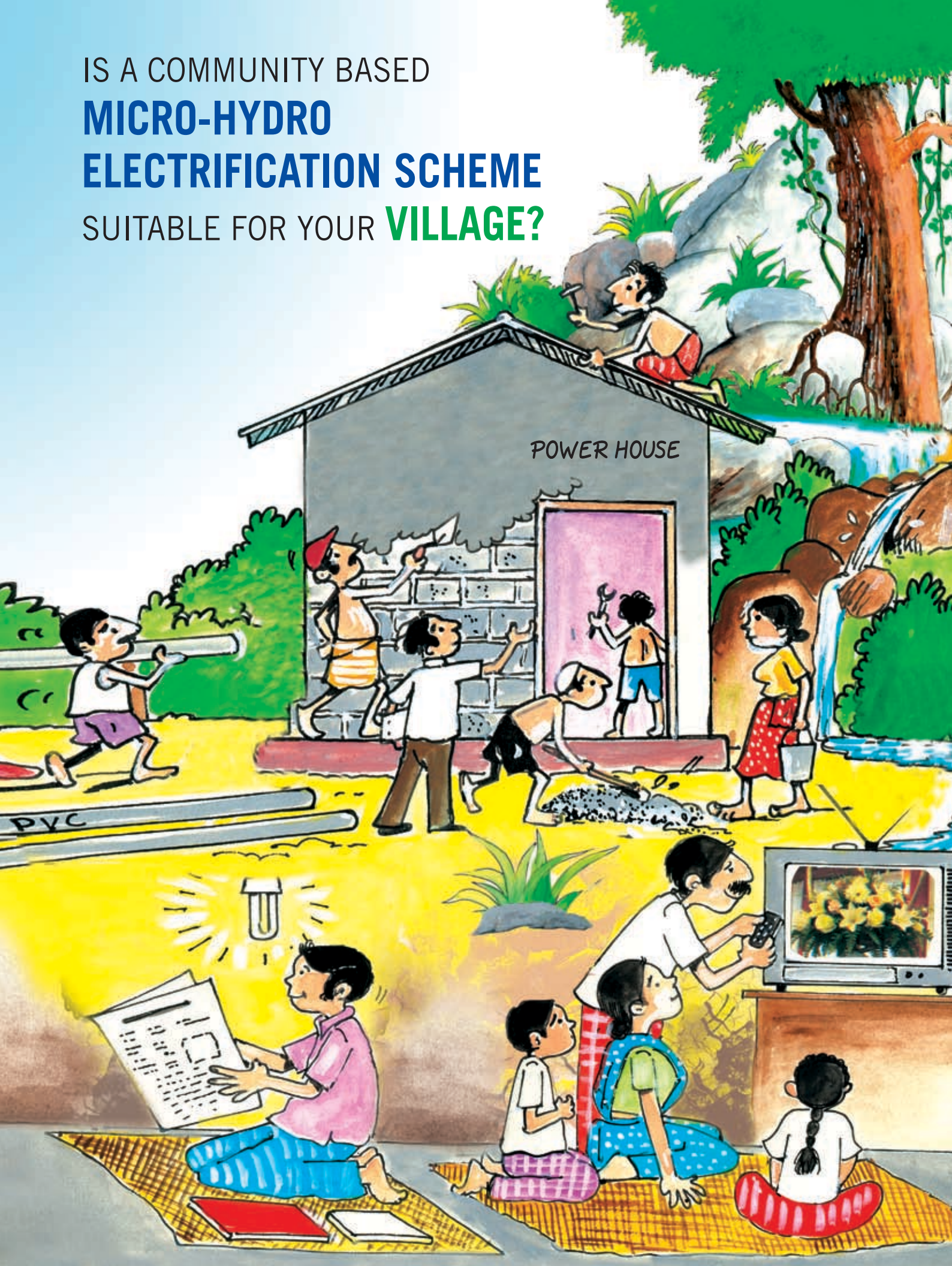
IS A COMMUNITY BASED

MICRO-HYDRO ELECTRIFICATION SCHEME

SUITABLE FOR YOUR **VILLAGE?**



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IS A COMMUNITY BASED MICRO-HYDRO ELECTRIFICATION SCHEME SUITABLE FOR YOUR VILLAGE?

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FOREWORD

The threats of global warming and climate change have drawn the world's attention to renewable sources of energy. Dwindling fossil resources, such as petroleum oils and coal, and the over dependence on imported fuels has prompted countries to look for internal resources to meet escalating energy demands. Micro-hydro is one of the technologies that use the locally available water resources to generate electricity.

Practical Action has promoted a number of renewable energy options over the last few decades, to help meet the energy needs of the poor, with micro-hydro being one of the earliest. Working on micro-hydro village electrification schemes over the last 25 years, community based renewable energy technology has proven to be an appropriate energy solution for remote rural villages which are not connected to the main electricity grid.

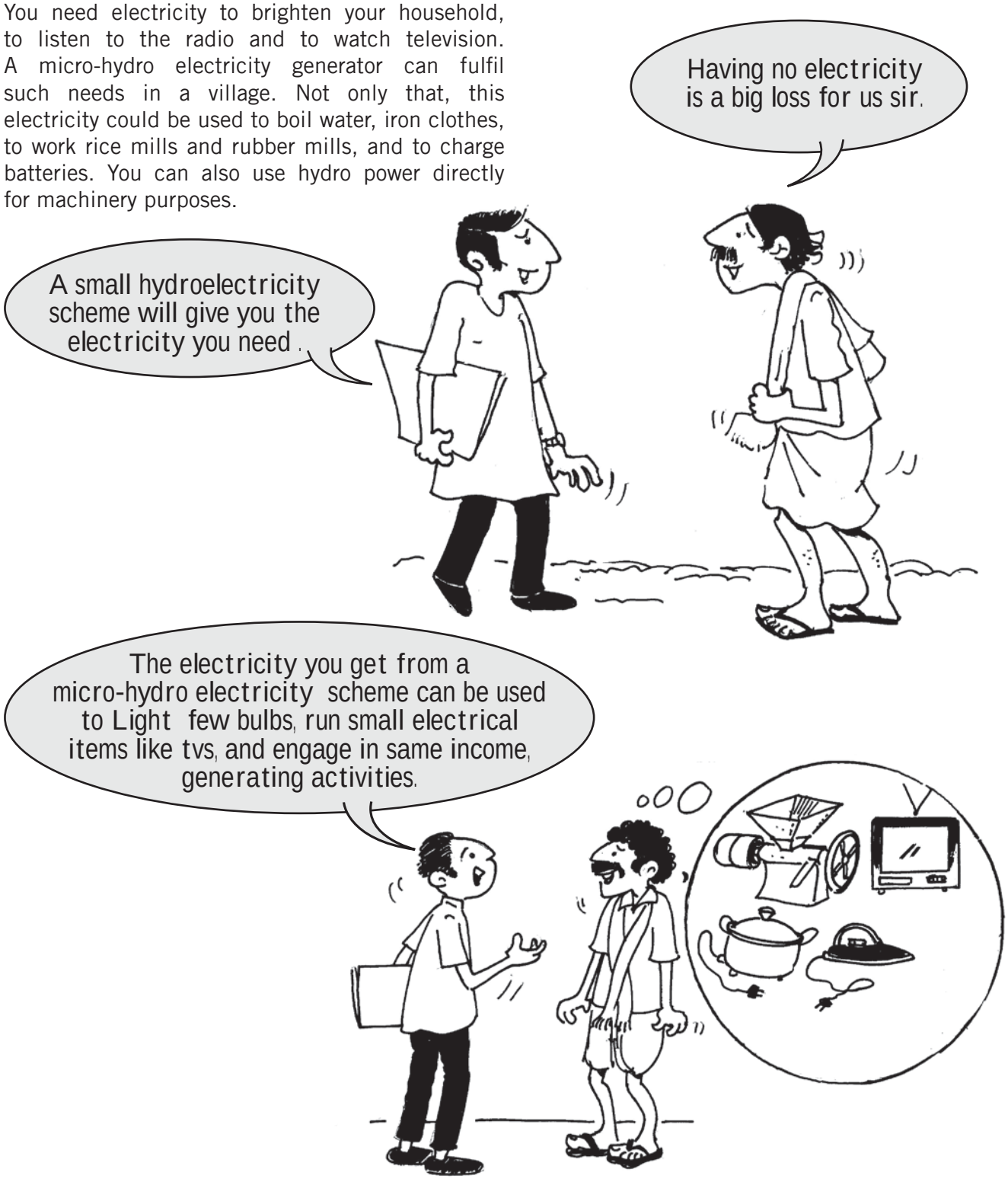
Community based micro-hydro village electrification schemes use the water of the streams that generally pass through the villages to generate power to meet the community's basic electricity needs. The communities are involved in these schemes from the very initial stages. Owned by the community, the micro-hydro electricity schemes are operated and maintained by the community.

However, without a basic knowledge it is hard for any person to assess whether a village could have a potential to generate electricity from a micro-hydro scheme to meet their electricity needs. Some fundamental aspects have to be considered and basic calculations have to be made. This booklet helps a lay person to understand and gain an idea as to whether their village has a potential to meet its own electricity needs through a community based micro-hydro village electrification scheme.

Your electricity

NEEDS

You need electricity to brighten your household, to listen to the radio and to watch television. A micro-hydro electricity generator can fulfil such needs in a village. Not only that, this electricity could be used to boil water, iron clothes, to work rice mills and rubber mills, and to charge batteries. You can also use hydro power directly for machinery purposes.



Though small, a hydroelectricity generator would be quite expensive. It has to be properly maintained. If a hydroelectricity generator is provided to your village and if it does not provide its service properly, it would be a waste of money, time and effort.

People can start a project of this kind at their own cost, or with some external assistance. Though these micro-hydro power projects are suitable for some villages, for some the solution to the electricity problem would not be the same.

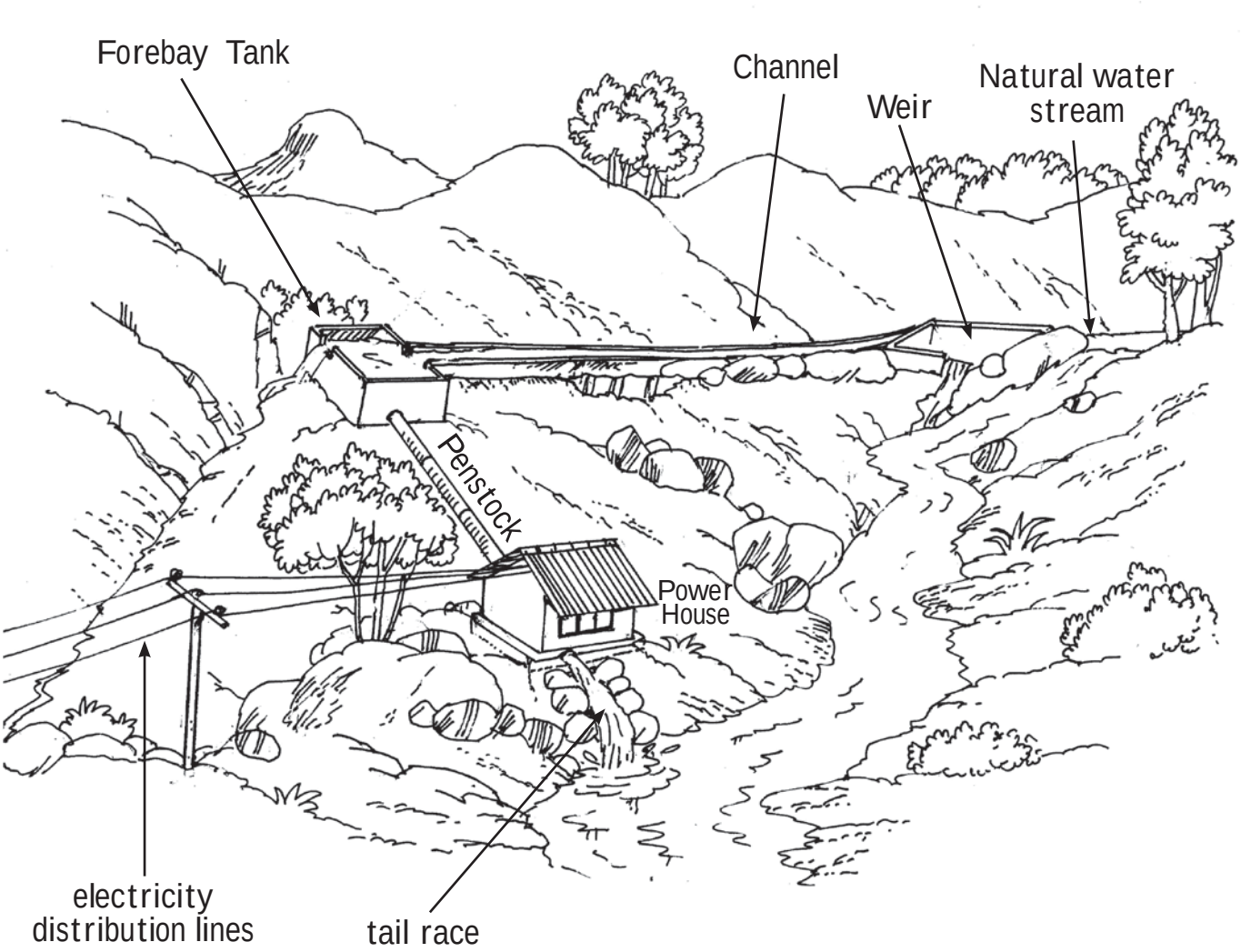
This booklet has been produced to help you to recognise that difference. It tells you how you could build a suitable hydroelectricity project for your village, the ways you could take part in this at village level, and the help you could receive in order to do this.

You could receive further information on the technology and community based approaches used from the booklet "Community Based Micro-Hydro Village Electrification Schemes – Technology & Approach" published by Practical Action.

WHAT is a micro-hydro village electrification scheme?

Hydroelectricity is the generation of power using the energy of falling or flowing water. There are many such systems around the world providing electricity to communities. The power generated will vary depending on the available energy in the source (stream) and, therefore, the number of houses electrified will also vary. Generating 5 kW to 50 kW is enough to satisfy the total electrical demand of a general village. Such a system can be run as a stand-alone mini grid and is called "VILLAGE MICRO-HYDRO ELECTRICITY SYSTEM". These systems have practically no negative effects on the environment unlike the traditional power sources such as fossil fuel.

The diagram below details the basic structure of a small scale (micro) hydro scheme.



Water from the river is channelled through a settling basin, which helps to remove sediments that could harm the turbine. The water then flows into the forebay tank where it is directed downhill through a pipe called a penstock. When the water reaches the bottom, it drives a specially designed turbine to produce the electricity. (Source:'Micro-hydro power: the basics', Practical Action, available at http://practicalaction.org/?id=micro_hydro_faq)

A PARTNERSHIP

Take the example of a few people collectively buying a tractor for field work. Besides sharing it for your work, maintaining it is also necessary. Sometimes you'll have to train a villager for this and you'll have to pay him for his labour and time. Money would be necessary to buy spare parts, fuel and for repairs. Therefore, it is important that you should have a good understanding about use, maintenance and finance in such partnerships.

The electricity generated in a village (through the community based village hydro power project) would be like a tractor of joint use. Big or small, a lot of knowledge and skill is required to handle and maintain an electricity generator. Besides money for the initial cost of buying an electricity generator, money to purchase other components also needs to be found. Building a fund by collecting small amounts of money from the villagers would be the first step. Obtaining a loan from the bank may also be necessary.

ELECTRICITY

Consumer Society

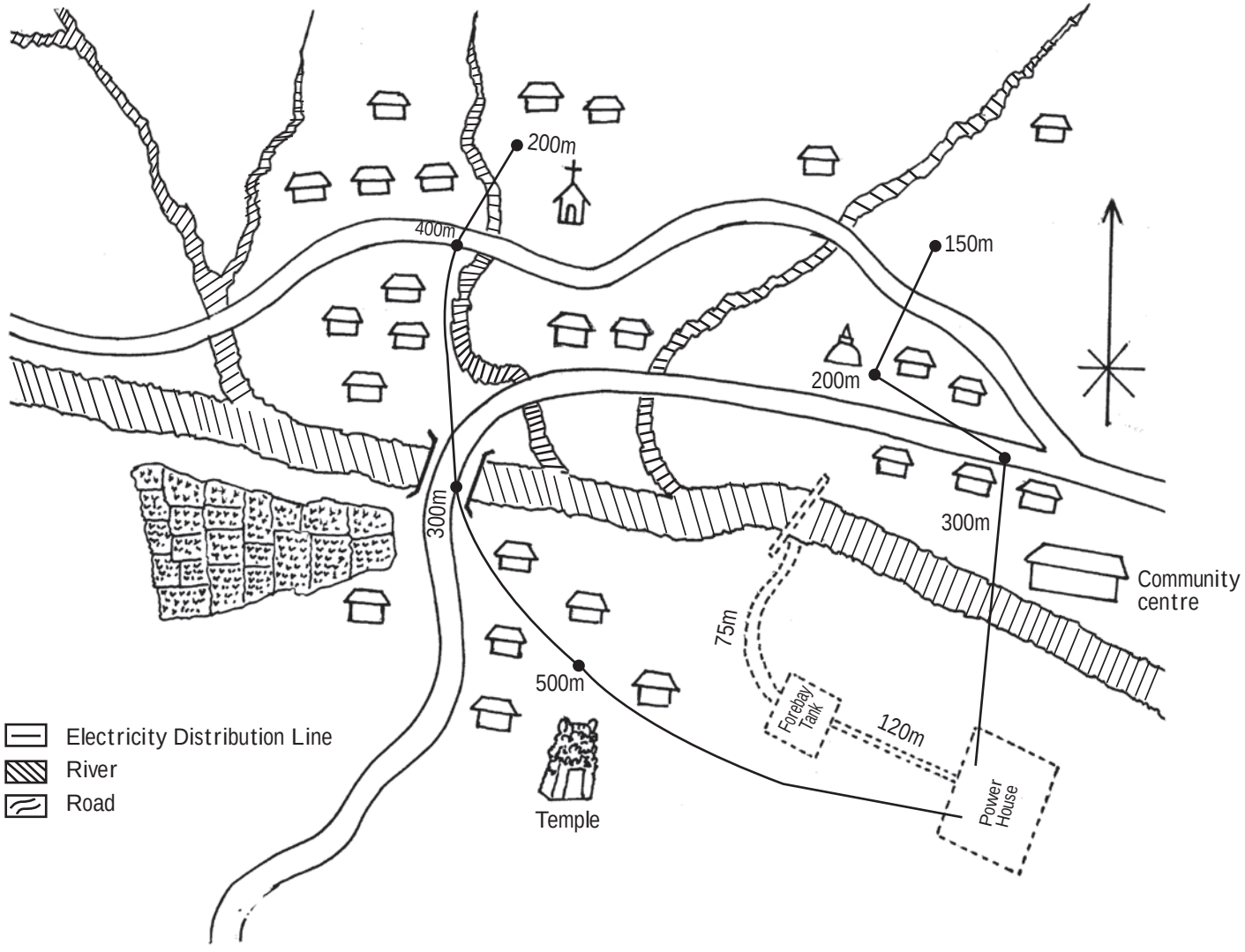
Money will have to be spent for maintenance and repair. The interest and loan from the bank will also have to be paid. You and your village should be able to bear all these expenses. There should be a scheme to charge that amount from the electricity consumers (the villagers who receive electricity from the micro-hydro village electrification scheme). This needs good management and takes time and effort and sometimes costs a little more. In order to make all this a success, it is important that the entire process be carried out through the village societies (an Electricity Consumer Society). It is also important to get women's ideas as well. So do not forget to actively include many women in this society.

STEP 1

Making a map of the village

Do you know the first thing to do if you feel that your village needs a micro-hydro electricity scheme? You'll have to draw a map which indicates the exact positions in which the village houses are situated. The distance between houses and the course of the water current should be accurately indicated. This map would be very important for a micro-hydro developer who would come to study if a hydro power project could be implemented in your village. The total cost of the project is based on the distance between each house and the hydroelectricity generator, etc Presenting an accurate map would make it possible to build up a well organised project.

It is equally important to state how the village acquires its water supply and how the water is used. If you could provide the micro-hydro developer with such a map, and a list of the other uses of water sources in the area, they may send a technician to help and advise you on relevant procedures. Do not forget to have a copy of the map ready to be given to the person who comes to assist you.

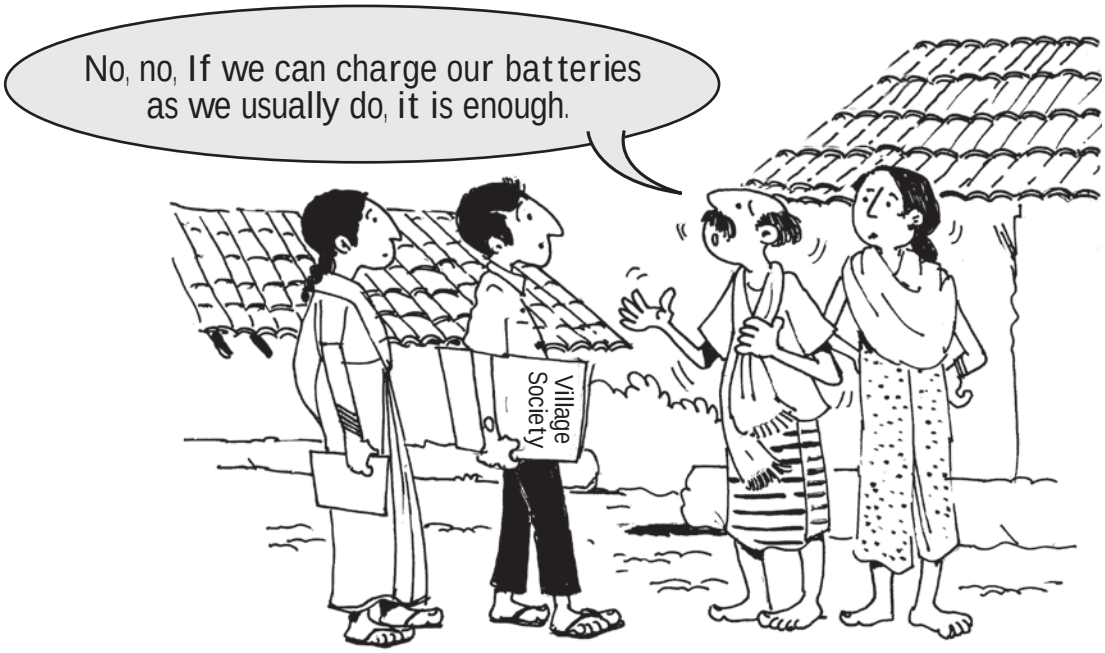


STEP 2

Identifying who needs electricity

In some villages only 20 or 30 houses in the village could obtain electricity from the micro-hydro project. In some villages this number could reach even 100. You need to ask the micro-hydro developer how many houses can be provided with electricity before you start to think of how many houses need electricity.

If you make promises to provide electricity to a certain number of houses before this, you may not be able to fulfil those promises. This would reduce confidence and create problems for the project. Sometimes providing all the villagers with electricity may be impossible. Some villagers may not believe in this new electricity power-plant. Some might be obtaining electricity using solar cells. Some might find it sufficient to charge their batteries as usual. Some might find it highly expensive.

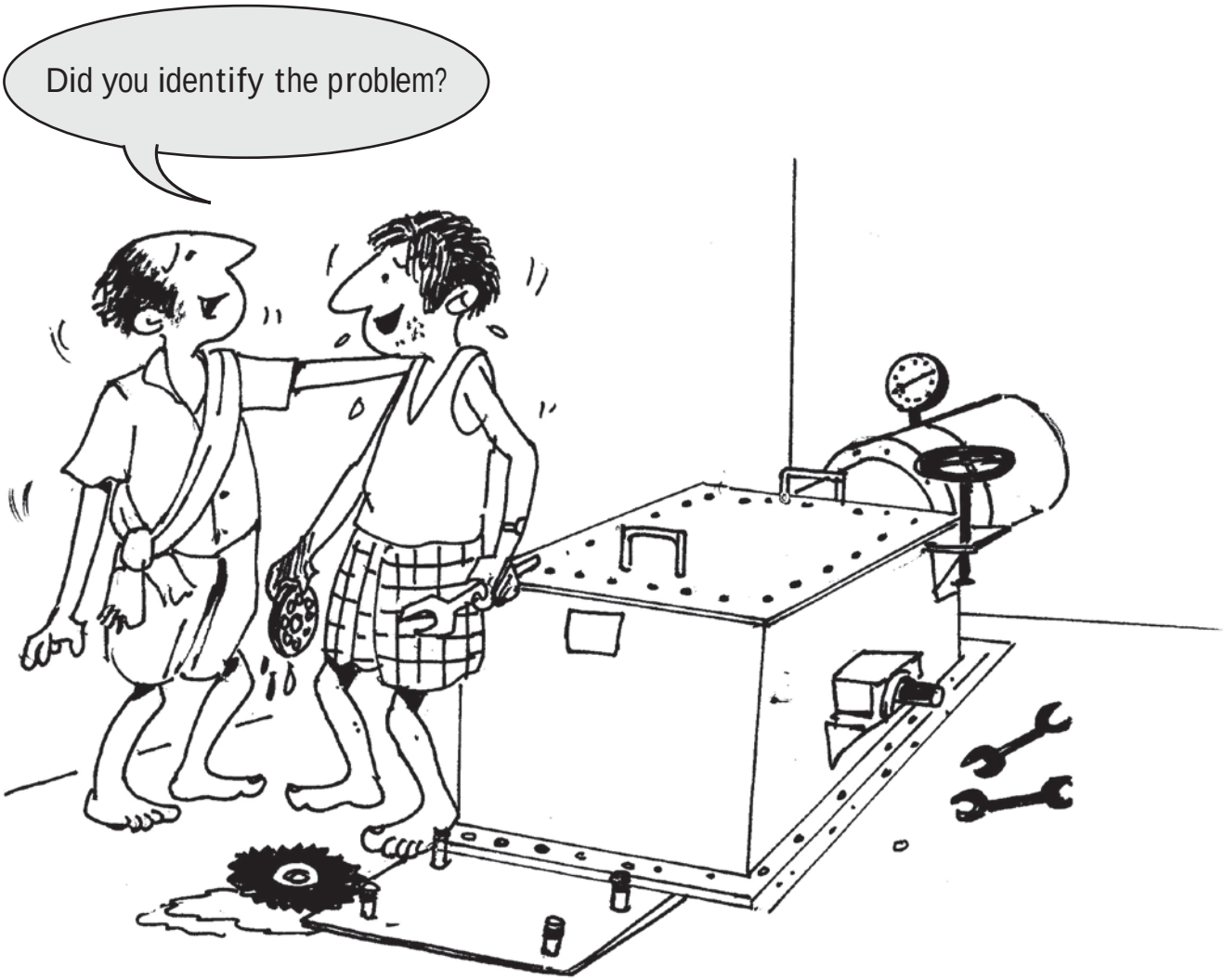


It is recommended that at least 25% of the cost is divided amongst the houses that expect to obtain an electricity supply. Collection of these payments would be the task of the Electricity Consumer Society which is responsible for implementing the project.

MAINTENANCE

Do you have access to the required skill?

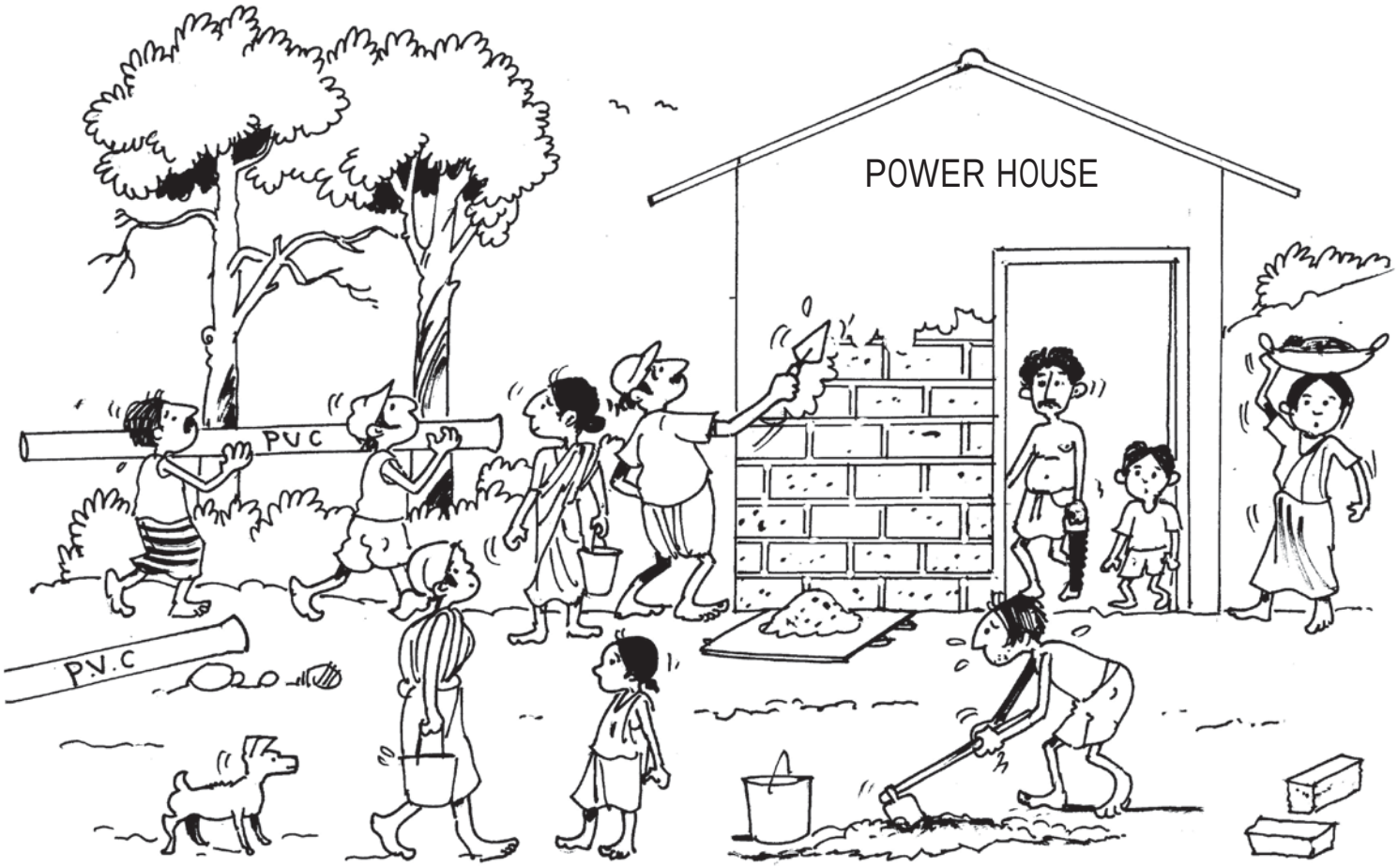
Look around. Does your village have a skilled electrician? Is there a person who can repair tractors and other machinery and equipment. Can he learn about the electricity generator and look after it? Or can you find a technician from a neighbouring village or city? Would he agree to come to your village and help you out when necessary?



If you CANNOT answer YES to even one of these questions it would be difficult to try to successfully run a hydroelectricity system in the village. Such a system cannot succeed without the required knowledge and skill. So this would result in a waste of money, and create problems in the village.

COST of maintenance

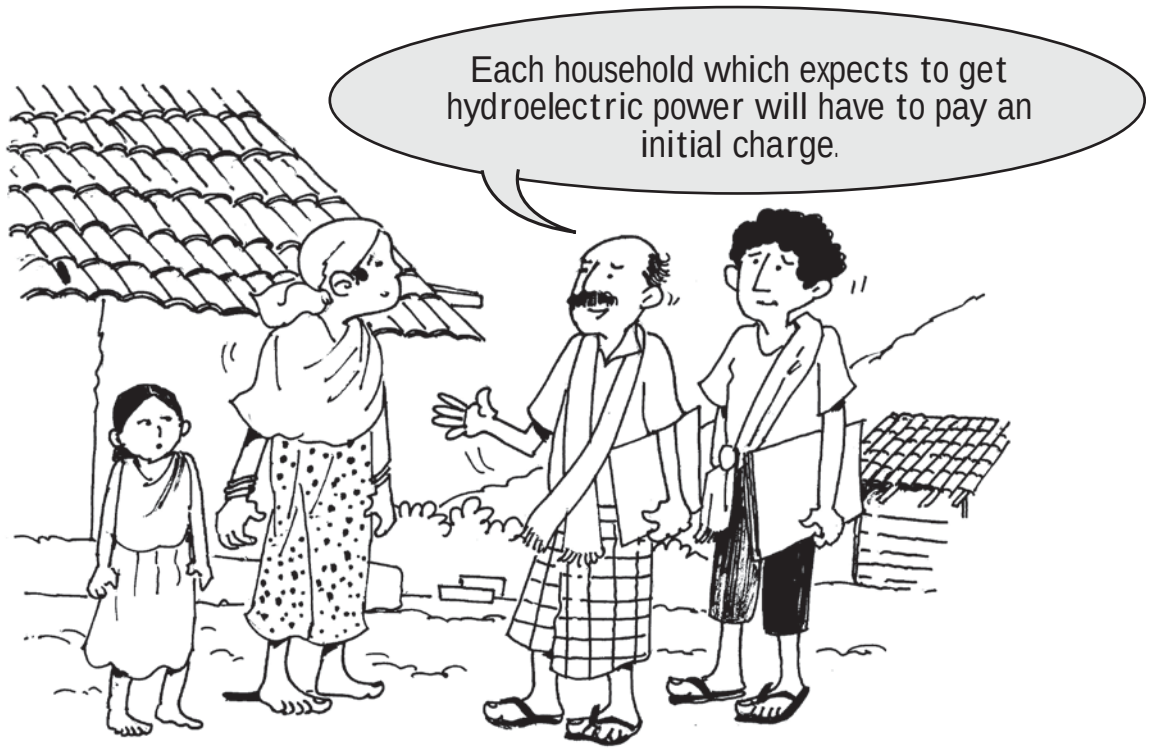
Construction is not the only expense in a project like this. The benefiting villagers must be able to meet the expenses related to implementing, managing, maintaining and repairing the micro-hydro scheme. Each and every villager who benefits from this project should seek out a way to reduce these costs. This could be done by villagers contributing resources (material, skills) and their labour. There should be an agreement on the initial cost which should be charged when supplying a house with electricity. In addition, it is important that all the electricity consumers agree on the monthly rate to be charged.



A resourceful PLAN

Special attention should be paid to the factors given below in order to do all this correctly.

- Sum up the connection fee and the monthly charges. Get everyone who wishes to be electricity consumers involved in this as it will help them to agree on fair prices.
- Keep books in order to show payment details for each household.
- From the beginning make arrangements for money to be set aside for charity purposes. Providing financial aid or small loans to families with low incomes would be such a step.
- Can the customers pay the decided monthly charges without difficulty? Do they have any disagreements on this? This should be discussed. Steps to assist them if necessary should be taken if the charges are a problem for them.
- Look after the hydroelectricity generating unit, which would prevent a frequent necessity for repairs. A good manager would pre-plan on emergency deactivations and store the essential spare parts. Then repairs could take place efficiently if failures were to occurs.
- If you implement a hydroelectricity project in your village, you should prepare monthly reports for institutions which aid you, such as banks, government institutions and non-governmental organisations. This would make it possible for you to gain such agencies' confidence and get advice from them.
- There is a possibility that the hydroelectricity project could create tussles and problems in the village. It is important to have a process to deal with such issues and to take appropriate decisions.



If it is difficult for you to organise yourselves in this manner it wouldn't be advisable to implement a micro-hydro power plant in your village.

Things that CAN be done

- When you inform the micro-hydro developer that there is a suitable water source in your village for a micro-hydro electricity project, they will send a technician to estimate the power that can be generated by it.

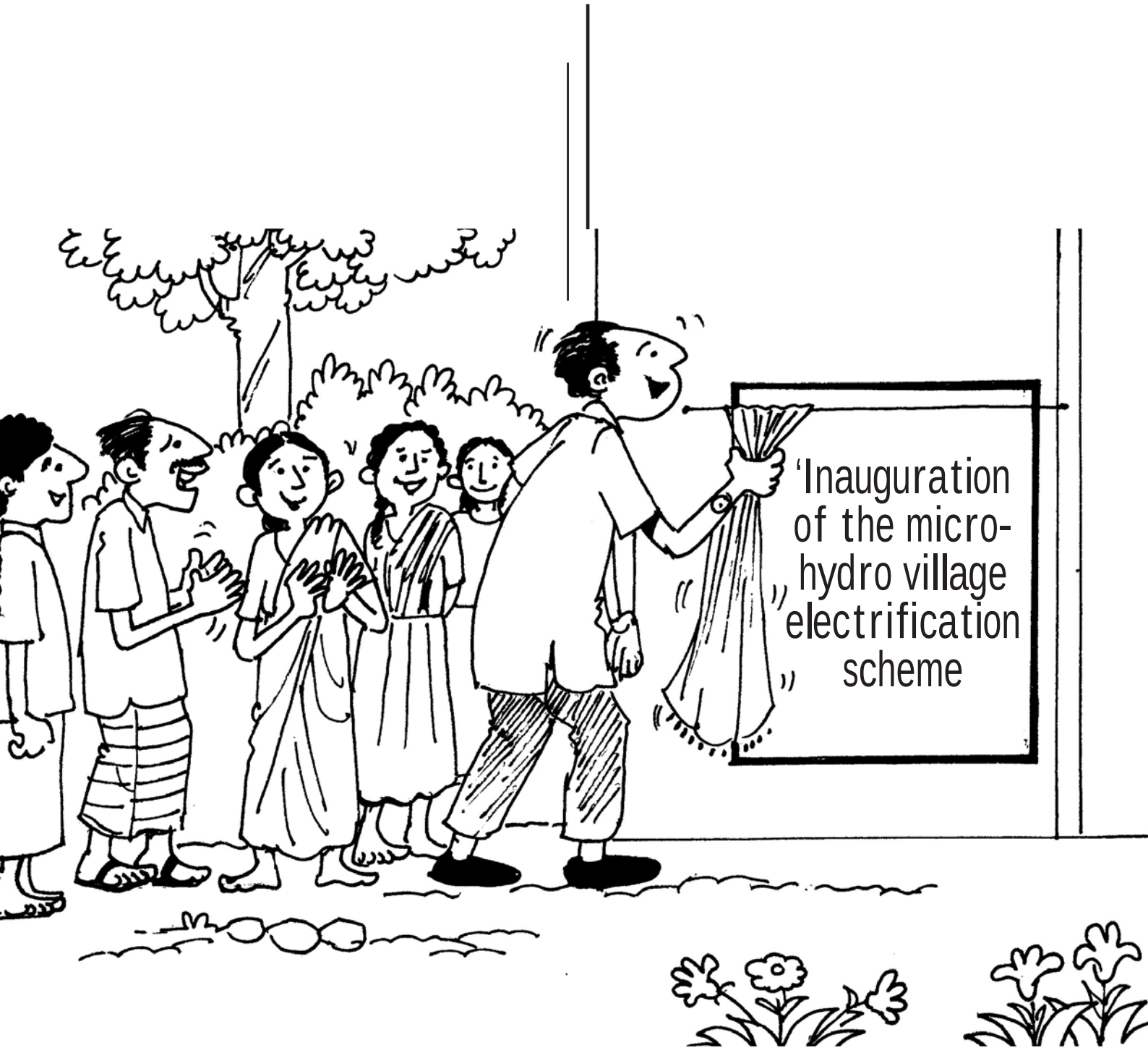
- It is advisable that you understand whether starting on such a project would be appropriate considering the social and the financial status of your village. There maybe supporting organisations which are ready to help you increase the organising power in the village. In Practical Action's experience it would be difficult to carry on with such a project if there is a lack of organisation of the villagers. Even supporting organisations can only offer you a helping hand. It is up to your village to decide upon all issues relating to the micro-hydro village electrification scheme.

- If the financial and social status of the village is appropriate for such a project the villagers can apply for financial aid. After submitting your application, the principles and procedure which should be followed to receive further aid will be explained to you by the bank. Knowledge on the following are required in order to successfully apply for financial aid; how to unite a large number of families, the procedure to follow in book-keeping, the capacity of the turbine machines used, and estimates of the electricity connection charges.

COSTS

The initial charge per household for electricity connection should be about 25% of the cost divided amongst benefiting houses. There should be transparent account keeping on business income and adequate fund controlling, recording and maintenance. The factors mentioned in this booklet should be followed when the fund is being used. This project should benefit the entire village including the poor families. The villagers should be ready to bear the total amount of expenses of the project if an application for financial aid does not succeed.

With proper assessment, planning and organisation a micro-hydro village electrification schemes can successfully bring your village the electricity it needs.



BASIC SURVEY FORM

(to be used by the village to gather important information about the potential of implementing a Community based micro-hydro village electrification scheme – this form can provide useful information to a micro-hydro developer)

1. The name of the village: .....

2. The name of you/your organisation: .....

3. A map of the village
   The course of the water current and waterfalls used in irrigation should be marked. Attach a detailed map.

   The approximate height to the water source from the proposed location of the proposed electricity plant

   .....

   The water level on sunny seasons:.....

   The length of the pipeline which supplies water:.....

4. The number of houses requiring electricity:.....

   Are they marked on the map? .....

   Are the distances between houses, and their distance to the channels of irrigation mentioned?
   .....

   The total number of houses including the houses marked on the map: .....

5. The method of maintenance

   Is there a trained technician in the village? Is there anyone with relevant technical skill or any other skill? Are there any other skilled technicians living in the area?
   .....
   .....
   .....

   Is there a hydro project near your village? Where is it? How far is it situated? How is it maintained?
   .....
   .....
   .....

Is there a technician or an electrician in the area? How far does he live? Can he provide a constant service?

.....
.....
.....

6. Controlling:

What are the village societies in the area? .....
.....

Who are their secretaries?

.....
.....

Are potential electricity consumers members of the same society?

.....
.....

Would they excel in keeping accurate accounts? .....

Can a responsible manager be appointed? .....
Can an individual be appointed to collect the monthly electricity charges and for repairing?

.....
.....

Who do you propose as the manager?

.....

How do you plan to bear these expenses?

.....
.....
.....