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CONCEPTUAL TOOLS FOR RRA IN AGRARIAN SOCIETY

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Abstract

This paper presents an array of tools commonly used for Rapid Rural Appraisal studies at Khon Kaen University. During farmer interviews, the tools are used as a base to generate on-the-spot questions and to probe for in-depth information.

Conceptual tools presented in this paper include sub-topics, secondary information and pre-existing maps, on-the-spot mapping, calendar of agricultural activities, labour schedule, activity sequence, logic and decision trees, six-helpers, and local terms and folk taxonomy. Examples of each tool are given and the strong and weak points of tool development and uses are discussed.

The importance of individual tools is likely to depend on the nature of RRA research topic and its objectives as well as experience of the RRA team members. While the tools presented in this paper deal mostly with agricultural subject matter, they do so in an inter-disciplinary way that reveals much about what is important to farmers' lives because the farmers' lives are centered on agriculture. For this reason such tools are potentially useful for all RRA's in rural areas, not just agricultural ones.

Introduction

Rapid Rural Appraisal (RRA) is one of the methods extensively used by the KKU-USAID Farming System Research Project to study the existing farming systems, farmers' decision making on resource management, and farmer adoption of introduced technologies. The methodology of RRA involves casual conversation with the farmers and local authorities by an interdisciplinary team of researchers. The nature of data gathering is therefore that of semi-structured interview. The questions directed to the farmers are loosely based on a short checklist of guidelines (or the so-called "subtopics"). Under such circumstance it is necessary to build on-the-spot questions during the interview to communicate with the farmers in order to probe for in-depth details. But how can such questions be generated?

This paper deals with tools for conceptualization used during RRA work at Khon Kaen University. If the members of an RRA team can learn

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how to use these tools, they will be able to question the farmer and discuss findings with him without having to write down specific questions ahead of time.

How can the questions be generated on the spot?

RRA is much different from the formal questionaire. The latter has a well prepared plan to ask definite questions with rigid lay-out under certain assumptions. Theoretically, the formal questionaire will leave no room to fill in new findings or to probe deeply into relationship between or among components of farming systems and/or with natural and socio-economic settings, unless that questionaire is purposively set to do so. In contrast to the formal questionaire, the bulk of questions generated during the RRA interview have to be done on the spot while talking to the farmers. Questions asked to farmers or key informants can be built around:

1. subtopics/checklists
2. pre-existing information on the sites
   - 2.1 reports and statistics
   - 2.2 maps abd aereal photographs
3. resource management probing
   - 3.1 mapping on the spot
   - 3.2 crop or animal calendar
   - 3.3 labour schedule
   - 3.4 activity sequence
   - 3.5 decision making
4. direct observation and indicators
5. general tools
   - 5.1 six helpers
   - 5.2 local terms, folk taxonomy, and sayings

1. Subtopics/checklists

Initially, subtopics (guidelines) or checklists can be prepared prior to the RRA trip from brainstorming by all members of an inter-disciplinary team consisting of biophysical and social researchers. During the discussion each member of the team contributes his or her existing knowledge of own discipline toward a better understanding of the topic under study. Technical terms of own disciplines should be explained clearly to other members from different disciplines so that a common understanding toward the topic of study can be developed. At the end of brainstorming discussion, tentative pictures of the subject under study are drawn in the form of hypotheses upon which a number of key subtopics and checklists are based. These key subtopics and checklists will then be used as a springboard to generate questions during farmer interviews. Examples of subtopics and checklists are given by Grandstaff and Grandstaff (1985, 1986), Subhadhira et al (1985), Rhoades (1982), and Beebe (1985).

There are a few likely mistakes that may happen and disrupt the brainstorming discussions. Firstly, since RRA involves an interaction among researchers from different disciplines each member should not be so defensive on own discipline and should not strongly insist that only factors from own discipline are the most likely one influencing

the farmer conduct or causing key problems in the village community. Instead, try to be open-minded and thoughtfully work out relationship between factors of own disciplines and those of others. It is most likely that the observed phenomenon is generated from a chain of interaction among various factors and thereby needs investigation by an interdisciplinary team. At the end of study, key determinants or constraints may be the result of a few factors concerning one or two disciplines but nevertheless such conclusion should only be drawn after the whole team has thoroughly studied the whole system together from each disciplinary angle. Another problem in interdisciplinary discussion is the background knowledge of the individual team member. Once having obtained a higher degree and/or becoming specialized in one narrow subject, one tends to lose sight of the broad background knowledge of one's own discipline. For example, an agronomist cannot work in place of an horticulturist. If this kind of circumstance is inevitable, as often found in the case of a small RRA team, a knowledgable person of particular key backgrounds should be asked to join the brainstorming discussion in order to obtain the vital subtopics prior to the RRA trip.

2. Pre-existing information

Once the target area has been specified, pre-existing information on the area or on particular locations should be sought. From such information, a tentative picture of how agricultural activities interact with rural environments can be drawn, so that specific subtopics can be derived during the brainstorming discussion. Careful analysis of the secondary information will definitely shorten time for RRA as well as giving a more accurate picture of the rural system under study. It has been warned that failure to analyse the pre-existing information may result in wasting more time and money to gather information which has been previously collected (Chambers, 1980).

Pre-existing information can be broadly divided into two kinds.

2.1 Reports and statistics

Unless a village targetted for RRA is in an area under a long-term rural development project or a government-aided action program, reports written on particular villages tend to be sporadic, but often information can still be obtained from local governmental agencies. In Thailand, excellent background information of about every village in the rural areas has been recently collected under a joint-program between the National Economic and Social Development Board (NESDB) and the Community Development Department of the Ministry of Interior. The data was collected by the local Community Development worker who spent time gathering information from village headmen, members of village committees, and own observation. The contents included in this so-called "Gor Chor Chor Song Khor" report are basic statistical figures on agriculture, socio-economic conditions, health, natural resources, etc. Primarily, the data collected is planned to be used for establishing the "Poverty Index" of the village so that appropriate strategies for rural development can be undertaken during the period of the upcoming sixth national plan. Since most of the village data

was taken from opinions or observation, not by direct measurement, certain quantitative figures included in the report may not be dead accurate. Nevertheless, the data from this report are very useful for suggestive guidelines.

Another set of basic information on rural areas of Thailand is also available at sub-district (tambon) level. The information has been included in the handbook prepared by the local sub-district agricultural extension officer during 1982-1983. The objective of this handbook is to provide background information on agriculture of every rural sub-district and therefore provides excellent supporting information to the recent "Gor Chor Chor Song Khor" report.

Unfortunately, there is no definite plan to update the village and tambon data at regular interval. If updating can be done, dynamic changes in rural areas can be revealed.

2.2 Maps and Aerial Photographs

A number of excellent and informative maps are available from a few governmental authorities in Thailand. The Map Division of the Royal Thai Army provides topographic maps of variable scale (usually 1:250,000, and 1:50,000) aerial photographs usually 1:50,000 and 1:20,000) based on aerial photographs. Each 1:250,000 map covers approximately the area of an entire province and provides information on routes of transportation, topography, vegetation, large water resources, location of administrative centers, etc. Location of particular villages may not be evident at the 1:250,000 scale, but it will be found in the more detailed map of 1:50,000 scale. The 1:50,000 map has proven to be most useful and becomes a "must" for any RRA trip. It provides the location of village site, topographic features of natural surrounding, drainage patterns in different forms, water resources, routes of transportation between villages, land occupied by different type of forest, land devoted to paddy fields, etc. (Figure 1). Transects of the area can then be prepared from the contour lines of this 1:50,000 map and with pre-existing information on soil and agricultural activities it can be used to identify suggestive agroecological zones for further ground checks (Figure 2). The scale of this map can cover the area of whole sub-districts, (usually about 1,000-20,000 ha) but is too small for detailed study of the area of any particular village.

The detailed features of the village under study can be obtained from the aerial photographs of 1:20,000 scale (Figure 3). Under a pair of stereo-lenses, the topographic features and drainage patterns (Figure 4) can be thoroughly studied. Then later ground-checks with loacl inhabitants will provide an accurate picture of the village natural surroundings. Aerial photographs taken at different times also provide information on natural resource usage and changes in physical features of the area (Figure 5).

The weak point about the army maps is that most of them are not updated frequently enough to catch up with the current land uses or changes in environmental setting. Furthermore, the use of aerial maps

needs to be planned well ahead of time as it often takes a long time to obtain them from the Army Map Division.

Apart from the army maps, various soil maps prepared by the Department of Land Development are extremely useful for area study (Figure 6). The soil maps are currently available for every province of Thailand and have been prepared at the scale of 1:100,000. Different soil series are presented on the map together with topographic features. Soil series are known to be associated with type of crops grown in the areas, with degree of flooding, with water-holding capacity, with soil fertility, etc., (KKU-FORD Cropping Systems Project, 1982). Maps to be used for special purposes are also prepared for certain areas by the Department of Land Development; examples of these maps are soil salinity maps, land capability maps for growing various crops, ground water maps, etc. In addition, finer detailed maps of certain areas can be obtained from action programs working in the specific areas as in the case of the USAID-supported Northeast Rainfed Agricultural Development Project (Limpinuntana and Patanothai, 1982) and Royal Irrigation Department. (1971).

Careful studies of the pre-existing maps will generate a number of well-directed sub-topics or checklists based on good approximation of interaction between agricultural activities and natural surroundings. Furthermore, such studies will also minimize time on RRA spent in target areas.

3. Resource management

In most cases, RRA studies deal with management of rural resources of one kind or another. Therefore, a number of essential checklists on resource management can be automatically included beforehand. These checklists can later be used, together with the "six helpers," as the tools to generate a flow of questions, even when used by newcomers with no previous experience with RRA. The essentials here are mapping to show distribution of local natural resources and agricultural commodities, calendar of animal or cropping activities, calendar of seasonal usage of resources under investigation, labour schedule of villagers or representative farm family, activity sequence of any resource use or any agricultural production process , and decision making of the villagers.

3.1 On-the-spot mapping

Studies of resource management requires knowledge of the spatial distribution of resources and how those resources have been utilized for agriculture and other purposes by the villagers. Mapping of spatial distribution of resources and how they are used for agriculture will help in understanding the possible relationships between various environmental factors and agricultural commodities. The relationships can be found by simply overlaying information of various kinds on top of one another. To do this effectively, the army maps of 1:50,000 scale and the aerial photographs should be made available to the key informants in the village. The key informats can then be asked to identify on the map the exact location of natural resources and the pattern of resource usages (e.g., cropping,

livestock grazing, etc.) all year round. Different patterns of usages from year to year, particularly in years with normal and abnormal rainfall should also be asked. Dynamic changes from old times up to the present can also be recorded on the map. Local names of particular locations in the village should be identified on the map and then should be used to develop mutual understanding on localized resource usages between the researchers and the farmers without having to refer back to the map so often. Figure 3 shows a map with typical local names identified by a key informant.

To fully understand how an individual household utilizes the land for cropping or other agricultural commodities, a member of the household can be asked to aid in drawing the diagram of spatial distribution of various crops on his farm land (Figure 7). For the detailed study of factors affecting cropping, it is also necessary to draw the land transect showing toposequential location of crops and natural resources (Figure 8). Soil fertility and water availability, of drought, or flooding tend to be associated with topographic features and thereby dictate types of crops grown by the farmers. In the case of studying mixed cropping or seeding pattern of crops for further agronomic improvement or on-farm trials, spatial arrangement of crop(s) within the same plot should be drawn (Rhoades, 1982). If possible, map drawing should be done in the field so that direct observation can be done at the same time and probing questions can also be asked on the spot.

Cooperation in drawing maps between the farmers and interviewer is also a tool to produce smooth communication between the two parties.

3.2 Calendar

Crop calendar has been extensively used by various cropping/farming system projects (Beets, 1982). It tells about the earliest and lastest time of planting and harvesting of individual cropping pattern and therefore the period and duration of area occupied by that particular pattern (Figure 9). Calendar can be further modified to cover period of labour usage on the crop activities; i.e., land preparation, weeding, fertilization, harvesting, and threshing for grain (Figure 10).

Similarly to crops, calendar can be prepared to show the start and finish of other agricultural sectors, seasonal usage of natural resources; e.g., in the case of animal feed availability (Figure 11), drinking water for man and livestock, source of fuelwood, etc.

Seasonal start and finish of an individual cropping pattern has a definite relationship with cettain key environmental or socio-economic features. For example, a key natural determinant that is most likely to dictate a cropping pattern is either rainfall and/or water availability from irrigation, which may vary from year to year. They are the primary factors that govern the soil moisture which in turn is further modified by soil texture and topographic sequence. Certain cropping patterns are also dictated by temperature, daylength, etc. In the case of commercial crops, market demand can also dictate the

time of planting and harvesting. Traditional festivals can also keep labour away from planting, weeding or harvesting crops (Figure 12). The relationship between seasonal planting/harvesting of cropping paterns and other biophysical/socio-economic features can be found by overlaying of information.

While preparing the calendar, a lot of questions can also be asked on the spot about labour schedule and activity sequences of individual cropping patterns or other resource usages.

3.3 Labour schedule

Labour schedules are drawn to develop understanding on how labour is utilized in management of resources or agricultural commodities. Labour schedules can be prepared to show general patterns of labour usage in the village or in individual households. It can be presented in the form of seasonal or daily pattern. For seasonal schedule, a pattern similar to the crop calendar can be drawn, but in addition to crops other activities are included in the same diagram; e.g., livestock raising, wood gathering, native vegetables and fruits collecting, silkworm rearing, cottage industry, off-farm work, etc. (Figure 13). Labour schedule or calendar can also be modified to include man-hours of labour usage (Figure 13).

In the study of a household's labour management, labour schedules for individual members can be worked out roughly. It is likely that division of labour exists within a rural household. The jobs preferred to be done by people of different sex or age should be noted. An example of seasonal labour schedule of a typical household of the Northeast is shown in Figure 14.

Apart from seasonal pattern, daily labour schedule can also be prepared for individual activity such as rice transplanting or dairy cow keeping (Figure 15). Daily labour schedule often involves routine works divided among household member and time of the day.

The labour schedule information collected from RRA may not be as good in details as that from continuous monitoring by daily record keeping. Nevertheless, information obtained from RRA should be sufficient to list out critical times for peak labour usage and the most likely period of competition for labour among various component activities of the farming system. Study of labour schedule is also essential for introduction of new technologies or rural off-farm work to the farmer. Recommended technologies or off-farm work will have a better chance of success in periods of light labour usage for agriculture (as found to be successful in the cases of introduced cottage industry and the dry season job creation program by the government).

3.4 Activity sequence

A number of questions to be asked on the spot can be discovered under the form of activity sequence. If a particular farm work can be broken down into a detailed activity sequence, a lot of information on that particular farm work can be learnt by simply asking questions on

step-by-step activities. Here, the six-helpers type of leads (who, when, where, why, what, how) can be effectively combined to gain insight on details of individual activity. It is quite amazing how farm work can be broken down into several sequential activities (Figure 16). It helps if some researchers in the RRA team know the activity sequence beforehand or otherwise the researchers can simply ask the farmers on what they do first and then what they do next. Separate activity sequences should also be asked for years with normal and abnormal rainfall together with the reasons for any differences found.

Careful investigation on activity sequence alone will reveal a lot of details in that particular work or resource usage performed by the villagers.

3.5 Logic/decision trees

Many RRA studies have in common trying to understand how villagers manage their resources or why they take up or give up particular technologies or cropping patterns, i.e., to understand farmers' strategies and decision making. Therefore after a day of RRA interview, the likely factors that influence those should be identified and tentatively concluded, if possible, in the form of logic or decision trees. These will then be used to generate questions during the next RRA visit.

The logic tree can be drawn to classify farmers by types of operation or pattern of resource usage as observed by the researchers. The diagram of logic tree should include key determinants pointing or placing at strategic branching points (Figure 17). In any given situation, however, decision making is that of individual farmer or household. The decision tree can be drawn to illustrate the key factors or important conditions that make the farmer decide to adopt one type of cropping pattern or management in preference to the others (Figure 18). In many cases, decision making involves dates or exact amounts of resources which act as deadlines or cut-off points for the farmers to choose between alternatives (Figure 18).

Logic and decision trees are important tools for researchers to come closer to understanding farmer decision making.

4. Direct observation and indicators

RRA has two limitations. The first is that most of the questions have to be prepared on the spot in order to be flexible with the facing situation. The second weak point is the short time spent in interviewing the farmers and therefore the answer given in haste by them may not represent a true story. The situation is serious if the questions on personal feelings or sensitive issues are asked and the interviewees have not developed a sense of trust towards the interviewer; an anthropologist who spends much longer time in the village will perform better than an RRA interviewer in this aspect. Yet, similarly to other research or survey studies, accurate information is still demanded from RRA. As a consequence, direct observation on important indicators to support the findings are

essential. The indicators can also be used to generate on the-spot questions to ask the farmers without preparing formal questions beforehand.

If the indicators being observed do not agree with the farmer's answers, the researchers shoud not hesitate to ask the farmers for the reasons. More in-depth knowledge on rural living will be learnt from doing so. It may be rather difficult for researchers who have no background information on rural setting to identify good indicators. The first set of indicators observed by newcomers tends to come from sheer curiosity. However, the use of indicators still provides new researchers the opportunity to ask questions and thereby to communicate with farmers.

Indicators used to generate questions can be either subjective or objective. Certain indicators can be observed for the first time when the RRA team enters the village. For example, the villages which have closest contacts with governmental officers tend to have fences around every house and the whole village shows a number of posted signs displaying names of roads, proverbs and slogans. A large and well-built temple may indicate unity and wealth of the village. Wealth of a household can be observed from the build of the house, health of people, array of electrical appliances, type of transporting vehicles, size of land holding, number of livestock, etc. Health of buffalo and cattle during the late dry season and during the rice transplanting period also indicates pasture availability in that particular village.

The indicators used may not be in the form of materials. A sign of community cooperation (unity) can be recognized by asking the question on how often pooled labour for public work or share-labour on agricultural works are done and how they are organized.

Direct observation on how the interviewee reacts to the questions being asked is also important. Sometimes the interviewee is dissatisfied with the questions which may be too offensive or too personal. In cases like this, the interviewer may have to change the subject or try to approach it indirectly, or uses visual indicators, or else say goodbye politely and try to obtain the answer from other interviewees.

5. General Tools

5.1 Six helpers

Some types of tools can be used to get detailed information on almost any topic and are especially helpful to newcomers to RRA who have been observed during the interview to run of questions too quickly due to lack of experience and insufficient background knowledge on rural setting. The six helpers, which include "who, when, what, where, why, how" should be frequently used as guides to ask the farmers on the farm activity under interest. One example can be given on interviewing a key informant about "rice transplanting". In being asked "who" transplant rice seedling, the farmer would reply that all members of the family except the kids who have to go to school, sometimes he has to hire extra labour; he may add land preparation

will be done beforehand by the male who is frequently the head of the family and who decides which plot should be transplanted first on that particular/day. When being asked, "how" rice seedling is transplanted, the farmer would explain the techniques and may further explain the different techniques used between the soils of heavy and light texture. If being asked "when" rice is transplanted, he would give the monthly period of rice tranplanting (July-September in Northeast Thailand), he may also give the period during the day that transplanting is preferred to be done. In response to the question on "where" rice seedlings are transplanted first, the farmer would say that rice will be transplanted first on the lowest part of paddy field and later on transplanting is done progressively up the slope on the upper part of paddy field which lie next to the upland area of the rolling topogrophy. If the questions on "what" transplanting is and "why" rice has to be transplanted, the farmer would give the background knowledge on rice transplanting to the newcomers who know nothing at all about rice cultrue.

When properly used, the six helpers always generate a lot of information for RRA interviewer: newcomers and oldtimers alike.

5.2 Local terms, folk taxonomy, and sayings

The farmers' answers are important not only in terms of in-depth information but also in order to generate the next questions on the spot to probe for further details. So frequently, newcomers or even oldtimers of the RRA team are bewildered by local terms. And it is more so if the RRA interviewers have the background of different dialects. In Thailand, although people of the whole country use the same language there are differentces in dialects among the Central, Northern, Northeastern, and Southern natives. Without understanding the local terms, the RRA interviewers can easily get lost during conversation. Alternatively, the interviewers may have a wrong interpretation, thereby resulting in gathering incorrect information. Using the local terms in asking questions will also bring out better answers from interviewees.

Folk taxonomy is another important tool to probe deeply into the existing resource management and constraints in farming systems. Folk taxonomy helps to understand how people classify resources and environments which in turn reflects different strategies on management to cope with the local constraints. A good example of folk taxonomy is how the Northeast farmers have classified their paddy fields according to toposequence and water availability. Different varieties of rice are strategically planted on different types of paddy field at different date during the rainy season.

Beliefs of local people can be reflected from local proverbs, sayings, and taboos. Quotations are often found during conversation and should not be left unnoticed or without clarifying meaning.

It is rather difficult to get a published handbook on local terms and folk taxonomy. It is left to the researchers to ask the villagers for explanation.

Conclusion

A range of conceptual tools have been used to generate questions on-the-spot in order to probe for more details on agricultural activities and rural livings. It is unlikely that all tools will be used with equal importance in one RRA period. The importance of individual tools is likely to depend on the nature of RRA research topic and its objectives as well as on the experience of the team members. For example, the study of the whole village resource use system or RRA employed in the "site description stage" of the Farming System Research will require extensive use of secondary information and pre-existing maps of the target area. In contrast, pre-existing information may not be so essential for the RRA studies which aim to investigate certain resource management topics, indigenous technological knowledge, farmer adoption of introduced technology, etc. These latter types of RRA require more on local mapping (with the assistance of key informants) calendar details in activity sequences, labour profile, and decision tree drawing. For newcomers to RRA who find difficulty in communicating with the farmers for the first time, map drawing and more frequent or conscious use of the six helpers and probing on activity sequences have proven to be helpful.

Finally, please do not forget that the farmer's answer is the most important spring board to generate the next question. Therefore, it is important for the researchers to listen carefully and try to understand local terms, folk taxonomy, and old sayings. Whatever the topic or situation, the use of conceptual tools such as those discussed in this paper can help the RRA researcher learn a lot about villagers' lives and resource situations. Naturally, experience is required to use conceptual tools effectively; i.e., "practice always makes perfect."

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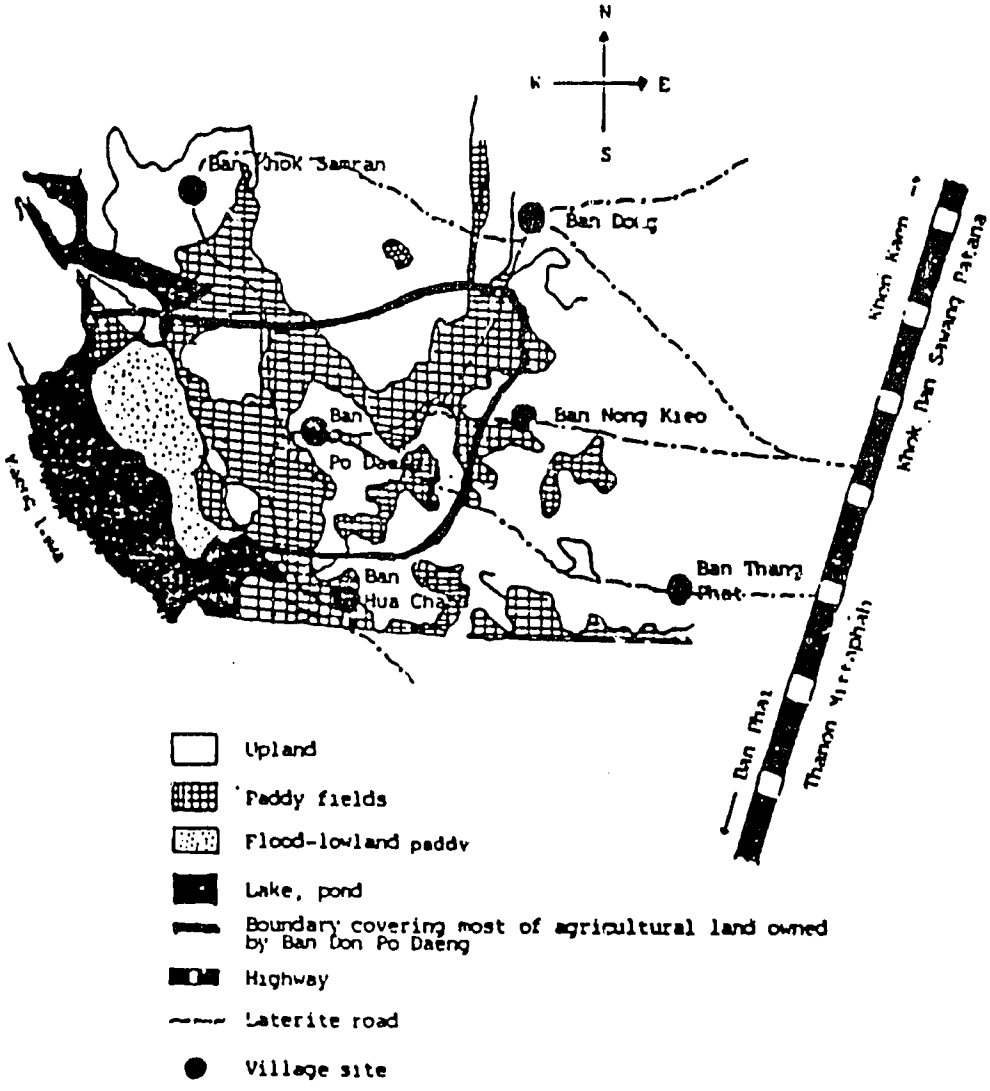


Figure 1. Map of Ban* Don Po Daeng, Changwat* Khon Kaen, showing her neighbouring villages and the surroundings: prepared from the 1:50,000 army map.

(KKU-USAID Farming System Research Project, 1984b)

* Ban = village

* Changwat = province

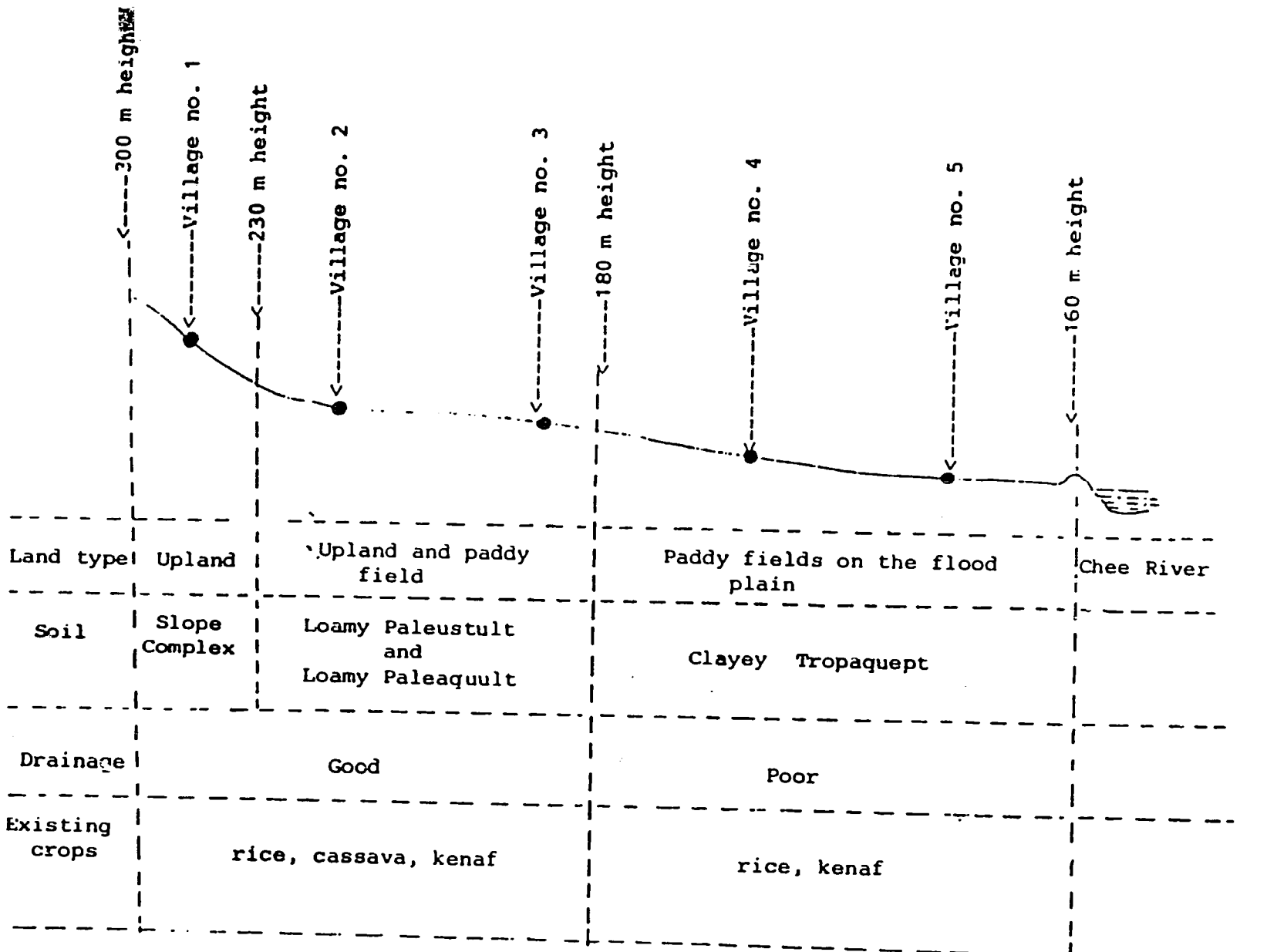


Figure 2. Transect map of Tambon[2/] Po Chai, Changwat Khon Kaen Prepared from the 1:50,000 army map with the added information from Changwat soil map and the Gor Chor Chor Song Khor report

(KKU-USAID Farming System Research Project, unpublished)

1/ height = height in meter above sea level

2/ tambon = sub-district

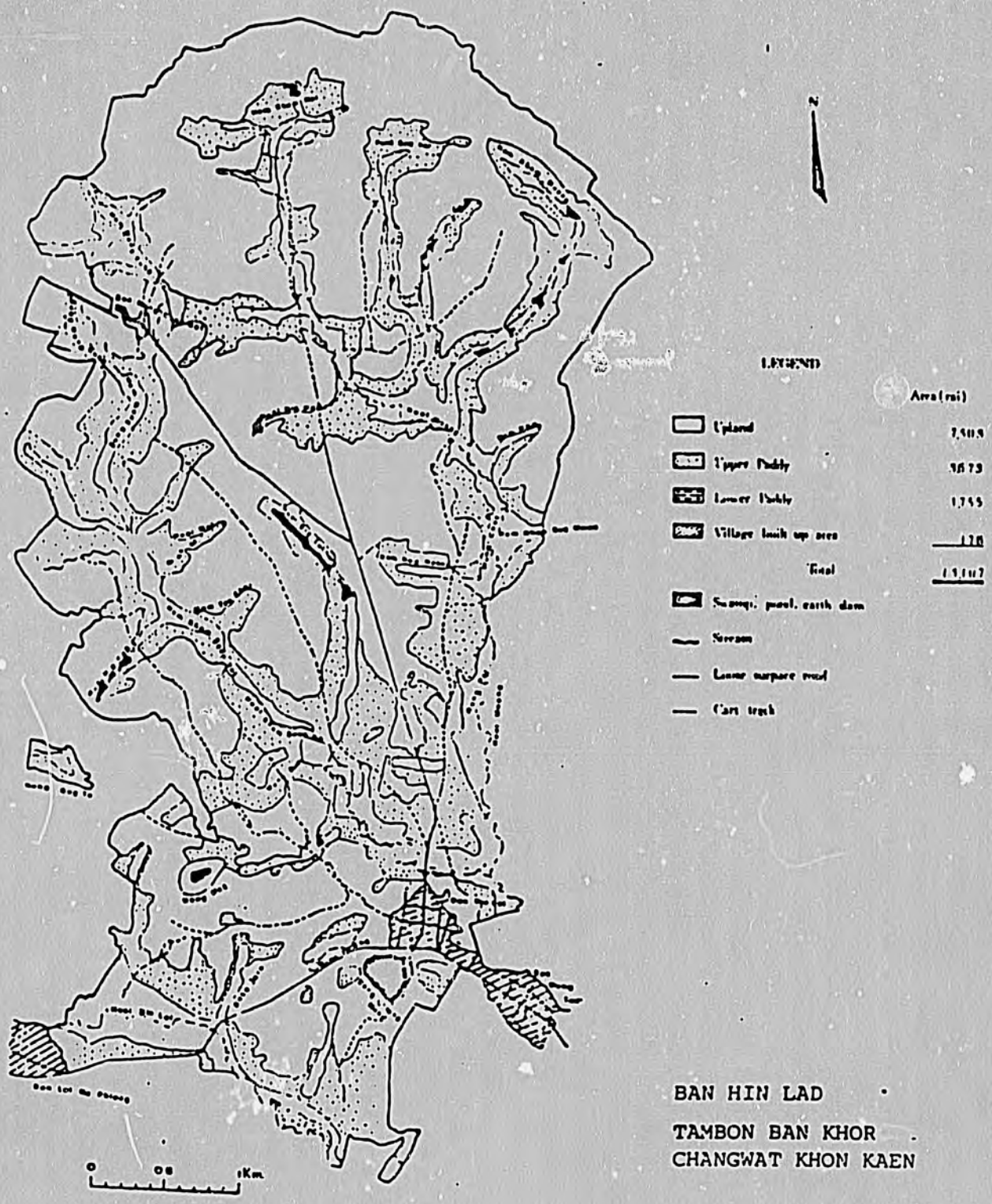


Figure 3. Village map showing type of land, water resources, and roads as prepared from the aerial photograph

(Ratanasophon, personal communication)

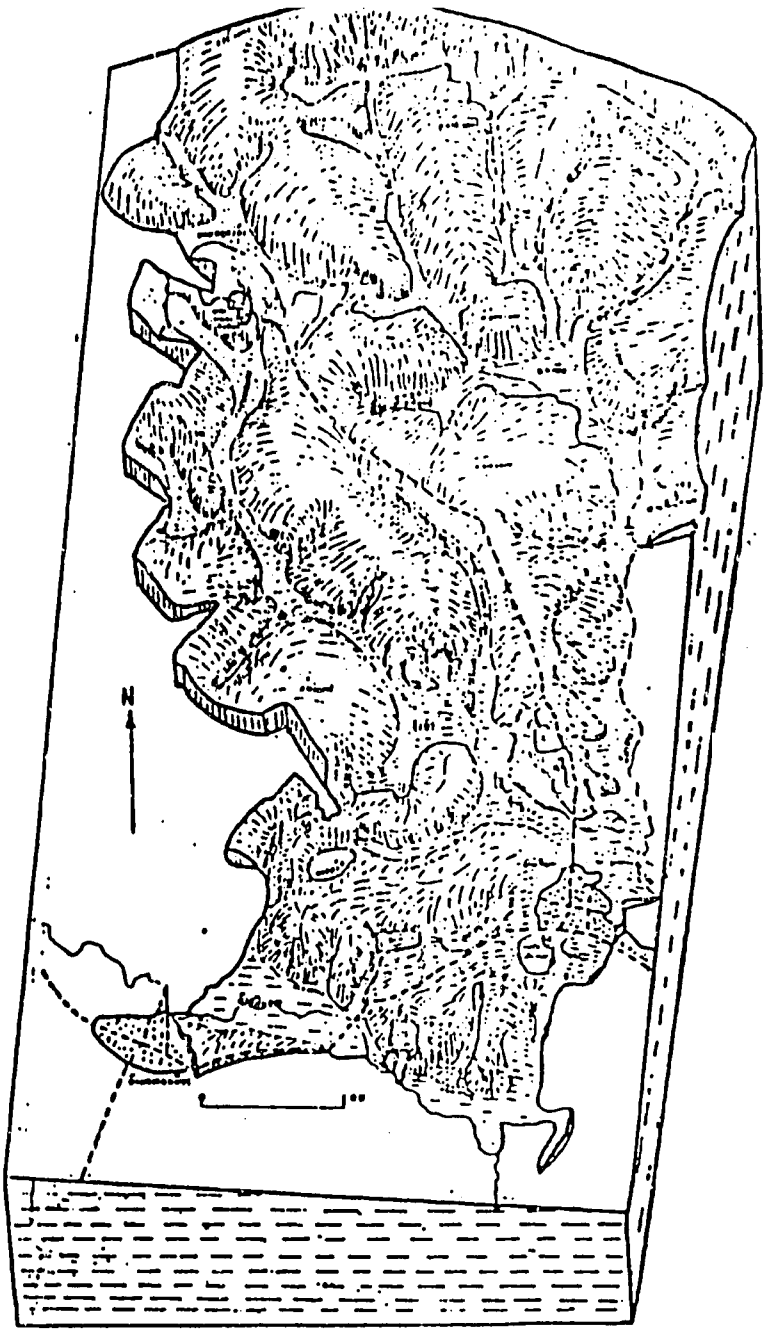
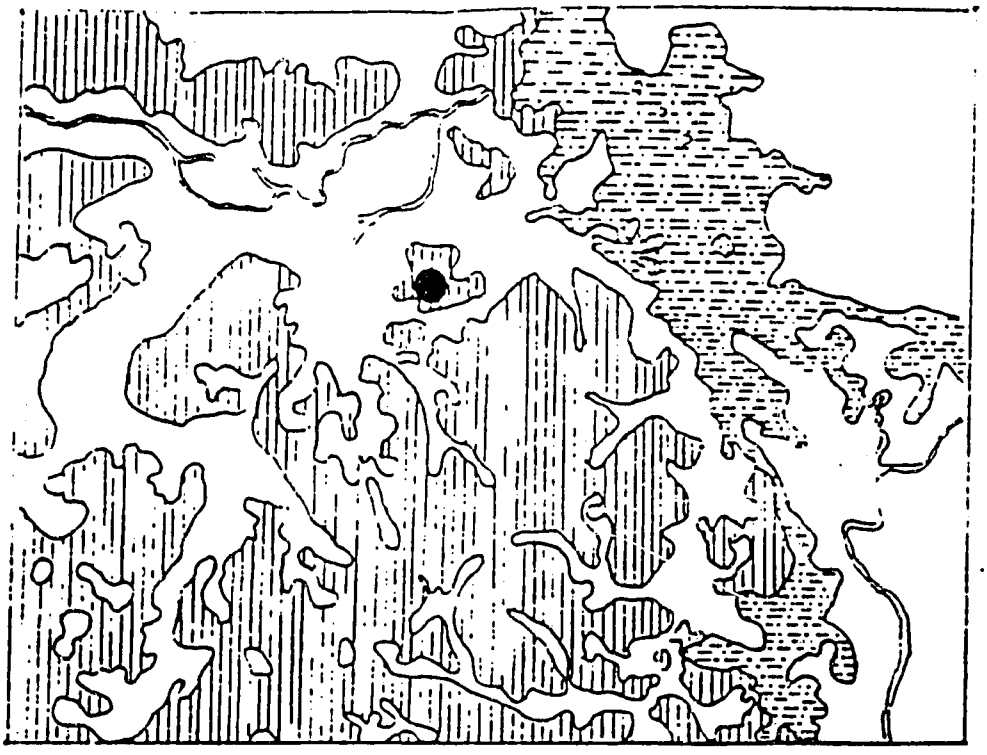
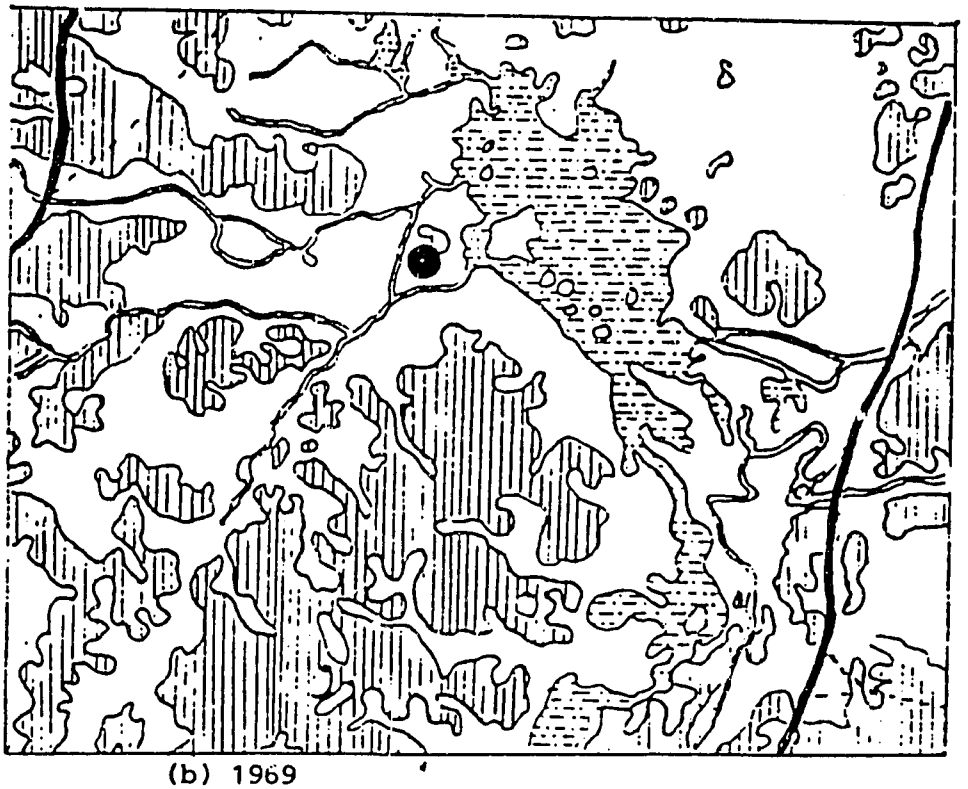


Figure 4. Block diagram showing topographic features and drainage patterns of Ban Hin Lad, Changwat Khon Kaen as prepared from the aerial photographs.

(Ratanasophon, personal communication)



(a) 1954



(b) 1969

Forest

Paddy field

Lake

stream

Road

Track

Village site

Figure 5. Changes in drainage pattern, water resource, area occupied by forest, and land use in Ban Don Chang, Changwat Khon Kaen as observed from the aerial photograph in 1954 and 1969

(KKU-FORD Socio-economic Studies of Rainfed Farmers Project, 1984).

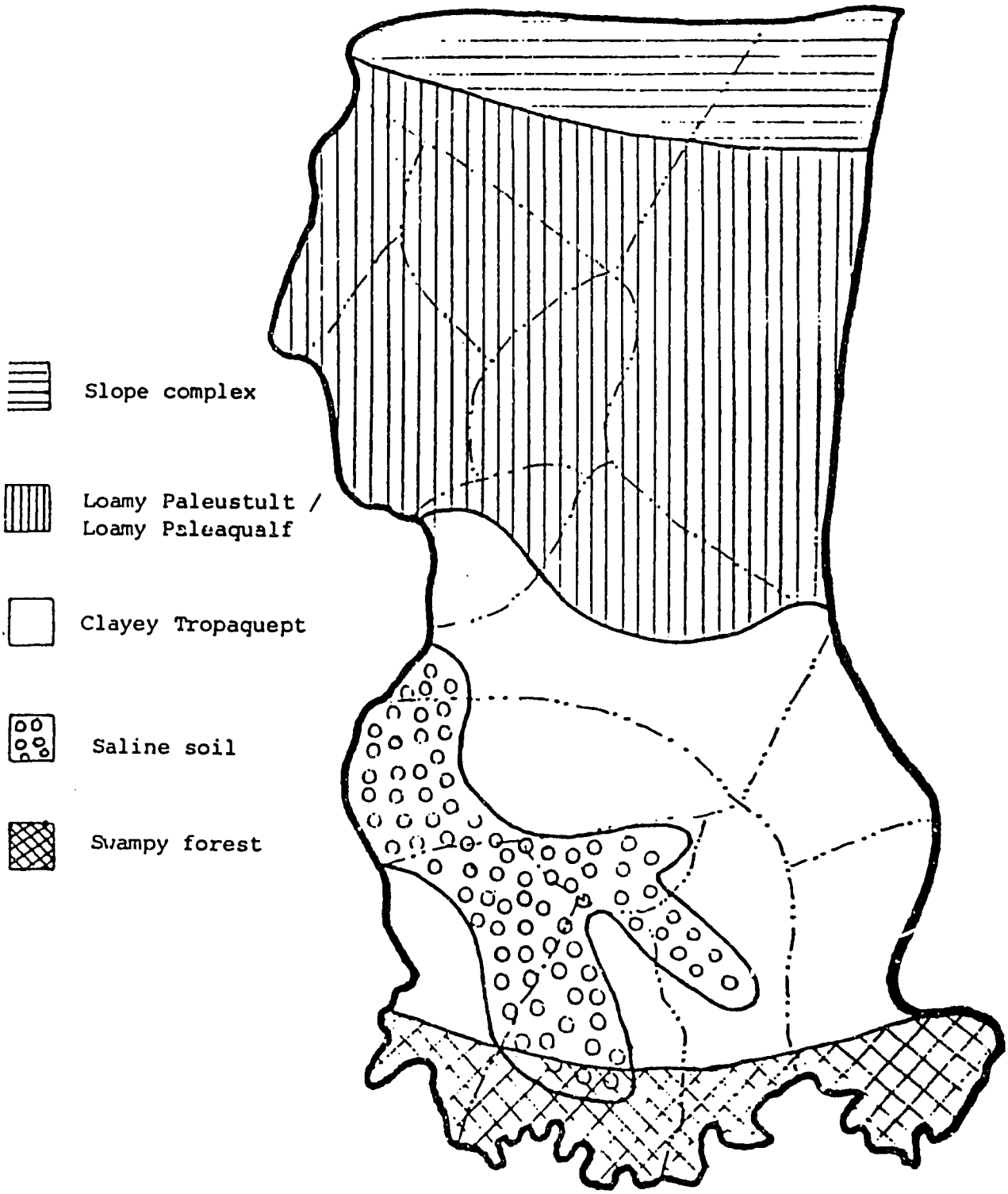


Figure 6. Soils of Tambon Po-Chai, Changwat Khon Kaen

(KKU-USAID Farming System Research Project, unpublished).

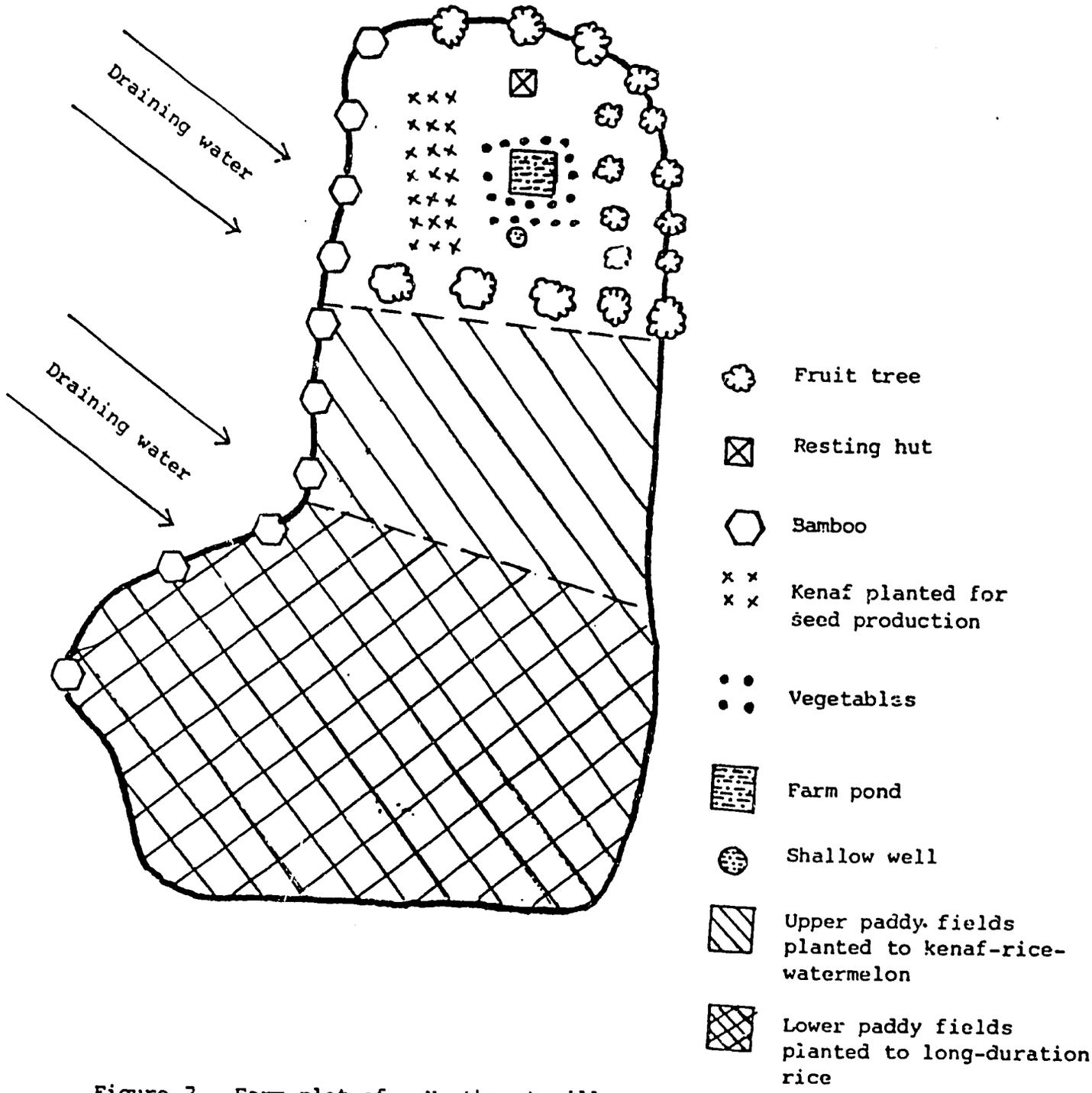


Figure 7. Farm plot of a Northeast villager displaying the current land use pattern

(Limpinuntana, unpublished)

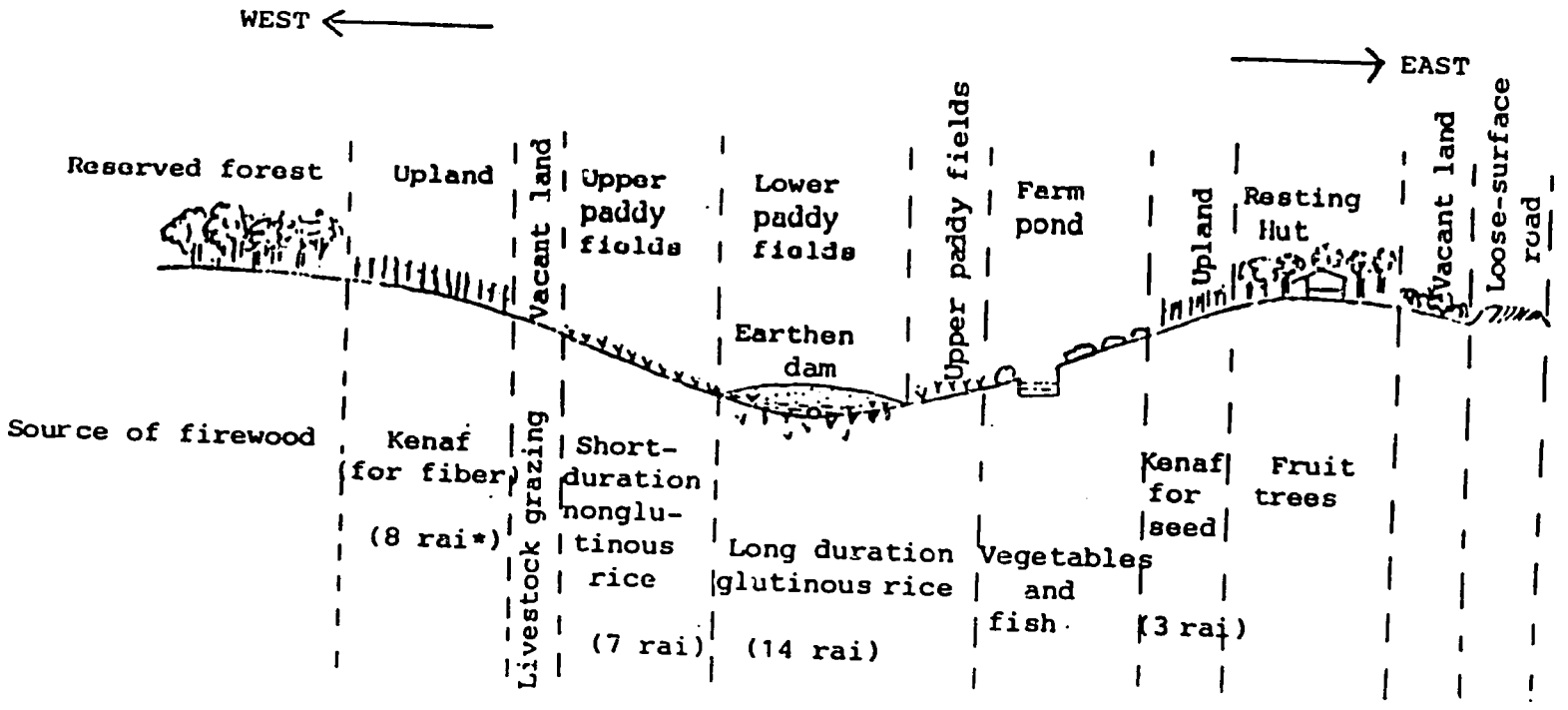
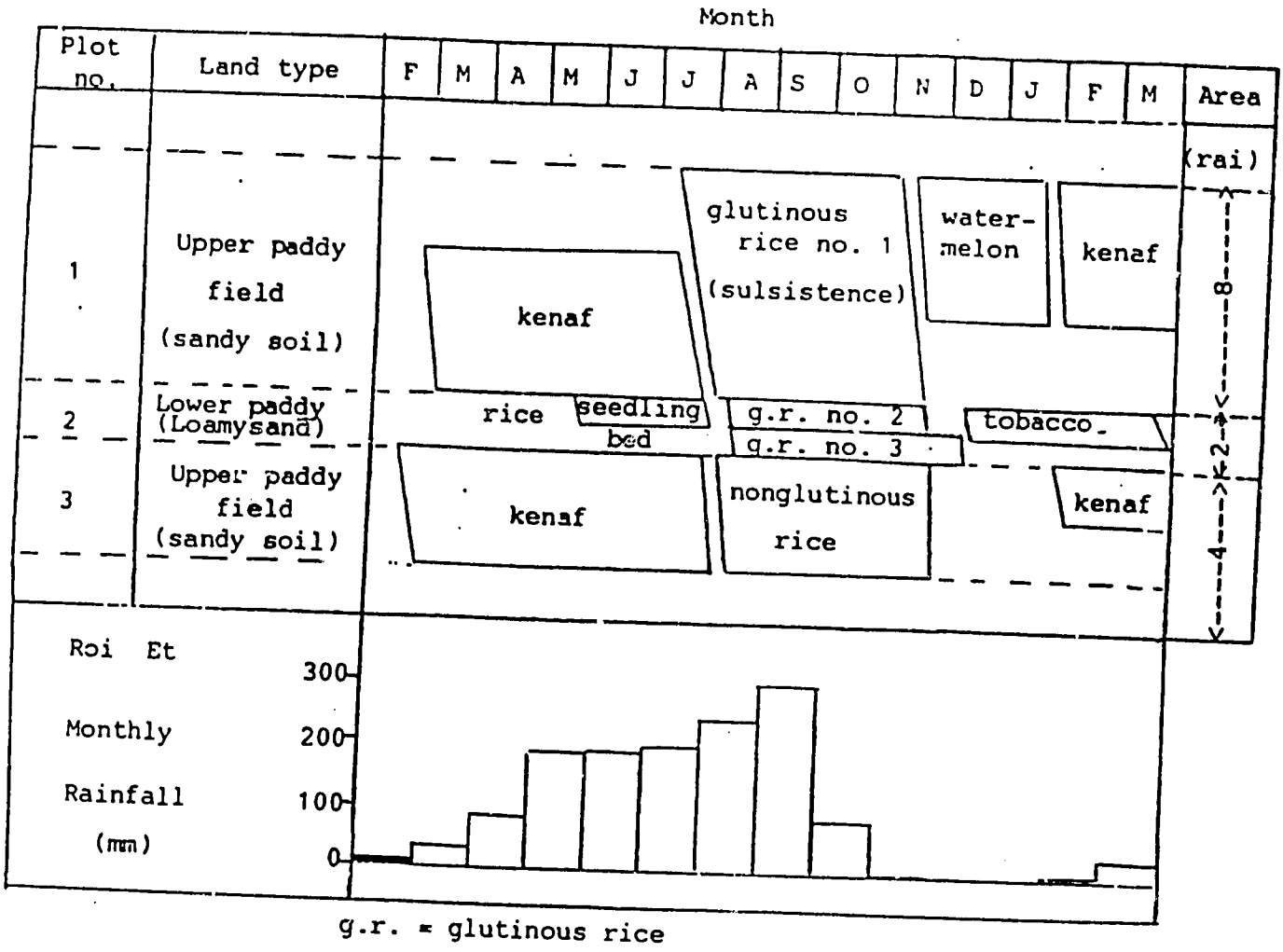


Figure 8. Transect of the undulating farm land of a Khon Kaen farm household (KKU-USAID Farming System Research Project (unpublished)

* 1 rai = 0.16 ha



g.r. = glutinous rice

Figure 9. Crop calendar of a farm household recorded at Tambon Nong Kaew, Changwat Roi Et in 1983 by the RAT* team of the Northeast Rainfed Agricultural Development Project

(Limpinuntana and Craig, unpublished)

*RAT = Rapid Appraisal Technique

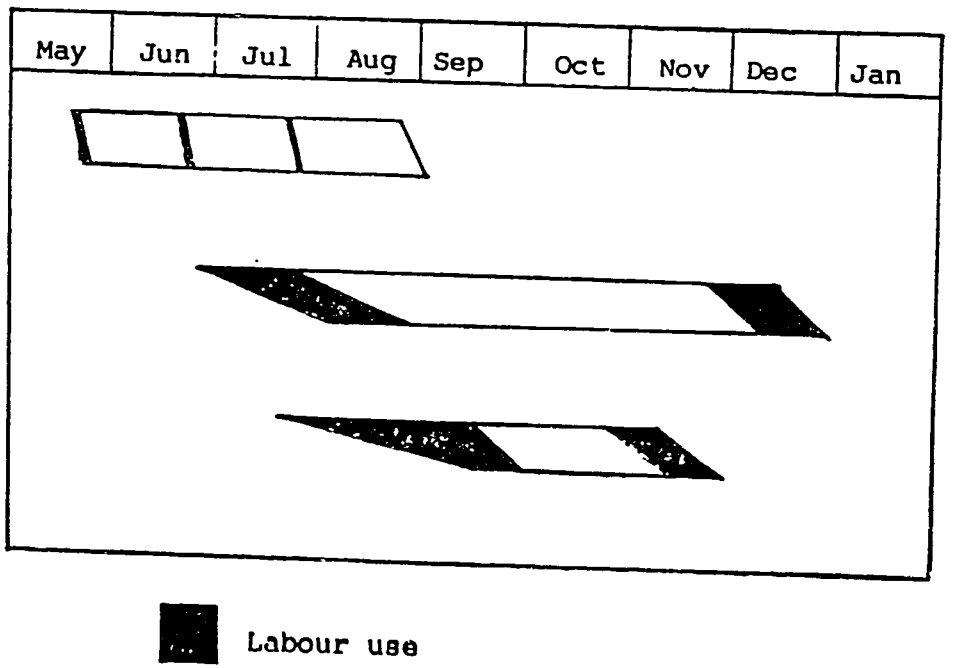


Figure 10. Rice growing calendar displaying the period of labour usage (Limpinuntana, unpublished)

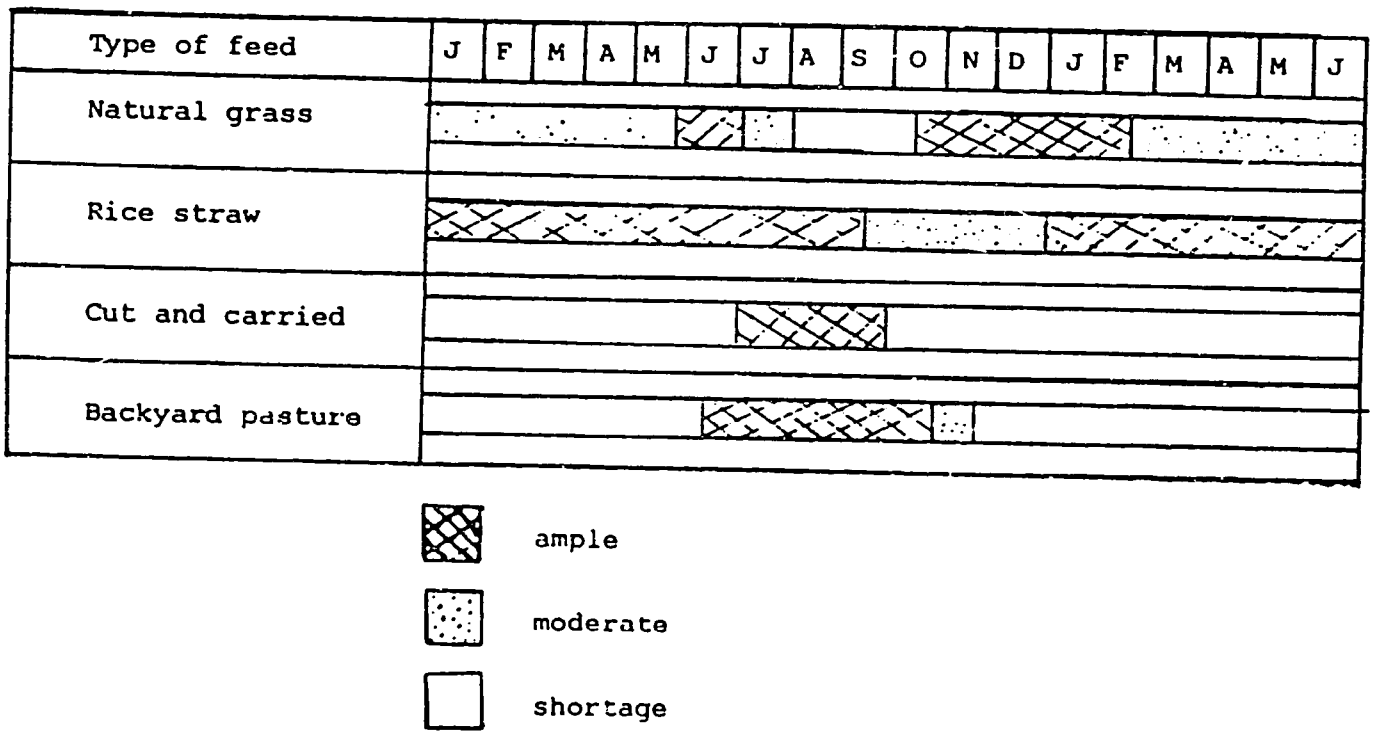


Figure 11. Seasonal availability of various type of livestock feeds in the Northeast Thailand.

(adapted from KKU-USAID Farming System Research Project, 1984 a and b)

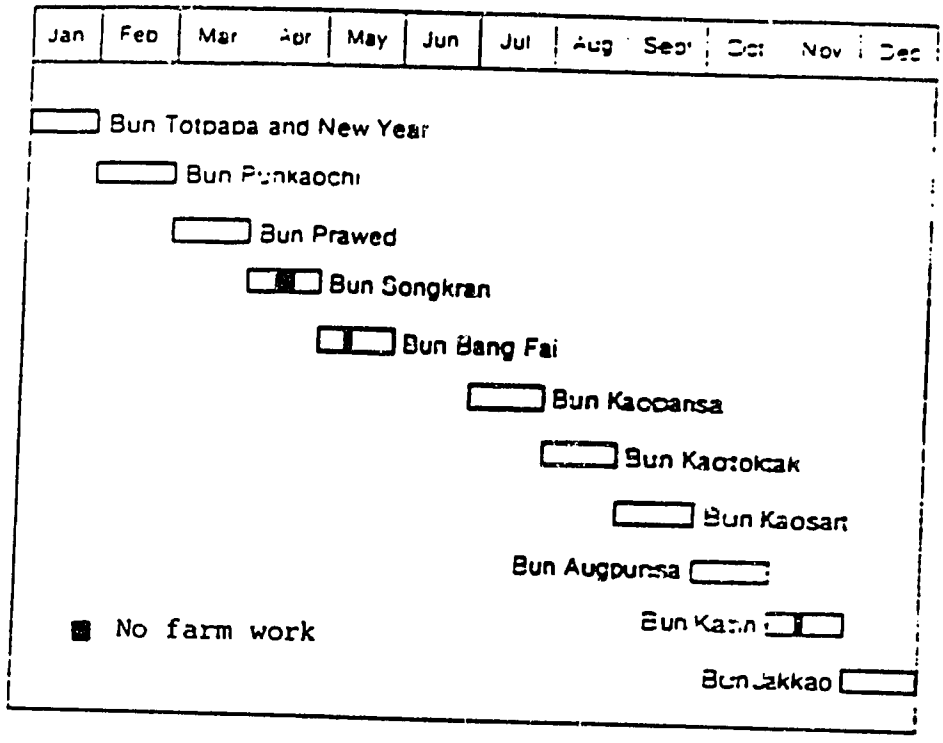


Figure 12. Monthly festivals of the Thai Northeasterners

(Polthanee, 1983)

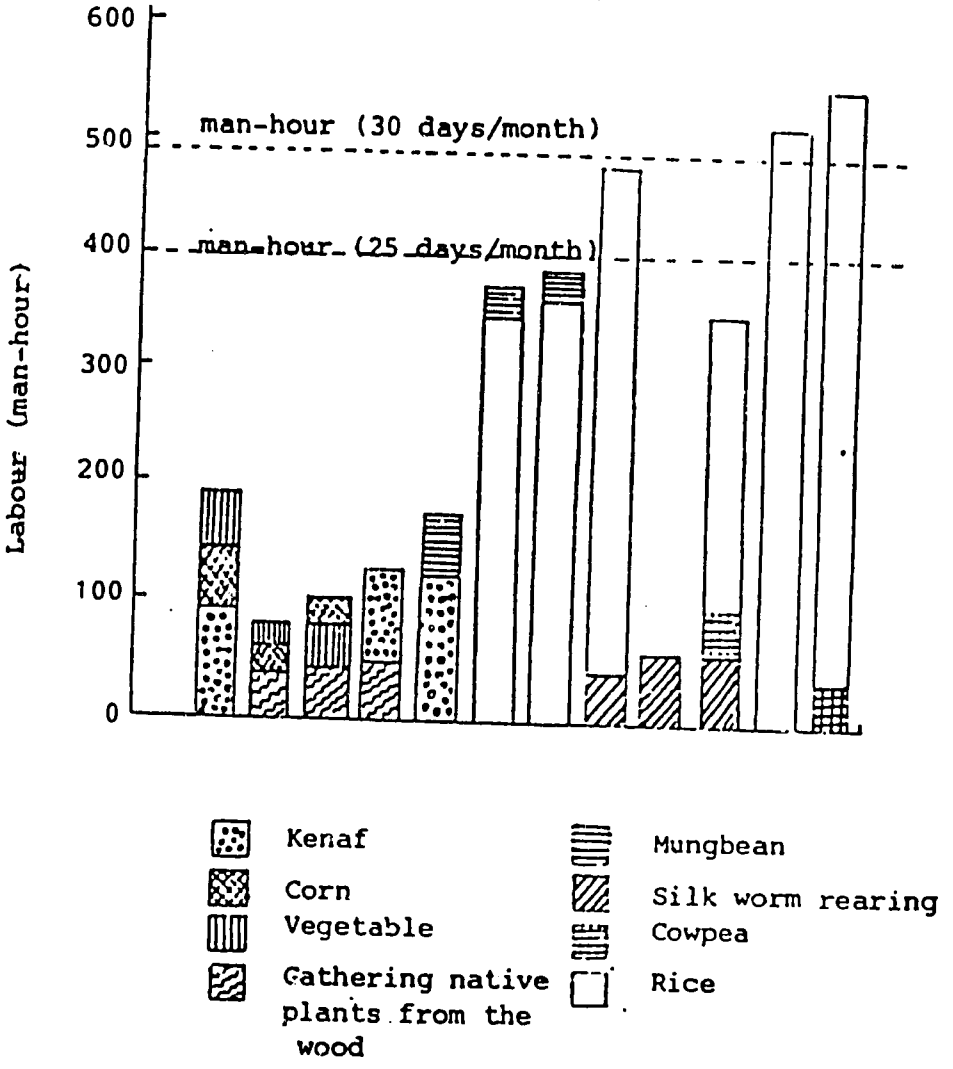
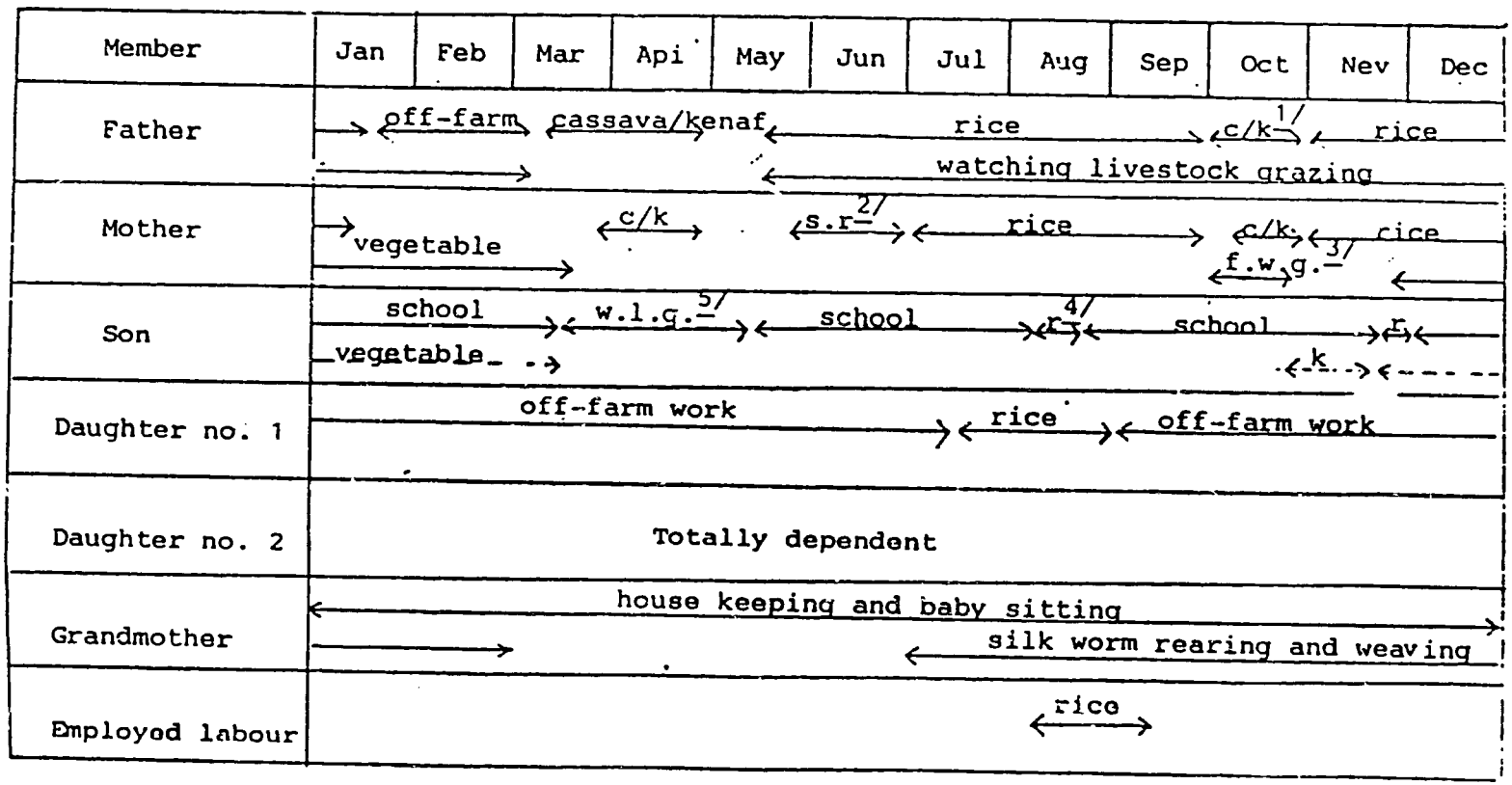


Figure 13. Seasonal labour schedule of a Khon Kaen farm household showing man-hour of labour use

(Limpinuntana, 1984)



1/ c = cassava, k = kenaf

2/ s.r. = silk worm rearing

3/ f.w.g. = firewood gathering

4/ r = rice

5/ watching livestock grazing

——— = full time

----- = part time

Figure 14. Seasonal labour schedule of members in a typical farm household of Northeast Thailand

(Limpinuntana, unpublished)

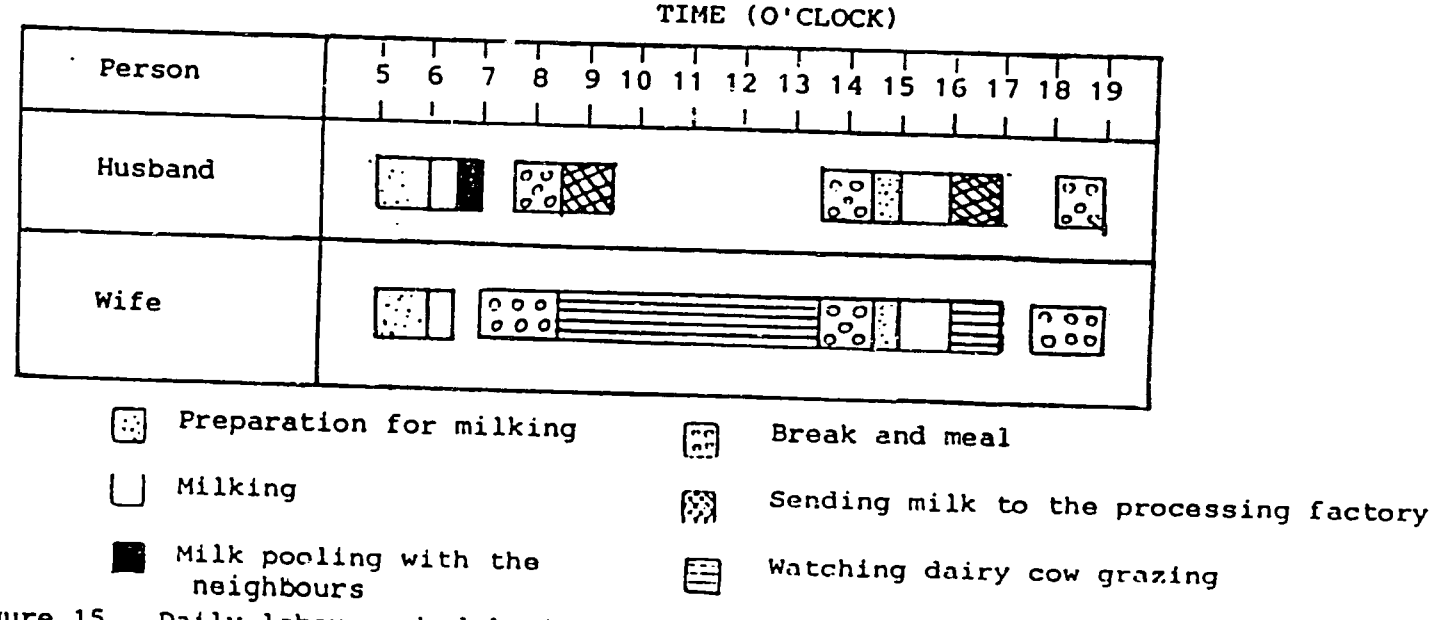


Figure 15. Daily labour schedule in dairy cows raising of a husband-and-wife team (KKU-USAID Farming System Research Project, 1984 a)

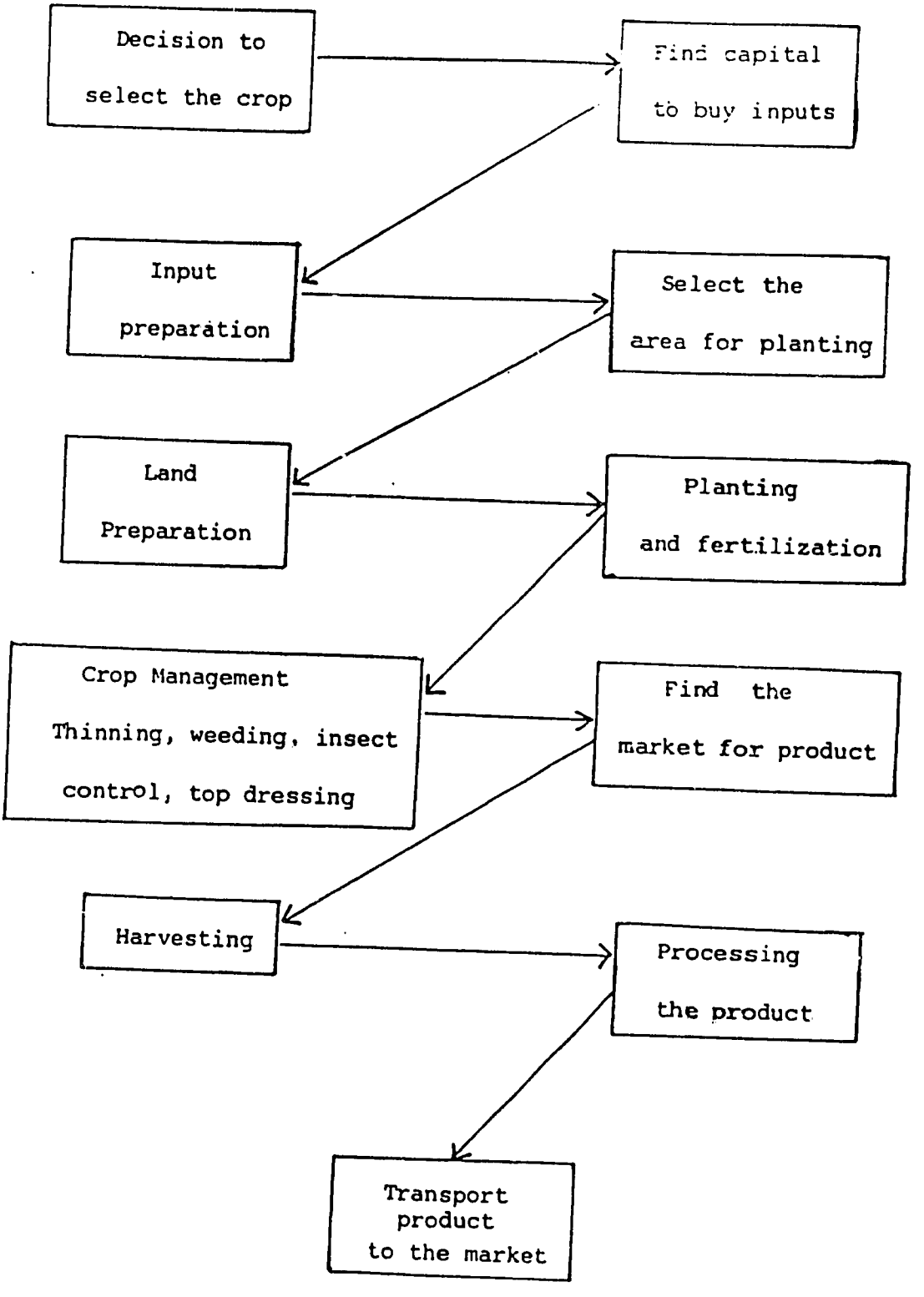


Figure 16. Detailed activity sequence on growing a commercial crop

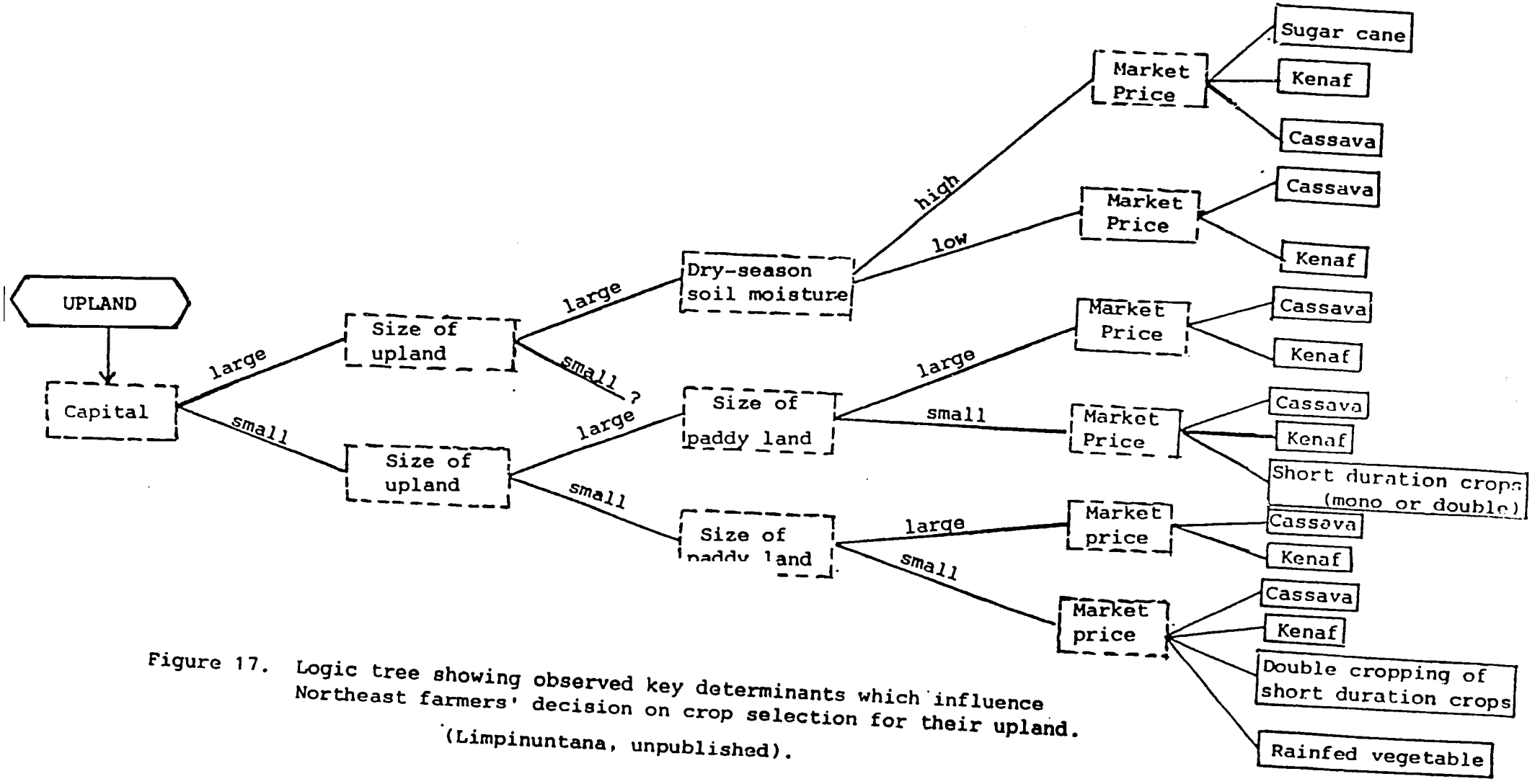
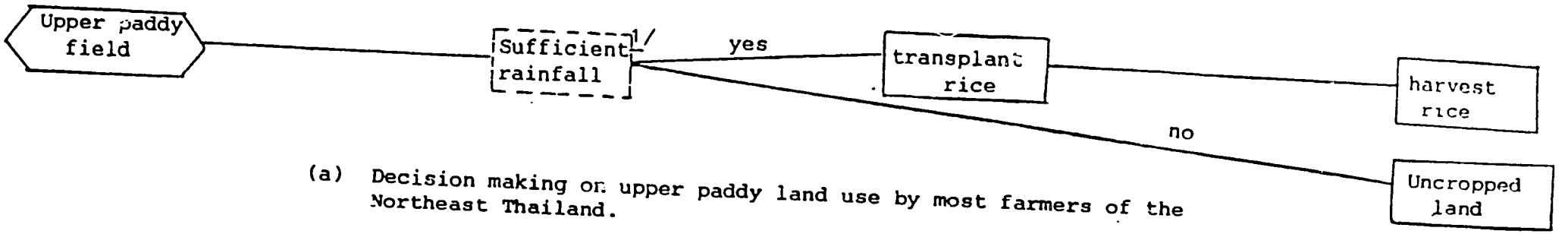
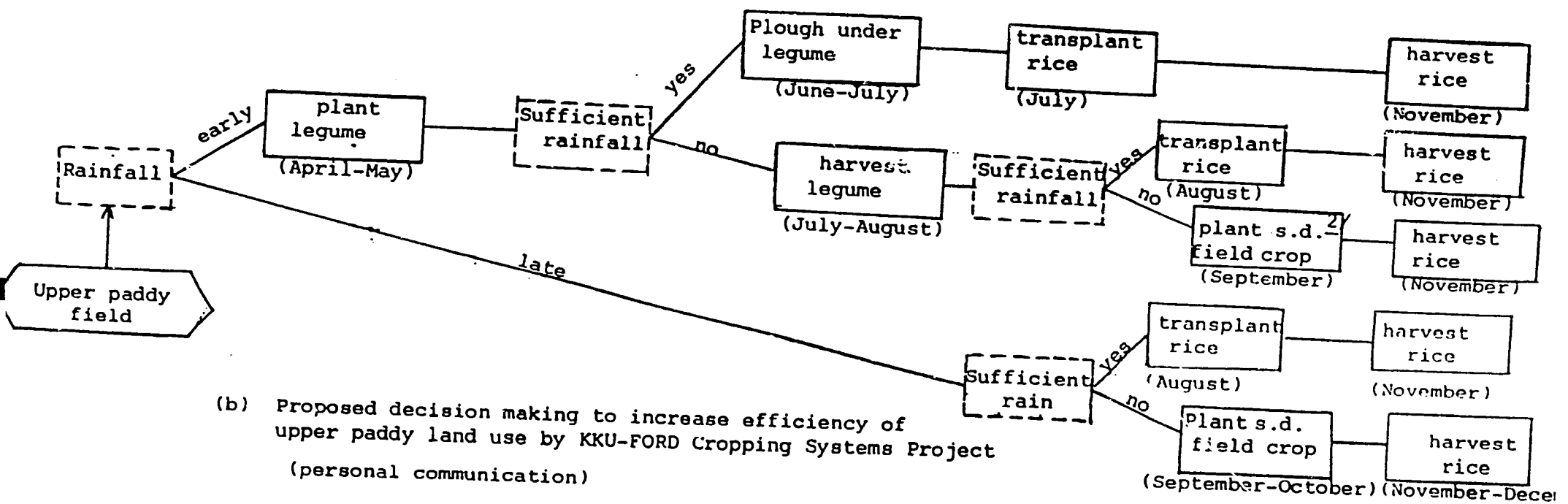


Figure 17. Logic tree showing observed key determinants which influence Northeast farmers' decision on crop selection for their upland. (Limpinuntana, unpublished).



(a) Decision making on upper paddy land use by most farmers of the Northeast Thailand.



(b) Proposed decision making to increase efficiency of upper paddy land use by KKU-FORD Cropping Systems Project

(personal communication)

Figure 18. Decision tree diagram showing decision making on upper paddy land utilization as based on rainfall pattern

1/ sufficient for transplanting rice

2/ s.d. = short-duration