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IDENTIFICATION AND UTILIZATION OF FARMER RESOURCES IN IRRIGATION DEVELOPMENT: A GUIDE FOR RAPID APPRAISAL

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Introduction

In most places in the hills of Nepal, and to a somewhat lesser extent in the Terai, wherever there is a reasonable potential of developing irrigation, the farmers have already made some effort to irrigate part of the potential command area. This means that the local farmers have some experience in diverting water, digging and maintaining canals, distributing water to the fields, and applying it to the various crops. To most effectively develop irrigation as quickly as possible over a wide area in Nepal, these local resources must be identified and utilized.

Organization

Wherever there is some existing irrigation, there is also an organization to carry out the primary tasks of an irrigation system. These tasks include construction of the civil works to capture and convey water to the fields, allocation of entitlements to water among the members, distribution of the water to the farms, maintenance of the system, and managing of conflicts. In order to carry out most of these tasks, the organization must have a means of mobilizing both human and financial resources.

The organization may be very informal, or it may exhibit a high degree of formality with scheduled meetings, elected officers, written rules, accounts, list of members and their water allocation, and members' attendence at work. The amount of organization required and the formality of the organization is, to a large degree, a function of how much labor must be mobilized to maintain the canal to deliver the available supply of water as needed. If little labor is required, the organization tends to be much less formal and vice versa. Although when one first observes a community irrigation system,

it may appear that there is no organization and, depending on the time of year, that the system is in complete disrepair, if one asks the right questions of the right people some form of organization can always be identified. And what in the winter might look like a system in complete disrepair will look quite different at the beginning of the monsoon rice season after the annual cleaning and maintenance has been done.

A broad diversity of organizations and means of carrying out the primary tasks of an irrigation system have been observed among community-operated systems in the hills of Nepal. What follows is a summary of observations of community irrigation systems in Gulmi, Palpa, and Nawal Parasi Districts.

Construction

Local communities have constructed long canals (more than six kilometers) through jungle, hard rock, and along the face of cliffs. Often they have hired other villagers who are skilled in cutting canals and tunnels through hard rock. Flows of between 300 and 400 liters per second have been measured in canals constructed by local communities.

Water Allocation

An irrigation system must somehow allocate entitlement or rights to the water among the farmers. Two basic principles by which this is done have been observed. The most common principle used is to divide the water in proportion to the land irrigated by each farmer in the command area. Thus, if a farmer has one-twentieth of the land area irrigated, he is entitled to one-twentieth of the water in the system.

Another principle of allocating water is by selling shares in the system to the members. In one system the total water

supply is divided into 60 shares, and the 105 members own anywhere from one-eight of a share to four shares. If one farmer has more water than he needs for his land and another has less than needed, the one can sell to the other. One year, ten additional shares in the system were sold for a total of Rs. 28,000, and that money was used to make improvements in the canal so that more water could be delivered to serve a larger area. The price of water shares has been set to somewhat reflect the resources that have been invested in the system over the years. Since there are about 40 hectares in the command area, one share of water can irrigate about two-thirds of a hectare, and the current price of a share is Rs. 4,000.

Water Distribution

In a well-functioning irrigation system, water is distributed to each farmer's fields in the amount that he has been allocated. Three methods of distributing the water among farmers for monsoon rice cultivation have been observed.

One method is through the use of saachos. A saacho is a horizontal weir made from a log with two or more notches of equal depth but varying widths cut into the top. It is installed in the canal so that all the water flows through the notches, causing the flow to be divided in proportion relative to the ratio of the width of the notches. The ratio of the water allocation of the land served by the distributary canals below the saacho is the same as the ratio of the widths of the notches. These saachos may be used only to divert a proportion of the flow from the main into secondary canals, or they may be used right down to the individual field level.

Another common method for distributing the water according to the allocation is by a timed rotation. Each farmer takes water from the canal for a specified length of time. The length of each farmer's turn is calculated to provide him the proportion of the flow to which he is entitled by the allocation.

The third method of distribution observed is by contract. The members of the organization pay one or more persons to deliver the water to all the fields. The contractors adjust the flow throughout the command area so that all fields are covered as adequately as possible. This method of distribution is especially suitable when the fields are a long distance from the village where most of the farmers live.

Water distribution for wheat and maize tends to be much less precisely regulated. Usually the farmers decide among themselves when each will irrigate his fields, and then each farmer will be allowed to take water until his fields are fully irrigated. Since water is relatively scarce at the time of maize planting, the mukhiya may be in charge of distributing water so that all members are able to plant at least some of their maize at the optimal time.

Operation and Maintenance

Nearly all of the community irrigation organizations have a mukhiya or adhyaksha, and many have a bahidar or sachiv. The mukhiya is responsible for organizing and supervising work on system, and the bahidar keeps the accounts, minutes of the organization's meetings, and a record of members' attendance at work.

The critical period for maintenance of most community irrigation systems is prior to and during the monsoon season. Most organizations have a meeting of the members in Jestha. Plans are made for the major annual maintenance which is done in Jestha and Ashadh.

Generally the members all have to work to clean and repair the canal. Some organizations give a contract to one or more members for this work, and all the members have to contribute money to pay the contractor. Money may also be raised in this way to purchase tools and cement.

An important element in the operation of an irrigation system is a method for early detection of any problems at the intake, landslides that block the canal, and leaks in the canal. During the monsoon, usually two people patrol the canal every day. The members may do this turn by turn, or two people may be hired to do this on contract. The persons patrolling the canal do minor repairs and alert the rest of the members if more labor is required.

Resource Mobilization

An irrigation organization must be able to mobilize resources, both labor and material, to be able to operate and maintain the system. The ability to mobilize resources in a timely fashion is the major factor distinguishing a well-operating irrigation system from an ineffective one. In community irrigation systems, these resources are contributed by the members in proportion to the benefits they receive from the system.

In systems where water is allocated in proportion to the area irrigated, members are usually required to contribute labor and cash according to their land area which is served. For instance, in one system a person with 40 mato muri of irrigated land is required to provide one laborer every day that ordinary maintenance work is done. A person with only 20 mato muri has to supply one laborer every other day. In another system, cash was raised at the rate of Rs. 2 per mato muri to pay a contractor to do the maintenance.

Another basis for resource mobilization is in proportion to the productivity of the irrigated land. Each member's irrigated land is rated by measuring the yield of rice, i.e., number of dhan muri, and both labor and cash are contributed in proportion to the number of dhan muri each person's land yields.

Community irrigation organizations which allocate water in proportion to purchased shares of water also mobilize labor and cash contributions on this basis. One laborer must be provided each day of ordinary maintenance for each share of water owned. This year, one organization raised cash at the rate of Rs. 250 per share for a total of Rs. 15,000 from sixty shares.

When emergency maintenance is necessary, most organizations require all members to work irrespective of the number of shares owned or the size of the land irrigated. At times work will continue at night by the light of kerosene lanterns and torches.

The amount of resources community irrigation organizations mobilize is considerable. Several systems with command areas of 30 to 50 hectares regularly mobilize more than 2,000 man-days of labor in a year. One organization with 55 members raised Rs. 70,000 in one month's time to install a pipe to cross a major river.

In order to mobilize these large amounts of resources, an irrigation organization must have means of enforcing its rules and assessments. Most organizations keep written records of members' attendance at work, and people are FINED if they do not work as required. Fines are set at about the same level as the local daily wage rate. If a person refused to work or pay the fine, the organization can deny that person water. Several organizations have reported that when members have refused to pay, a group of the members has gone to that person's house, taken his pots and pans and threatened to sell them. The person then paid the fine, and all the members saw how serious the organization was about collecting fines.

Conflict Management

An irrigation organization which must distribute a limited amount of water to many members and which requires the cooperation of the members for operation and maintenance will inevitably experience conflict. Some members may try to steal more than their allotted share of the water. Members, from time to time, will fail to contribute their required share of the labor and cash to maintain the system. To function well, irrigation organizations must have an effective way of managing conflicts when they arise.

As mentioned above, most organizations levy cash fines against members who are absent from work. Persons who are caught stealing water are also usually fined. One organization exacted a public confession from a member caught stealing water, and the signed confession was recorded in the organization's minute book. Since the enforcement of sanctions is in the hands of the members who benefit from the proper adherence to the rules and who control the distribution of water, there are both the incentives and the means to enforce the rules.

Conclusion

The above has been a brief review of the types of community irrigation organizations that have been observed and the different ways which they carry out the tasks of an irrigation system. A surprisingly broad diversity has been observed over a fairly small area. The purpose of this review has been to alert the reader as to what to look for in community irrigation organization.

When one observes any irrigation, one should expect that there is some organization in existence for managing the system. Persistent questioning may be required to uncover information about how the organization is structured, how it mobilizes resources, and the way in which it carries out the primary tasks of irrigation. But learning about the organization and working with it can greatly facilitate further irrigation development through improvement and extension of the existing system.

The farmers in the organization are probably the best source of information concerning stream and canal flows. They can identify the problems in the existing system that need to

be overcome through some construction inputs and can establish priorities concerning what is most urgent to be done first and what can wait if the budget is limited. The organization has experience in mobilizing and organizing construction labor, and the members are experienced in the use of local materials in construction and maintenance of the system. It can certainly manage the transport of materials to the site. Likely the organization has some experience in handling money raised from the members contributions and fines. If the organization is made responsible for accounting for the money used in a project, and if all the members are informed of how much money is dispersed and what it is to be used for, likely it will be managed more effectively than if a contractor is given the responsibility for implementing the project. The members have a strong incentive to ensure that the money is spent so as to accomplish as much work as possible on the system, and with all the members informed of how the money is to be spent, there are checks to prevent any individual from pocketing a part of it.

By working with existing community irrigation organizations and mobilizing the local resources represented in the organization, the limited resources of the government can be spread over a wider area bringing about more and better irrigation development.

QUESTION GUIDE FOR THE ASSESSMENT OF LOCAL RESOURCES FOR IRRIGATION DEVELOPMENT

I. General Information — Date _____

Persons interviewed — Interviewers

_____ _____

_____ _____

_____ _____

A. Location of the area

1. Zone _____ 2. District _____

3. Panchayat _____ 3. Village _____

4. Route and distance from:

   a. Nearest public transport

   b. District Center

B. Physical information

1. Make a sketch of the community (from an air photo if possible) and show with names:

   a. Streams and rivers

   b. Paths and roads

   c. Location of village and housing clusters

   d. All irrigation canals with an outline of the command area served

2. Make a detailed sketch of the area that is proposed for irrigation development or improvement and include:

   a. Name of all water sources presently used or proposed to be developed

   b. Outline the command area and roughly show the ward boundries

   c. Show all existing canals, housing clusters, drains, and gullies

C. Population

1. How many households are there in each ward of the panchayat?

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2. How many landholders have their house more than one hour walk away from the command area?

D. Ethnic Groups

1. What ethnic/caste groups are represented and in what proportion?

2. Do they live in specific areas? What are these areas called? (include on the sketch of the area)

3. Which groups dominate the local politics? Economy?

E. Land Holdings

1. Are there many landless households?

2. How many households presently own irrigated land in the proposed command area?

3. How many additional households will receive irrigated land in the command area?

4. Who are the three largest land owners and where is their land in the command area? How much land does each own? Do they have special influence in the present irrigation system?

F. Tenancy

1. What forms of tenancy are there in the area? Adhiya?

2. How much of the land is farmed by tenants?

G. Agricultural Production

1. Cropping cycle and area

	Crop	J	F	M	A	M	J	J	A	S	O	N	D	Area
khet														
irrigated bari														
bari														

2. What percent of the area is irrigated in the wet season?
3. What percent of the area is irrigated in the dry season?
4. For each crop what are the varieties planted?
5. What are typical rates of fertilizer (compost and commercial) for each crop? Where is commercial fertilizer purchased? Is the supply of manure adequate?

6. When is the water supply for crops most critical? When is it in short supply, i.e., when is it extremely important to use it most efficiently?

7. Constraints to increased agricultural production and cropping intensity

   a. Could you grow more crops than you are growing now? Would it not be better to grow 2 crops of paddy?

   b. Is fertility a problem? Is there not enough manure produced? Is it first allocated to other fields? Is the supply of commercial fertilizer insufficient or unreliable?

   c. Is uncontrolled grazing of animals a problem? Are there rules concerning grazing? Would it be possible to stable animals and bring fodder to them? Is fodder a limitation on the number of animals you keep?

   d. Is there a labor shortage due to low population density? Seasonal migration for employment?

   e. Does the land ownership pattern inhibit increased cropping intensity, i.e., is there a concentration of land ownership among a few people and do they dictate the cropping pattern?

   f. Is there a problem of water? Is the supply insufficient for the area? Is the supply too unreliable making increased cropping intensity risky?

8. Changes in cropping patterns

   a. What changes have there been in the cropping pattern? Probe with specific questions such as: When was wheat first grown? When was a second crop of paddy begun? When were new varieties introduced?

   b. What caused the changes in cropping patterns?

      1) Introduction of irrigation?

      2) Improvements to the irrigation system?

      3) Introduction of new varieties, inputs, knowledge?

9. If you had all the water you want when you want it, what changes would you make in your cropping patterns?

   a. How much bari would you make into khet?

   b. What crops would you grow on the khet?

   c. Would you continue to cultivate bari? What crops would you grow on bari?

10. Food sufficiency

   a. How many households have excess grain to sell?

   b. How many households must purchase more grain than they sell?

H. 1. What local employment opportunities are there? How many people are employed in each?

2. Is there much seasonal migration to find employment? When does it occur? Where do people go?

3. Has there been much permanent migration? Have people migrated because they could not produce enough food?

I. Markets and Prices

1. Where is surplus production sold?

2. Where are food grains purchased?

3. Where are inputs purchased?

4. How much are transport costs? How long does it take to transport a porter load?

J. Institutions

1. Are the following institutions located in the community? If not, where is the nearest one? How good are the services? How well are the structures maintained?

   a. Sajha?

   b. JT or JTA. What is his name?

   c. Agricultural Assistant. What is his name?

   d. Agricultural Development Bank?

   e. Health Post?

   f. Panchayat house?

   g. Schools - primary, middle, secondary?

   h. Police station?

K. Development

1. What local development projects have been undertaken in the area? Who initiated them and how were they implemented? How much labor was voluntary? How much was paid labor? How and where was money raised?

2. What is the state of maintenance of these projects?

3. Who benefits from the projects?

II. Organization Date _____

Persons interviewed Interviewers

_____ _____

_____ _____

_____ _____

A. Membership

1. How many farmers are members of the organization?
2. Are all people who receive irrigation members of the organization? Is there a system of representation?
3. Is there a difference between those who have khet and those who only have bari which is irrigated?
4. Are non-cultivating (or absentee) land owners participating members?
5. What is the membership status of tenants?
6. Are there any members who do not have land in the system?

B. Social Composition

1. What ethnic/caste groups are present in the system? In what relative proportions?
2. Are any restricted from full participation in the organization? Is the organization dominated by one or a few individuals? Who?
3. Do women have a role in managing the system? Labor for maintenance? Application of water?

C. Official positions or roles

1. List the official positions within the organization, e.g., mukhiya, bahidar, chowkidar, etc. Get the names of the current office holders. For each person named, what other positions in the community or other organizations does he currently hold?

2. How and when are they selected?

3. For how long do they hold a post? How long have the current officers been in office? Under what circumstances will they be replaced?

4. Do they represent specific areas within the system?

5. What is the remuneration for each position? Monetary and/or other benefits and privileges?

6. Are there recognized unofficial positions? How is the organization related to the Panchayat system? (i.e., are officers in the Panchayat also leaders in the irrigation organization?)

D. Meetings

1. What regular meetings of the organization are there?

   a. What is the date and purpose of each of the meetings?

   b. Who attends?

   c. Who runs the meetings? Is there a highly respected person/persons in the meeting who contributes alot but does not hold an official position?

   d. Are minutes kept of the meetings?

   e. Are there sanctions for not attending?

2. What meetings are there that are not regularly scheduled?

   a. For what purposes are they called?

   b. Who calls them? Who attends?

   c. Are there sanctions for not attending?

3. Are there any ritual ceremonies conducted related to the irrigation system?

   a. When are they conducted?

   b. Who participates in them?

c. What is their purpose?

d. What is the remuneration for those who conduct the ceremonies?

E. Water Allocation Principle

1. By purchased share?

2. By land holding size? How was this first measured? How are newly developed land areas incorporated? Are there considerations for different soil types?

3. According to position along the system?

4. By rights of people who first developed the system?

F. Water distribution

1. How is the water distributed for rice?

a. By timed rotation?

1) How is the rotation initiated? How is the order of rotation determined?

2) How does the rotation proceed (tail to head, head to tail, etc.)

3) How is the rotation timed? Does the time period change with supply and demand changes? Who decides when and how to change the rotation?

b. By proportioning weirs (keys)? To what level? What happens below this level?

c. By contract?

1) To whom is the contract given?

2) What is the amount of the contract?

3) What is the time period of the contract?

d. Are there changes in the water distribution within a season for any reason? Is the distribution different for land preparation? Are there times of stress when there are special rules?

2. Have the methods of distribution changed as the system has been improved or expanded? Has rotation been discontinued as the supply increased? Has rotation been introduced as the area has been expanded?

G. Conflicts

1. What conflicts related to water management are there? Water stealing? Rearranging rotation after flow has been interrupted by landslides?

a. Are conflicts among individual farmers or different sections of the system? (rotation area?

b. Do farmers have to closely guard the water during their turn? What happens if they do not, i.e., how is water stolen? By breaking bunds to make illegal turn-outs? Obstructing keys?

2. Who does a farmer go to with a grievance? What is the process of resolving conflicts? What are the sanctions and how are they enforced?

H. Maintenance

1. Routine maintenance

a. When is it initiated?

b. What needs to be done?

c. How is water delivered during maintenance or is it completely stopped until the maintenance has been completed?

d. Who plans and organizes the work?

e. How is labor mobilized? What are individual members responsibilities? Are they based on area irrigated, crop grown, shares owned? How do they differ for khet and bari owners? Do women also work?

f. How is cash raised for purchase of materials? What are individual members responsibilities? Is there a water fee? When is it collected? Who collects it? On what basis is it charged?

g. Are there written records kept of individual member's payments and labor contributions?

h. What are the sanctions for not fulfilling responsibilities?

i. How are the sanctions enforced?

2. Emergency maintenance

a. What are methods of early warning of emergencies? Chowkidar, person living near the intake, etc. ? How are they remunerated?

b. What are common emergencies? How are they caused?

c. How are people informed of the need for emergency maintenance?

d. Who is responsible to respond? How many people? For how long? Do women work?

e. Under what conditions will work continue at night?

f. How do they decide what repairs (temporary or permanent) should be made? Is this by consensus or by recognized authority?

g. What is the worst emergency that is recalled?

I. Conflict resolution

1. What are sources of conflict other than water stealing? Give examples of specific conflicts, e.g., making unauthorized khet, uncontrolled grazing, refusing to work when they are supposed to, misappropriation of funds. What are the sanctions for each of the above? Who enforces the sanctions?

2. How are conflicts resolved? Give the process for the above mentioned conflicts.

J. Does the system have written rules or by-laws? How were they formulated and by whom? What is required to change the rules?

K. Organizaitonal development

1. How was the organization (official officers, methods of raising money, membership, etc.) different long ago from now?

2. When did it change and why? Was it at times of expansion and improvement?

III. Historical development of existing irrigation system

Persons interviewed | Interviewers

_____ _____

_____ _____

_____ _____

Date_____

A. Orginal construction

1. When was the system constructed?

2. Who initiated and organized the initial construction?

3. How were the intake, layout of canals, and command area selected and designed? Who was responsible for that work (name, where from)?

4. How much did the original construction cost?

5. What resources were raised and how were they mobilized?

   a. Volunteer labor? How much? Who participated?

   b. Cash and materials? Who contributed? Loans?

   c. Technically skilled persons? From where? Names?

   d. Were any contracts given out? For what work? To whom? For how much?

   e. Government assistance? When the government was approached what was the procedure?

      1) Who from the system made the contacts?

      2) Whom did they contact first, where, and when?

3) With whom were the subsequent contacts, where and when?

4) Who came to look at the system? What did they do at the site?

5) When was the money/technical assistance actually given? Was it satisfactory?

6. What were the impacts of the improvements?

a. Increased area irrigated? Were new members added to the organization?

If new members have been added, do they have actual access to water? Do they participate as fully as those whose land is in the original command area?

b. More reliable irrigation on basically the same area? Did cropping patterns change? What new crops were introduced?

c. Less effort required for maintenance?

d. Reduction in conflicts?

IV. Technical information

Date _____

Persons interviewed

Interviewers

_____ _____

_____ _____

_____ _____

A. Water Source

1. Describe the main and all supplementary water sources.

   a. Type of source (spring, monsoon stream, spring, etc.)

   b. Extent of flow variation in liter/sec.

	In source	Diverted	Date
Measured			
Maximum			
Minimum			
Critical period			

(Maximum, minimum, and critical irrigation period flows expressed as a proportion of the measured flow using information locally available.)

2. What year was the last major flood? Work backward listing all the years of large floods.

3. When was the last drought? Work backward and list all the years of drought.

4. Could more water be diverted, i.e., if more water is available, what are the limitations in diverting more?

5. Estimated load (high, medium, low)?

6. Water quality for irrigation (good, poor)? Why?

7. Water rights

   a. Is there a water right for the water currently diverted?

   b. In whose name is the right and for what quantity of water?

   c. Are there other irrigation systems using this source? For each give: location (above, below), name, area served, number of households involved, whether or not they have a right to the water and to how much water.

   d. If all the water would be diverted, how would it affect other downstream users?

B. Intake

1. Describe the intake arrangement and structure (sketch)

   a. How often is the diversion damaged? One or two times each year? Every few years? What is the current state of repair?

   b. What problems are faced in repairing the diversion structure--materials, high water, labor, etc.?

   c. Is there a flow limiting device?

   d. Is there an escape for excess flow?

   e. What is the arrangement for stopping the flow in the canal?

   f. What methods are used in removing silt? How frequently is desilting required?

   g. Would there be benefit in a more permanent intake structure?

D. Distribution system

1. What physical control devices are used?

   a. Temporary (kutcha) earth diversion?

   b. Permanent gates, keys (proportioning [illegible])? If keys are used, sketch the branches and measure the respective key notches.

   c. When are these controls in operation?

   d. Who is responsible to construct them?

   e. Who maintains them?

2. Water delivery to the fields

   a. What percent of the irrigators must receive water via a neighboring field?

   b. To what degree are there canals to each field that a farmer owns? Can the field be fed by two canals?

   c. Have there been recent changes in the alignment of field channels? Why?

E. What are the soil types and how do they vary throughout the system?

F. Are structures provided or special provisions made for using the system for purposes other than crop production? such as bathing, washing clothes, watering animals, running a turbine or water wheel?

G. Physical constraints to increasing the irrigated area

1. What are the limitations to increasing the irrigated area?

   a. No more land that can be irrigated?

   b. Source of water limited?

c. Water delivery problems due to:

1) Inadequate diversion structure

2) Siltation

3) Seepage from the canal

4) Landslides

5) Canal size

6) Uncontrolled stream crossings

H. Identification of local priorities and resources

1. If you had access to Rs. 5000, 10,000, 50,000 (use amount with respect to project needs) how would you use it? If you then had Rs._____ more, how would you spend it?

2. Having identified the project, how could resources be raised?

a. How would planning take place? By the organization? By a committee? By an individual? Who would appoint a committee or individual?

b. How would money be raised?

1) From current members? How would it be decided who contributes and how much?

2) From potential new members? Would the organization accept new members?

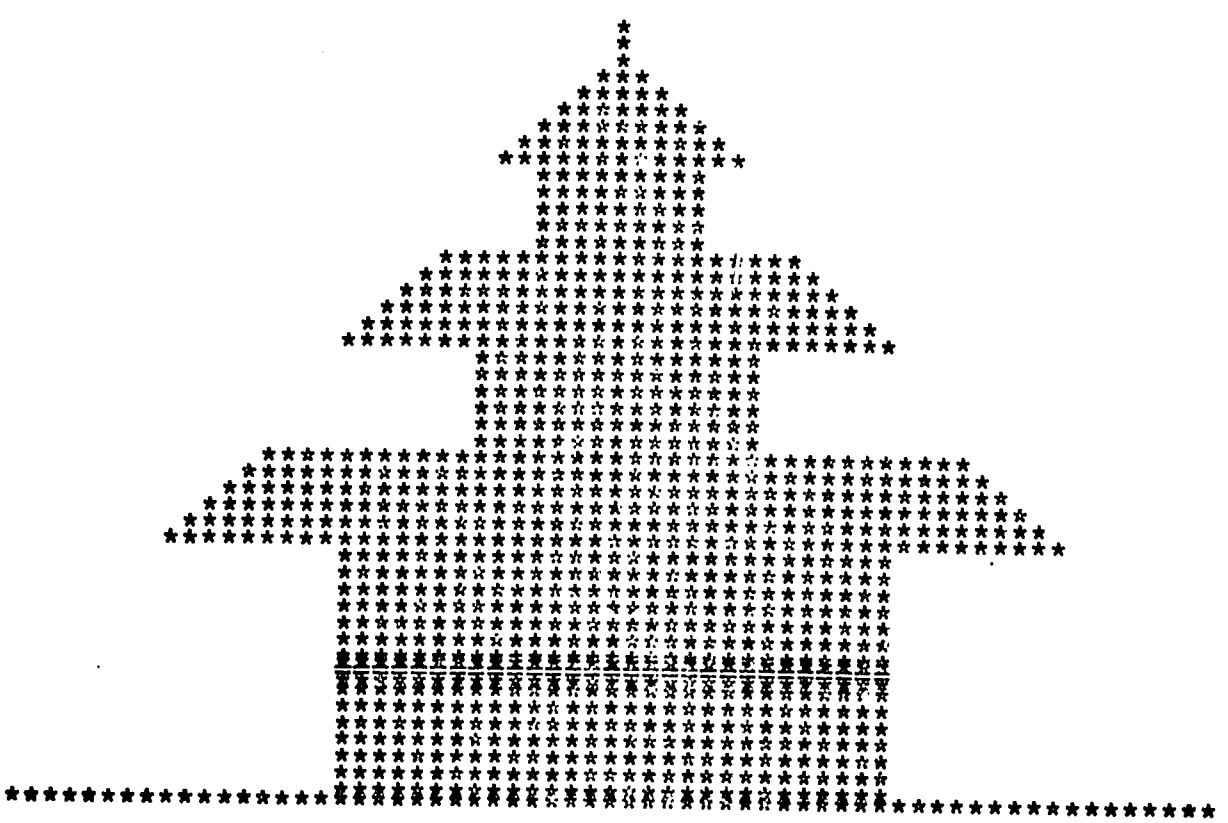
3) If you look outside the community for money, where would you look?

a) Who would you contact first? Who would make the contact?

b) Would you consider taking a loan from private individuals or a bank? Could a loan be paid back? In cash or kind (at harvest time)?

c. How would you organize to implement the project?

1) Would the present organization officers implement it, or would a separate committee be established?

2) Would you use only volunteer labor of the members, or would labor be contracted?

3) If there a specially skilled local group such as Agris that would be hired?