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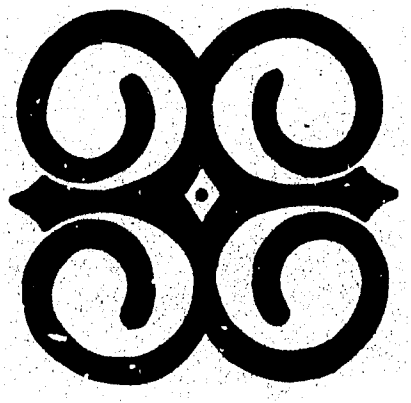

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Mapping and House-Numbering Methods in a Rural Health Project: Experience in the Danfa Project, Ghana

Monograph Series, Number 10

DANFA COMPREHENSIVE
RURAL HEALTH AND FAMILY PLANNING
PROJECT, GHANA

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FOREWORD

The Danfa Comprehensive Rural Health and Family Planning Project is a teaching, research, demonstration and service program initially developed by the Department of Preventive and Social Medicine of the Ghana Medical School in 1965 and implemented under contractual agreement with the School of Public Health at the University of California, Los Angeles, and the Agency for International Development in 1970. The eight year project is closely associated with other Ghanaian agencies and institutions such as the Ministries of Health, Social Welfare, and Finance, the Ghana National Family Planning Programme, and other University of Ghana departments.

The Ghanaian institutions have primary authority and responsibility for project administration. Ghanaian staff are hired by the institutions at prevailing terms of employment. All service costs are borne by the Government of Ghana as well as some of the training and evaluative costs. UCLA and AID are responsible for most of the research costs.

The project includes a longitudinal study of approximately 50,000 rural inhabitants, 10-50 miles from Accra. The project area has been divided into four sub-areas to investigate alternative methods of delivering health and family planning services, summarized in the chart below.

	Service Provided			
Area	Comprehensive Health Care	Health Education	Family Planning	Standard Health Services
I	Yes	Yes	Yes	Yes (equivalent)
II	No	Yes	Yes	Yes
III	No	No	Yes	Yes
IV	No	No	No	Yes

One of the principal goals of the project is to provide information about project activities and findings to concerned agencies on an ongoing basis to assist in health planning. A project monograph series has been developed to aid in this information sharing process, and we hope that the data contained in these papers, although often preliminary in nature, will prove useful to those involved in the project and to others interested in obtaining current information on rural health projects in developing countries.

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Mapping and House-Numbering Methods in a Rural Health Project: Experience in the Danfa Project, Ghana

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Introduction

The Danfa Comprehensive Rural Health and Family Planning Project* has been conducting research in southern Ghana since 1970.[1] This report describes our experience in mapping 310 villages and hamlets located in four research zones in a 250 square mile area (Figure 1). The majority of the 60,000 person population live in villages containing 100-400 persons; none of the villages is larger than 2000 persons.

Each year since 1971 the project has conducted a census of all 10,000 households,[2] and since 1972 there has been a series of long-term surveys designed to collect information about attitudes, practices, and health status.[3,4] We therefore needed detailed village maps to enable project interviewers to locate assigned households in this large area. Our experience in preparing village maps and numbering houses, particularly a combined mapping-house numbering method developed after several months of field operation, should be useful to investigators operating rural surveys in other developing areas.

Background

The four research areas are located within a fifty mile radius of Accra. In early 1971 we needed to map and number houses in four research zones each of which contained approximately 15,000 persons. The baseline population census was scheduled for late 1971, to be followed by the first of a series of

*Supported in part by USAID Grant AID/CM-afr-IDA-73-14.

longitudinal household interview surveys involving 2000 households, beginning in early 1972.

Two types of maps covering the project area were available. We initially reviewed Survey Office maps published in Accra. These used a 1:62,500 scale (1 inch = approximately 1 mile) and were based on ground surveys conducted until 1942, with intermittent revisions since then. While these maps showed major roads, large towns, and physical landmarks (rivers, streams and prominent hills), only one-third of current villages were shown, and many of these have names which differ from those printed on the map. Also available were enumeration area sketches used during the 1970 Ghana National Census. Census maps showed only the largest communities, local physical landmarks, and a boundary to set off an enumeration area containing about 700-1000 persons. Such maps were inadequate to help project interviewers find individual houses located in isolated villages during repeat surveys over a six year period. It was clear we would have to make our own maps which would show each village and hamlet in the project area and the location of every numbered dwelling place before the baseline census.

Initial mapping procedures

Several stages were involved in planning and conducting the mapping and house numbering exercises.

1. Planning. The sequence of activities used to map and number houses is shown in Figure 2. After reviewing the available maps to determine their utility for field interviewing, we met with each district administration officer to explain the objectives of the Danfa Project and the need for accurate village maps and household identification. The district office prepared letters of authorization which permitted project teams to paint house numbers on dwellings, and which requested village leaders' cooperation in the activity. Local community development officers in some areas were able to help by compiling lists

of villages known to them. These officers also contacted village leaders to distribute the official authorization letters and answer any questions. The survey coordinator made arrangements to obtain mapping and paint supplies, transportation, and rooms where final drafts of village maps could be traced. At the end of the mapping exercise, the coordinator sent sets of maps and village house number lists to authorities for their district office's use.

2. Training of mappers. The initial group of mappers had middle school educations and were fluent in two or more of the local languages. Since field work required travelling long distances on foot in all kinds of weather, physical fitness and adaptiveness were required of mappers. The training course gave mappers an orientation to the Danfa Project and stressed the need to establish and maintain good relations with villagers. Few villagers had heard of the project, and some were apprehensive about the potential use of house numbering as a basis for taxation purposes. It was important that mappers be aware of these concerns since they were often the first project staff to contact the villagers.

No previous mapping experience was required, since the necessary skills can be learned quickly. Technical training was done by experienced mapping supervisors at the Survey Office, Accra, during a two week course. Mappers first prepare rough notebook sketches of villages which accurately depict the relationship of each dwelling to major physical landmarks such as roads, footpaths, or rivers. These are not drawn to scale, but careful orientation to landmarks is required. After learning how to make these preliminary sketches, mappers were taught to transfer the information to a sheet of grid paper, where additional details were drawn. The field supervisor then checked each completed grid paper map for accuracy of house location and details. Several mappers with above average drafting skills were assigned to the project base

office, where final maps were to be traced from grid paper maps and blueprint copies made for interviewer use in the field.

3. Mapping procedures. Project mappers made detailed maps showing every village structure, even those buildings under construction (U.C.) or in ruins, as well as the type of vegetation and rubbish dump (R.D.) sites. Figure 3 shows an example of structural outlines for each building and the use of key symbols. These detailed maps are interesting because they reflect much of the culture in rural communities: the appearance of both new and collapsed dwellings suggests the occurrence of dynamic changes. The maps also give valuable information about the composition of a community -- its markets, schools, churches and other land uses. Such details are valuable for community development programs and sociological research, but experience showed that excessive time was involved to produce such maps for the large number of villages under study. Furthermore, the only essential map information was house location related to physical landmarks which could be recognized by interviewers on foot. Using the detailed mapping procedure we fell considerably behind the expected time schedule for mapping in the first three areas, so thereafter simplified mapping was developed and used in Area IV (Figure 3).

4. House numbering. We needed to number each occupied dwelling or compound so that accurate identification would be obtained during sample checks conducted to validate initial mapping information. There were two main considerations in placing numbers on houses. The first concern was to use a numbering method which would be acceptable to the residents. Villagers living in isolated hamlets were unfamiliar with house numbers, although most residents of larger towns had experienced house numbering during the 1970 census. Fears about numbers as a basis for assessing farm income or levying taxes were allayed by advance discussions with community leaders to explain the project's objectives and the

necessity of numbering and mapping to help achieve those objectives. When we explained to the villagers that interview information collected by the project over a several year period would be used to plan health programs, they readily accepted house numbers. Each mapper was trained to greet household members and explain the reasons for numbering houses. These efforts were successful; only one house owner in over 6000 structures has been unwilling to have his house numbered.

It was also essential to find a painting method which would last for at least eight years (the planned project duration), and which would produce numbers readily visible to field interviewers. We needed to distinguish project numbers from old census numbers remaining on many of the houses. Wooden plaques were considered too cumbersome and easy to remove. We noted that black census numbers painted on mud-walled houses seemed to form a good bond because numbers stood out in base relief, while unpainted adjacent mud surfaces had been eroded away by rain. To provide a stable surface for painting numerals on mud-walled houses (about 80% of all dwellings), a one-square foot patch of white paint was first applied. This set rapidly so that black identification numerals could be added almost immediately. (Figure 4)

Number squares were located on walls facing main roads or paths through a village, so that an interviewer can readily locate an individual house. We did not use doors or shutters since in the tropics these are frequently swung open which would obscure a number. When possible the square was placed high on the wall under an overhanging roof to provide increased protection from rain. The use of black numbers on a white paint background has provided an excellent contrast and facilitated recognition. After five years of weathering, the original numbers are still clearly legible and there has been no need for repainting.

Sequencing house assignments was important, since in several surveys we used systematic sampling which requires that serial numbers are evenly distributed throughout the village (Figure 3). The first house's number, 001, was placed on a dwelling at one end of the village; subsequent house numbers were assigned along a linear pattern, such as along a road or other major landmark. As house numbers were painted onto houses, a house number checklist was ticked off to minimize duplication and gaps in numbering. These house numbering methods have worked well in the Danfa Project and subsequently were used in other rural projects in Ghana conducted for United Nations demographic information in the Volta Region and in the World Health Organization program at Kintampo, Brong-Ahafo Region.*

5. Revision of maps. During the first five years of the project there has been considerable change in the number and location of houses, since many mud-walled homes collapse during the rainy season, and new houses are built during the off-farming period. To account for these changes, master maps stored at the base office are updated by information obtained from interviewers in field surveys and annual census operations. A house number list is kept current for each village and contains information about occupied houses and their project identification numbers. Numbers used on houses which have since been abandoned or collapsed are never reassigned and new dwellings receive new numbers.

Problems in mapping

As described above, the original technique of drafting detailed field map sketches entailed too much time. There was also a low output of completed maps by tracers at the base office. This delayed subsequent production of

* The Volta Region Survey was conducted by the Institute for Statistical, Social and Economic Research, University of Ghana, Legon, while the Kintampo Project involved the Ministry of Health.

blueprints for use in the field and began to threaten the project's time schedule for starting census activities.

Two factors were found to cause the low output of completed maps. Only temporary employment positions were offered to mappers so that they were highly motivated to make the work last as long as possible. To achieve a more adequate level of activity, effective supervision was required. In addition, marked delays in field work due to insufficient quantities of paint, poor transportation planning and inadequate housing accommodations affected the output of the initial field maps. A senior project advisor was assigned to the mapping operation to identify and correct these problems. A minimum weekly number of finished maps per mapper was set, taking account of the size and complexity of villages. Map-tracing output was immediately increased fourfold. The advisor also spent two months in the field to train several supervisors who then assumed the field supervision responsibilities.

Combining the mapping and numbering operations

The first three areas took much longer to map and paint than originally anticipated; nine months were needed to map and number these areas using a two stage procedure (Figure 2). After an area's maps were completed, a separate team began to paint house numbers. Area IV was designated by the Danfa Project as a control population whose health status would be compared to study populations receiving a variety of medical programs in the first three areas. Baseline census information in Area IV was needed quickly to select a sample for the household interviews scheduled in early 1972. Therefore, we decided to combine the mapping and house-numbering stages into a single operation in Area IV.

First, we obtained survey maps which covered the proposed Area IV and showed the major roads and largest villages. The field coordinator and two

mappers then made a two-day reconnaissance trip to see if the geographic features and environment were similar to the other three areas, estimate the size of the population, and gauge the suitability of the area for project studies. There were four large roads passing through the potential area: as we drove along these we measured the distances between roadside towns by vehicle speedometer and recorded the approximate number of houses in each village which could be seen from the road. Every few miles we asked a local resident to ride with us to show us where villages and hamlets away from the road were located. These volunteers also supplied us with village names and gave us an estimated number of houses in communities located off the roads. For example, we would point at a pathway leading off the main road and might be told that a twenty-house village was located about fifteen minutes' distance by foot. We recorded this information on the survey map.

From earlier work in the other project areas, we knew that an average house contained about 10 residents.[2] Therefore we estimated that about 1500 houses would be required to achieve the desired reference population of 15,000 persons. A tally was made of the cumulative number of estimated houses as we conducted the reconnaissance, and when we reached 1500 houses we prepared tentative Area IV boundaries and set up a time schedule to begin the combined mapping/numbering operation. The district community development officer then contacted village chiefs to describe the project and explain the mapping and numbering operation. Subsequent census figures revealed that the original population estimate obtained by a quick-count estimate during the reconnaissance by vehicle was within 10% of the actual population total.

The mapping procedure was then simplified by using plain rectangles to indicate occupied dwellings and a few major landmarks (Figure 3). The use of plain rectangles saved considerable mapping time and placed more emphasis on

spatial relationships and approximate distances. Houses located in adjacent hamlets or isolated single dwellings were not shown in detail on maps. Instead the path leading to the hamlet, its approximate distance in yards, and the house numbers contained were shown on the village map.

The field mapping team in Area IV consisted of two supervisors and four two-man teams. There was a mapper and one person to paint house numbers in each team. When the team entered a village, they went to the chief to explain the purpose of the mapping procedure and to request permission to proceed. Mapping teams carried extra copies of the letter of authorization in case they had not been received by the village chief. A notebook sketch of the village layout was drawn and a white patch painted on each house. While the painter went through the village and put white patches on house walls on a surface readily visible to future interviewers, the mapper prepared his preliminary map and made tentative number assignments, starting with residences at one end of a village. Then the painter and mapper together went through the village a second time to paint the black address numbers. The mapper checked each house number as it was painted against a household number checklist (Figure 4).

The combined mapping-numbering operation had two clear advantages over the original method of using separate teams for these activities. Considerably less time was required, which reduced cost in manpower and vehicle requirements. A cost comparison between the two-stage and combined operation is shown in the appendix. The accuracy of mapping was also improved: in the combined method, there was a better match between the actual house number and that shown on the map. The coverage of existing dwelling places was very high. During the subsequent household census, only a few isolated unmapped houses were discovered.

Recommendations

In experience gained during the past five years in the Danfa Project, Ghana, we have found that neither available survey maps nor national census enumeration area maps were satisfactory for helping field interviewers locate smaller villages and individual houses as required in a long-term research project. Survey maps were made on such a large scale that only one-third of villages identified during project field work were shown, and village names and roads were frequently out of date. Census enumeration maps are not detailed enough to guide an interviewer to dwellings, since they show only large communities and are intended primarily to show boundary lines enclosing an estimated population of 700-1000 residents.

We recommend the use of a simple village map which contains only the information needed for interviewers to locate individual households. This information includes key landmarks and occupied dwellings, which can be shown as a rectangle with the house's identification number. More detailed maps, while valuable for sociological studies, were found to take too much time and tended to focus a mapper's efforts on minutiae and artistic skills rather than accuracy.

We also recommend that village mapping and house number painting be done simultaneously. This markedly reduced time and cost, and improved mapping accuracy. The use of a white paint square on mud-walled houses with superimposed black numbers has remained clearly legible for five years. These mapping and numbering procedures have been successfully used in other rural areas of Ghana, and should be effective in other field projects as well.

References

1. Belcher, D.W., Neumann, A.K., Wurapa, F.K., Nicholas, D.D., Ofosu-Amaah, Amaah, S. (1975): "The Role of health survey research in maternal and child health/family planning programmes: Danfa Project, Ghana." J. Trop. Ped. Environ. Child Health, Vol. 21, No. 4, 173-177

2. Kpedekpo, G.M.K., Asuming, K., Blumenfeld, S.N., Wurapa, F.K., Belcher, D.W. (1975): "An analysis of the characteristics of households, household size, household heads, and the relationship within the household." Danfa Project Monograph Series, No. 8, School of Public Health, UCLA, Los Angeles, California 90024.

3. Belcher, D.W., Wurapa, F.K., Neumann, A.K., Lourie, I.M. (1976): "A household morbidity survey in rural Africa." Int. J. Epid., Vol. 5, No. 2, 113-120.

4. Belcher, D.W., Neumann, A.K., Wurapa, F.K. (1976): "Comparison of morbidity interviews with a health examination survey in rural Africa." Amer. J. Trop. Med. and Hyg., in press.

Appendix: Comparison between a two-stage and combined mapping and house numbering method in a 1500 house research area.

Resources	Method used to map and number houses			
	Two stages		Combined operation	
	Unit	Cost $	Unit	Cost $
Time in field	12 weeks	--	7 weeks	--
Field personnel	18	3510	10	1138
Vehicles	2	2400	1	700
Supplies	--	275	--	275
Map blueprints	--	90	--	90
Total		$6275		$2203

Figure 1 Location of the Danfa Project, Ghana

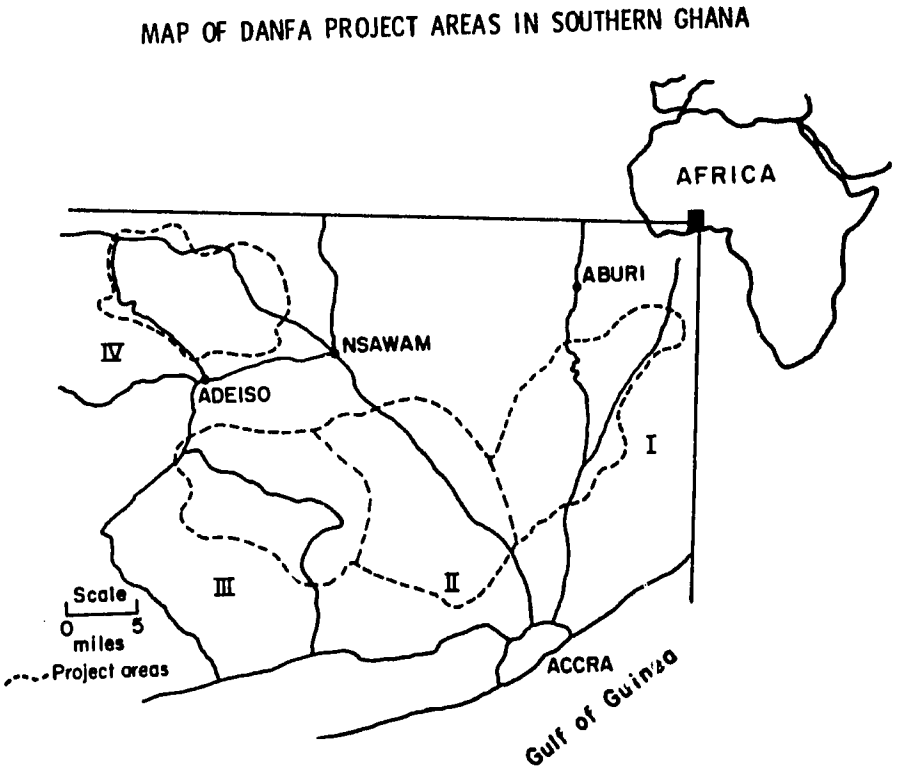
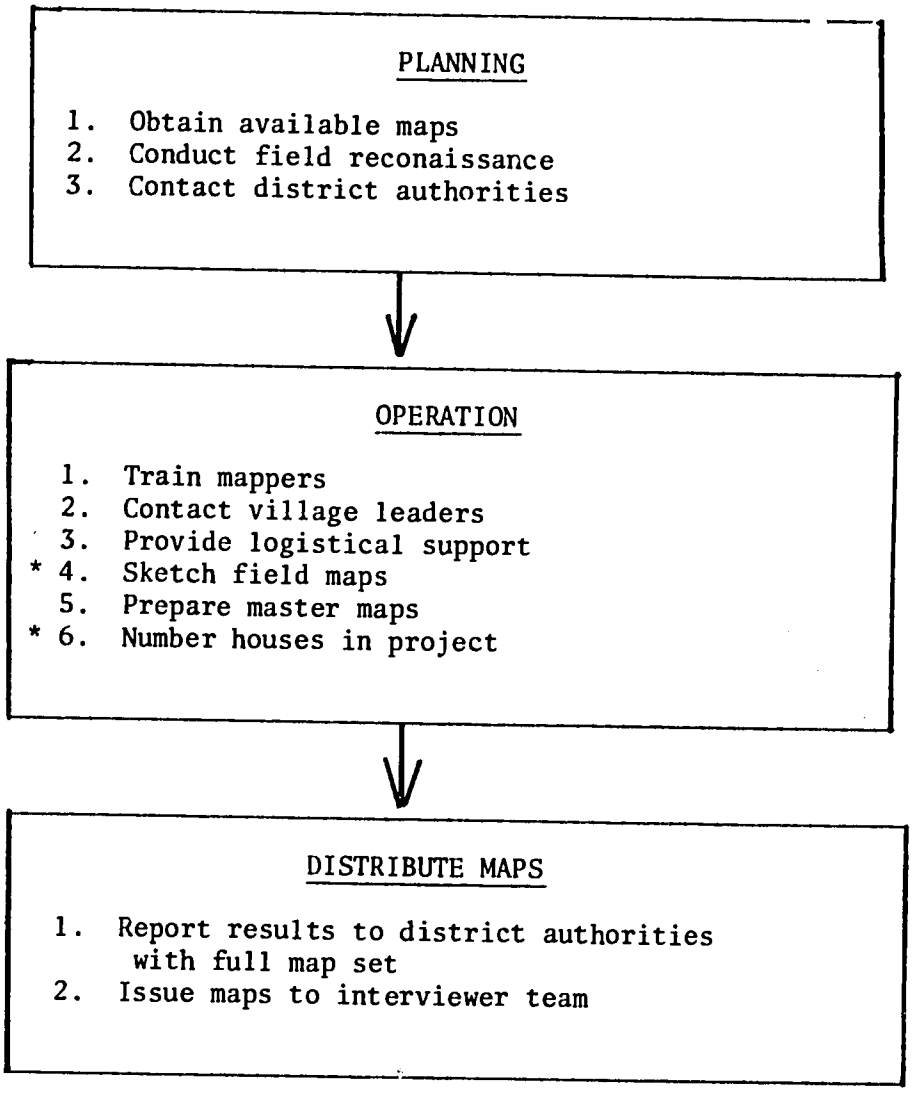


Figure 2 Sequence of field activities used to map and number 310 rural villages in the Danfa Project, Ghana



* In Area IV mapping and house numbering activities were combined.

Figure 3 Village map - detailed and simplified versions.

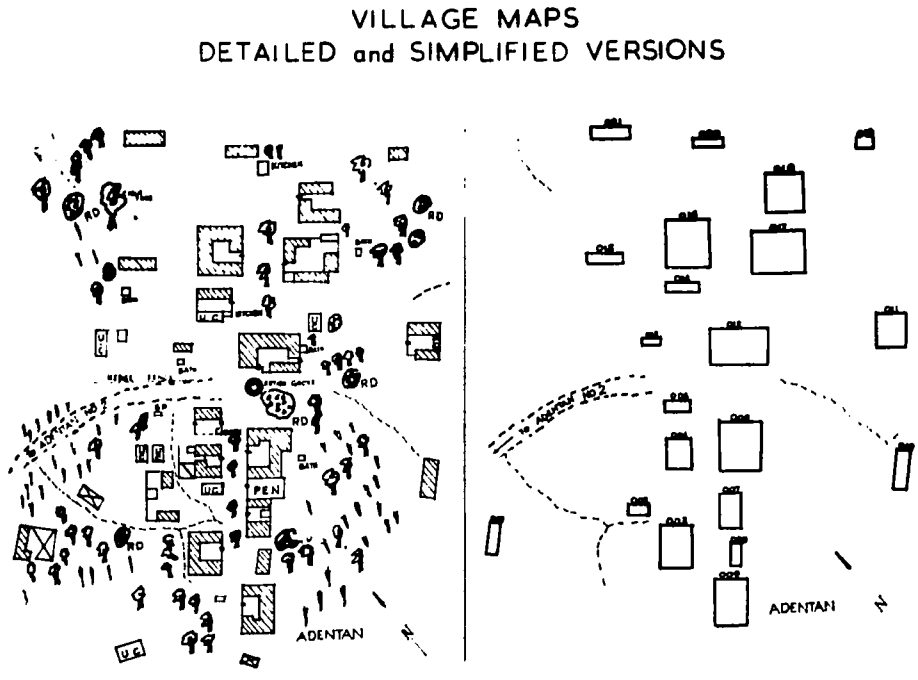


Figure 4 Painting house number, Danfa Project