

---

# HOW THE OTHER HALF BUILDS

## Volume 1: Space

Witold Rybczynski  
Vikram Bhatt  
Mohammad Alghamdi  
Ali Bahammam  
Marcia Niskier  
Bhushan Pathare  
Amirali Pirani  
Rajinder Puri  
Nitin Raje  
Patrick Reid

Research Paper No. 9

December 1984

Centre for Minimum Cost Housing, McGill University, Montreal

---

This study was prepared with the financial assistance of the Special Programs Branch of the Institutional Cooperation and Development Services Division of the Canadian International Development Agency.

First Edition, December 1984.  
Second Edition, June 1990.

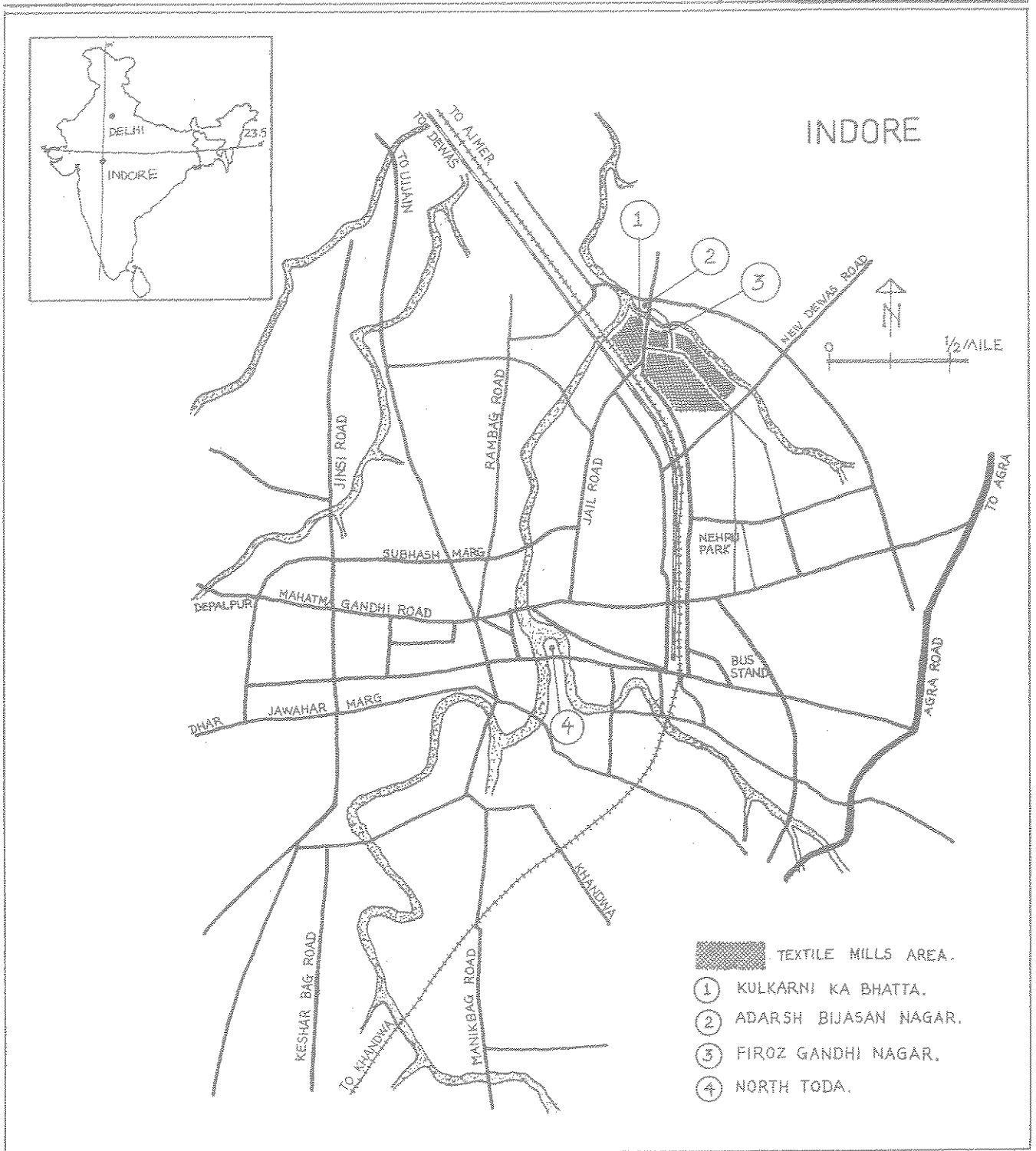
Additional copies available from:

Centre for Minimum Cost Housing  
School of Architecture  
McGill University  
Macdonald-Harrington Building  
815 Sherbrooke West  
Montreal, PQ, Canada H3A 2K6

T A B L E   O F   C O N T E N T S

INTRODUCTION.....	1
1. HOUSE EXTENSIONS.....	3
2. WORK PLACES.....	21
3. SMALL SHOPS.....	33
4. TREES.....	43
5. PUBLIC STRUCTURES.....	59
6. VEHICLES.....	69
7. ACCESS STREETS.....	77

Unless otherwise indicated, all plans and sections are drawn to 1:100 scale; location plans are 1:1000.



The physical survey on which this study was based were carried out in June 1984 by Vikram Bhatt and Bhushan Pathare. Site surveys were conducted in four informal sector settlements in the Indian city of Indore: Kulkarni Ka Bhatta, North Toda, Firoz Gandhi Nagar and Adarsh Bijasan Nagar.

# Introduction

As a result of the rapid and extraordinary growth of Indian cities such as Bombay and Calcutta, as well as of many smaller centers, the shelter problems of the urban poor in less-developed countries have increased in scale, and in severity. Conventional resources have become stretched to the limit and are now insufficient to deal with this situation, with the result that most low-income urban housing in India has been provided by the so-called informal sector, which exists, and thrives, outside the traditional market economy. The informal sector, which can be found in every less-developed country, is characterized by decentralization and fragmentation, flexibility and by the small scale of its entrepreneurial activities. Informal sector housing has been affected by a number of factors: large families, economic decisions and trade-offs which are complicated by the fact that there are usually many wage-earners, and sporadic incomes. Unlike conventional housing, the housing of the poor almost always combines living and working activities.

Despite its often spontaneous and improvised character, the informal sector has provided virtually the only delivery vehicle which has had any success in providing appropriate, low cost solutions to the shelter problems of the urban poor. The aim of the Centre for Minimum Cost Housing has been to understand this new phenomenon, with a view to developing technologies and methodologies that will be suitable to application in the context of these new circumstances.

Existing informal sector housing, often termed slums, represents a solution rather than a problem. It is, moreover, a solution that appears to deny conventional planning orthodoxy. The

priorities of the slum-dweller are frequently not those of the municipal authorities. Space takes precedence over permanence. A porch may be built before a bathroom; a work place may be more important than a private bedroom. The apparent inversion of values is especially evident in the public spaces. Whereas planned sites and services projects usually incorporate rudimentary, minimal circulation spaces, the public areas of slums are characterized by richness and diversity.

There is nothing basic about "basic housing"--an inaccurate and misleading term. Architects and planners are only beginning to understand the complexity of the housing requirements of the urban poor. Present-day "standards" are a poor tool indeed in this process. They reflect a view of optimal solutions that is not only culturally inappropriate but also inadequate. A new set of settlement standards needs to be evolved. These standards should seek to accommodate, rather than to reorganize. They should reflect the (sometimes harsh) reality of the urban poor, and they should respond to their special needs, not to an idealized set of criteria.

How to begin? Surely, by looking at how the poor actually live. This study is the result of site surveys carried out in June 1984 in four slums in the city of Indore--Kulkarni Ka Bhatta, North Toda, Firoz Gandhi Nagar and Adarsh Bijasan Nagar. The physical survey involved daily visits to these settlements, the preparation of measured drawings of selected locations, accompanied by observational notes and, in most cases, photographs. This raw material was later analyzed, redrafted and assembled into its present form. This work was done at the Vastu-Shilpa Foundation, in Ahmedabad, and at the

Centre for Minimum Cost Housing, in Montreal.

This first volume is part of an on-going project that is studying the physical performance of informal housing in less-developed countries. This study includes spatial requirements, low-cost construction materials, and non-conventional servicing and infrastructure technologies. We have been carrying out such a study of popular settlements in India, and we intend, in the future, to expand our activities to a selected number of urban settlements in other less-developed countries.

The current planning methodology of site and services projects recognizes the distinction between house plots and circulation spaces, but does not deal effectively with the diversity of the activities that take place in the "street." In addition to accommodating movement, the street is a place of work, shopping and commercial activity. It is the setting for social and religious functions. We have also observed that a great variety of domestic activities take place outside the plot proper.

We have examined these activities, and the spaces that they occupy, under the following headings:

1. HOUSE EXTENSIONS
2. WORKPLACES
3. SMALL SHOPS
4. TREES
5. PUBLIC STRUCTURES
6. VEHICLES
7. ACCESS STREETS

House Extensions take different forms, and represent a mediating zone between the house and the street. Another kind of space is the **Workplace**. A wide range of commercial activities take place in

and around the home, and require different sorts and sizes of space. Related to income-generation, likewise, are **Small Shops**, booths and kiosks, frequently a part of the dwelling or attached to it.

Streets and other public spaces are greatly influenced by the presence of **Trees**, which have physical, social and sometimes religious significance. Streets are also marked by the presence of **Public Structures** such as public water taps, temples and plinths. A separate section of this study has been devoted to the **Vehicles** that circulate in low-income urban settlements. Finally, we have studied the widths and character of the **Streets** themselves.

The Vastu-Shilpa Foundation of Ahmedabad has been a close collaborator in this work. We would like to express our appreciation to Prof B.V.Doshi, its director, for his inspiration, and for his assistance in matters great and small; also his able collaborators, especially Himanshu Parikh. We would also like to acknowledge the financial support of the Special Programs Branch of the Institutional Cooperation and Development Services Division of the Canadian International Development Agency (CIDA) which has supported a larger project of which this study is a part. The Indore Development Authority was extremely helpful in providing information, advice and documentation, especially Mr M.L.Bhatt, Chief Town Planner and Messrs Jape and Karandikar. We would also like to thank M Alain Bertaud, of the World Bank, for his stimulating advice and suggestions.

Witold Rybczynski, Director  
Centre for Minimum Cost Housing  
Montreal

---

# 1. House Extensions

There exists, in slum housing, a complex hierarchy of what we have called house extensions: spaces in front of the home that are nominally a part of the public realm, but that have acquired a private character through use, and through various physical modifications.

The simplest, and smallest, of these extensions is the stoop, often no more than an enlarged step, made out of beaten earth, stone or concrete. The stoop is usually less than 1m wide, and is used as a step, as a seat, or as a workbench.

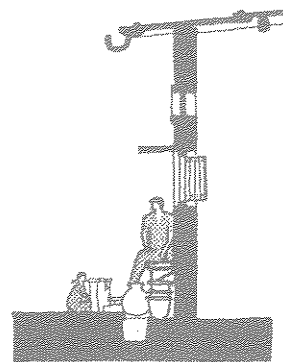
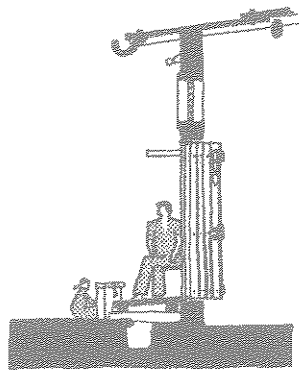
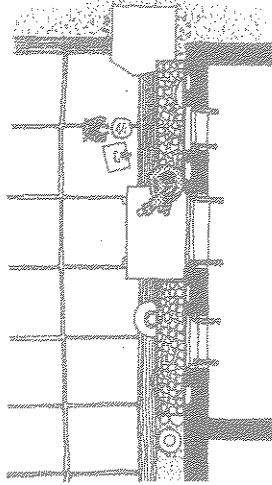
The size of the stoop is usually constrained by the width of the street, or the type of traffic on it. When the street is wider, or when there is very little traffic, the extension may be enlarged to leave the minimal required circulation area in the center of the street. The most common form of this kind of extension is the platform, up to 2m deep. The change of level clearly demarcates the private area, controls traffic, and is inexpensive to build. It can accommodate a wide range of activities, including food preparation and cooking, grain drying, and certain types of household work. The platform can also be used as a sleeping space, both during the day, and at night.

Frequently, the platform extension is elaborated to become a roofed porch--a traditional rural Indian house space. The porch roof can be temporary (plastic, canvas, reeds) or more permanent (tin, plastic, clay tiles). A porch serves the same uses as a platform, and, in addition, is often used as a storage space, both for household goods, and for vehicles such as pushcarts, mopeds, bicycles and motor-cycles. The presence of the porch supports also allows clothes-lines to be fastened.

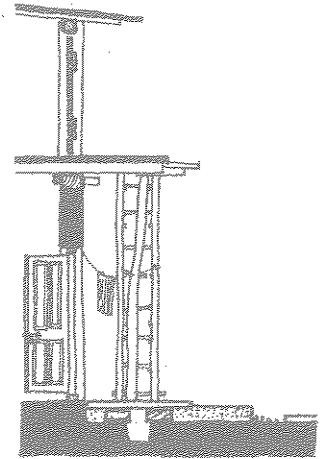
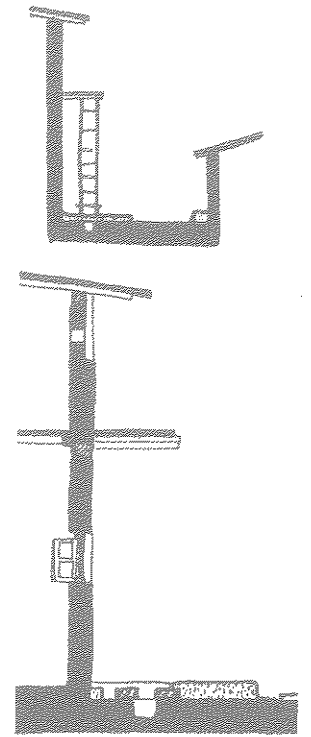
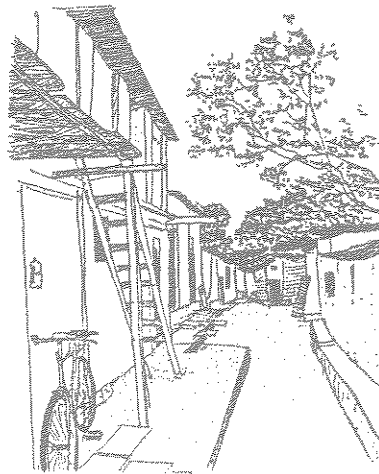
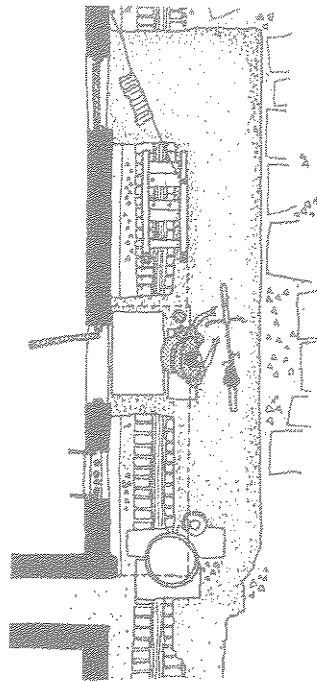
A further elaboration of the porch is the outdoor room, a roofed platform which achieves a greater measure of privacy through the use of walls on one or two sides. The outdoor room can accommodate some fairly private activities such as washing.

Large extensions, which could qualify as yards, were less common in the dense slums we visited. Where yards do exist, they are used for gardening and keeping animals.

Why do people build house extensions? Plots are extremely small, and many activities cannot be accommodated inside the house. The porch or platform is a feature of Indian rural housing that people understand, and which is easily integrated into everyday life. The public nature of this part of the house allows a greater contact with street-life. And, of course, platforms and porches are inexpensive.



Plan and Sections: A stone seat (K.K.Bhatta)



Plan and Sections: Extensions at two levels (K.K.Bhatta)

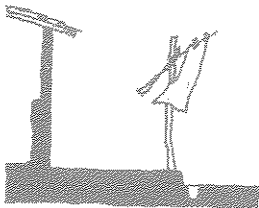
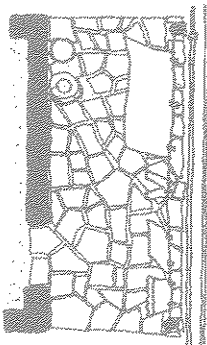
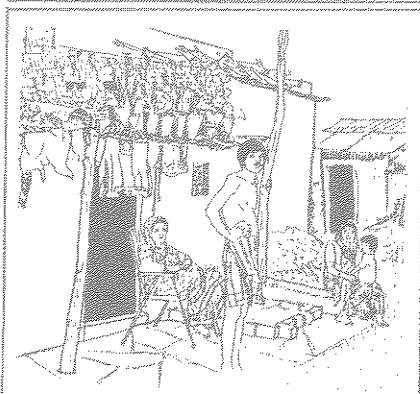
STONE SEAT (left)

This is an example of the simplicity of the forms and minimal dimensions that extensions can have. A stone slab, 25cm wide, 60cm above grade serves as a place to sit. It is also used to dry utensils and allows storage underneath.

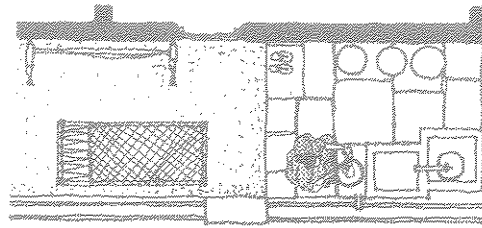
TWO-LEVEL EXTENSION (above)

This is an example of an extension which gains more living space. The extensions occur at both the ground floor and on the upper floor. The cow dung platform at grade has reduced the effective street width to about 1m. The upper extension is constructed of stone pavers set on a wood framework, supported from underneath by wood posts.

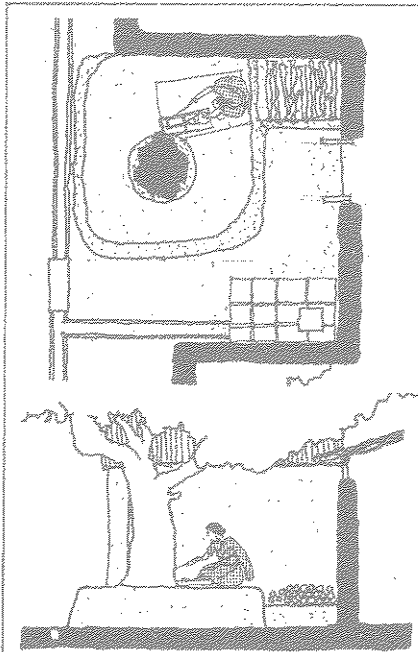




Plan and Section: Private extension-public seat (K.K.Bhatta)



Plan and Elevation: A two level extension (K.K.Bhatta)



Plan and Section: A raised platform (K.K.Bhatta)

PRIVATE-PUBLIC EXTENSION (above)

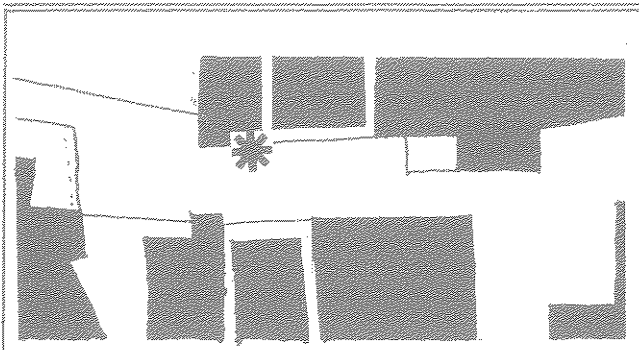
This slightly raised platform is paved with stones; one corner is used as a wash place. At the front a clothes line is stretched between two wooden posts that will eventually support horizontal wooden elements to carry the roof. It will be a few years, according to the occupants, before this improvement will take place.

TWO-LEVEL EXTENSION (top-right)

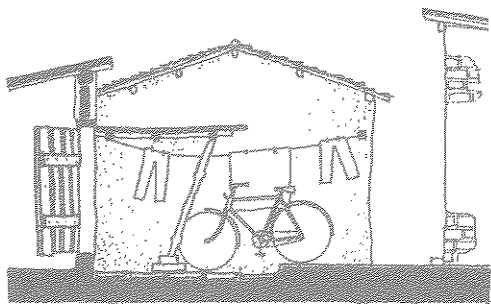
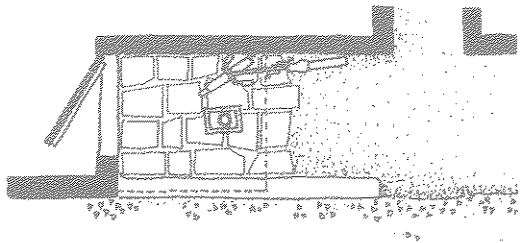
An extension in two halves; a wash place and a water cistern at the lower level and an outdoor living and sleeping area at slightly higher level. The open drain runs along the full length of the extension and is covered with a stone slab in the front of the house entrance. The slab serves as a step to the platform. A simple and direct design solution.

RAISED PLATFORM (above)

A tree-protected platform that is used as an house extension. The section closer to the house is used to store fire-wood and as a washplace, and is lower than the platform around tree. This extension platform is accessible from either side of the tree. The outer edge of the platform is used by passersby on the street as a seat.



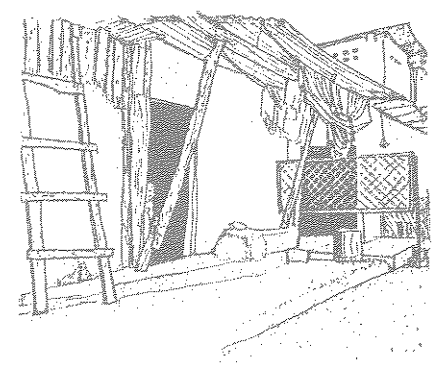
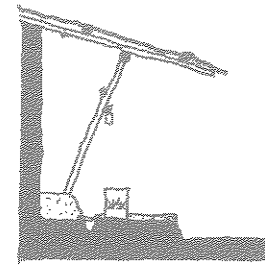
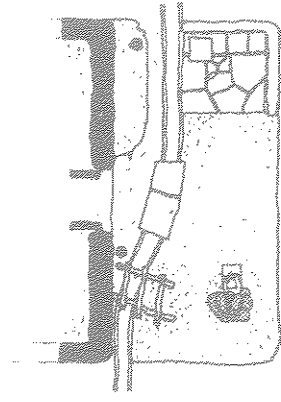
Location Plan



Plan and Section: A small extension (K.K.Bhatta)

SMALL EXTENSION (above)

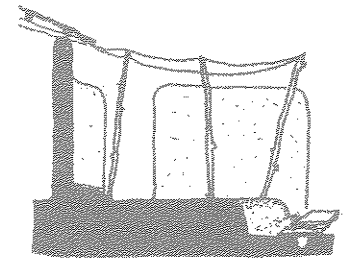
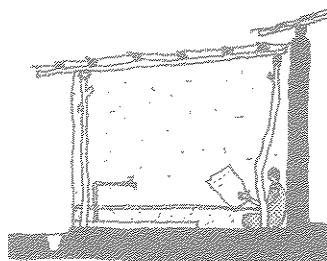
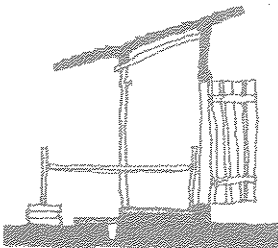
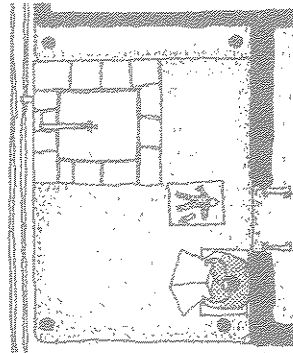
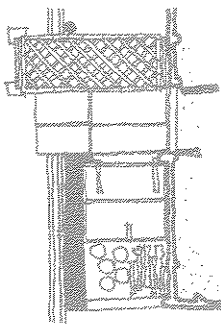
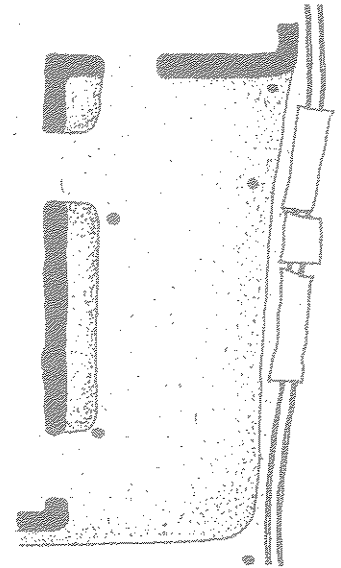
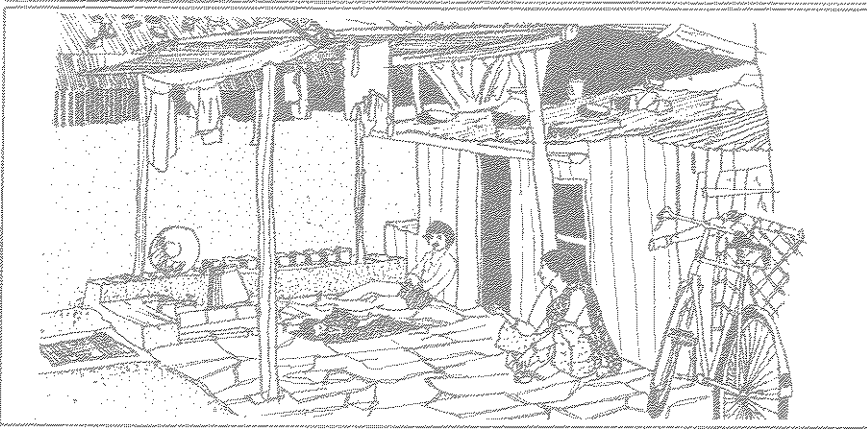
A cow-dung floor and a tin roof supported by bamboo make up this simple extension. A two foot high parapet demarkates its limit. The roof covers an area of almost 3.0 M2, which is large enough for storage of a bicycle and for other activities.



Plan and Section: A small washplace (K.K.Bhatta)

SMALL WASHPLACE (above)

This is a modest extension, with a small wash place (90cm X 90cm) covered with stones, and the other portion raised approximately 30cm off the ground and covered with dung plaster. The extension is partially covered with inclined wooden supports that are embedded in the ground and carry cross members which in turn are used to support metal sheets. The partial cover provides rain and sun protection. It is worth noting how the open drain is pushed back to increase the usable work space.



Plan and Section: Washplace and Sitting (K.K.Bhatta)

Plan and Section: Improved extension (K.K.Bhatta)

Plan and Section: A platform extension (K.K.Bhatta)

#### WASHPLACE-SITTING (above)

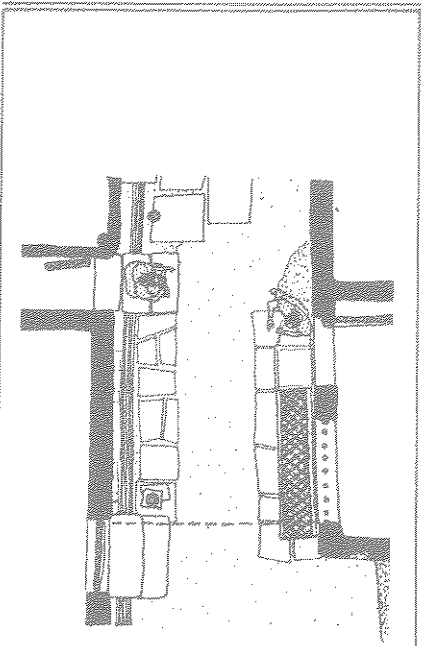
A small extension with a wash place that is enclosed leaving the rest of the space to be used for sitting or reclining. The extension is not wide enough to accommodate the full length of the bed and the occupants have placed bricks under two legs of the bed. During the survey it was observed that users need approximately 2m wide extensions to accommodate the full length of a bed, a standard piece of furniture, and frequently the only furnishing, in low-income Indian homes.

#### IMPROVED EXTENSION (above)

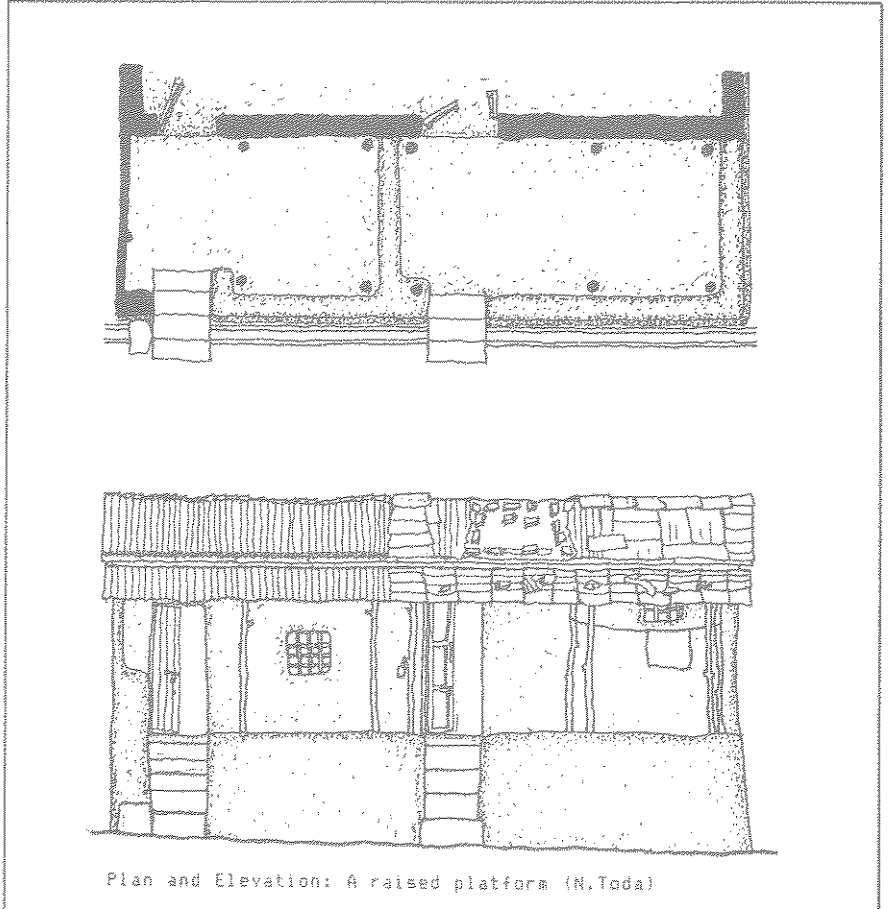
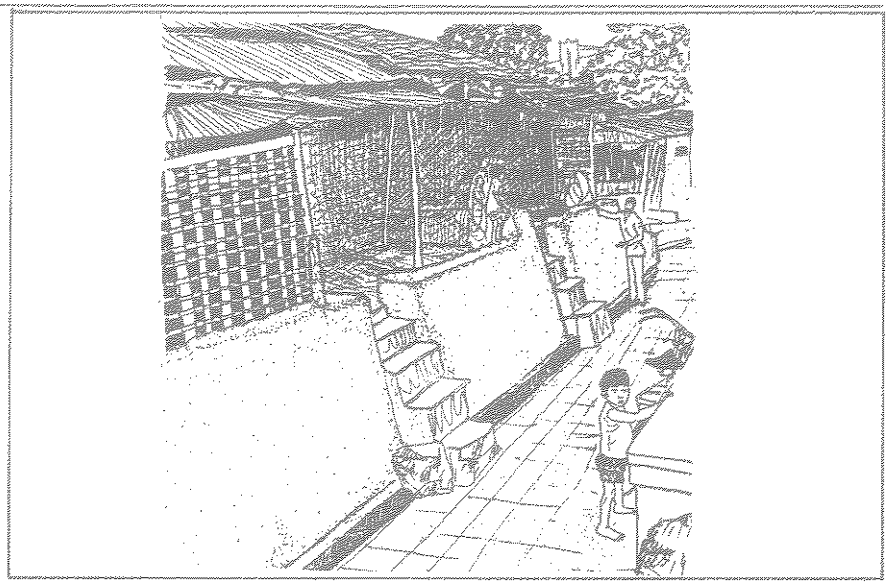
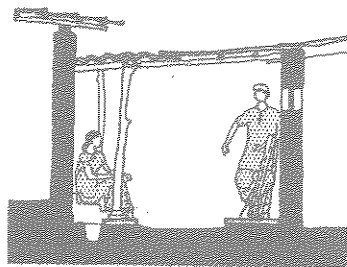
This extension is an example of the sort of improvement that occurs to platform type extensions. The little ledge on the side of the water-supply pipe and the wash place is used as a storage place for washing clothes or utensils.

#### PLATFORM EXTENSION (above)

A raised platform that functions as an extension as well as a transition space. It is considered to be a part of the "pucca" (permanent) house and the owner plans to convert this into a half covered and enclosed room.



Plan and Section: Extension at the end of a street (K.K.Bhatta)



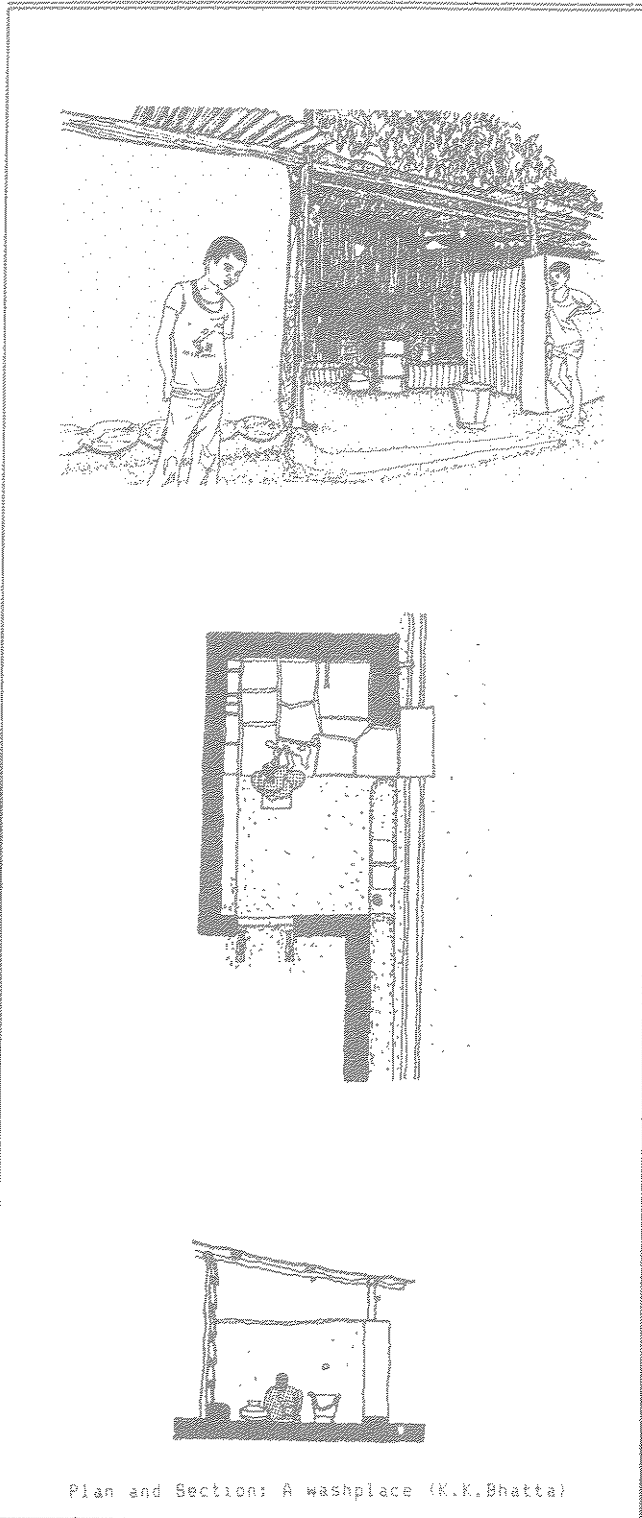
Plan and Elevation: A raised platform (N.Toda)

**STREET-END EXTENSION (above)**

This extension is in front of houses with a high plinth; the steps leading up to the top of the extension are kept very steep (30 to 40cm) in order to minimize the use of horizontal space, as the platform is only about 2m wide. Slightly raised (30cm) edges act as protective barriers and also provide a feeling of safety on the high plinth.

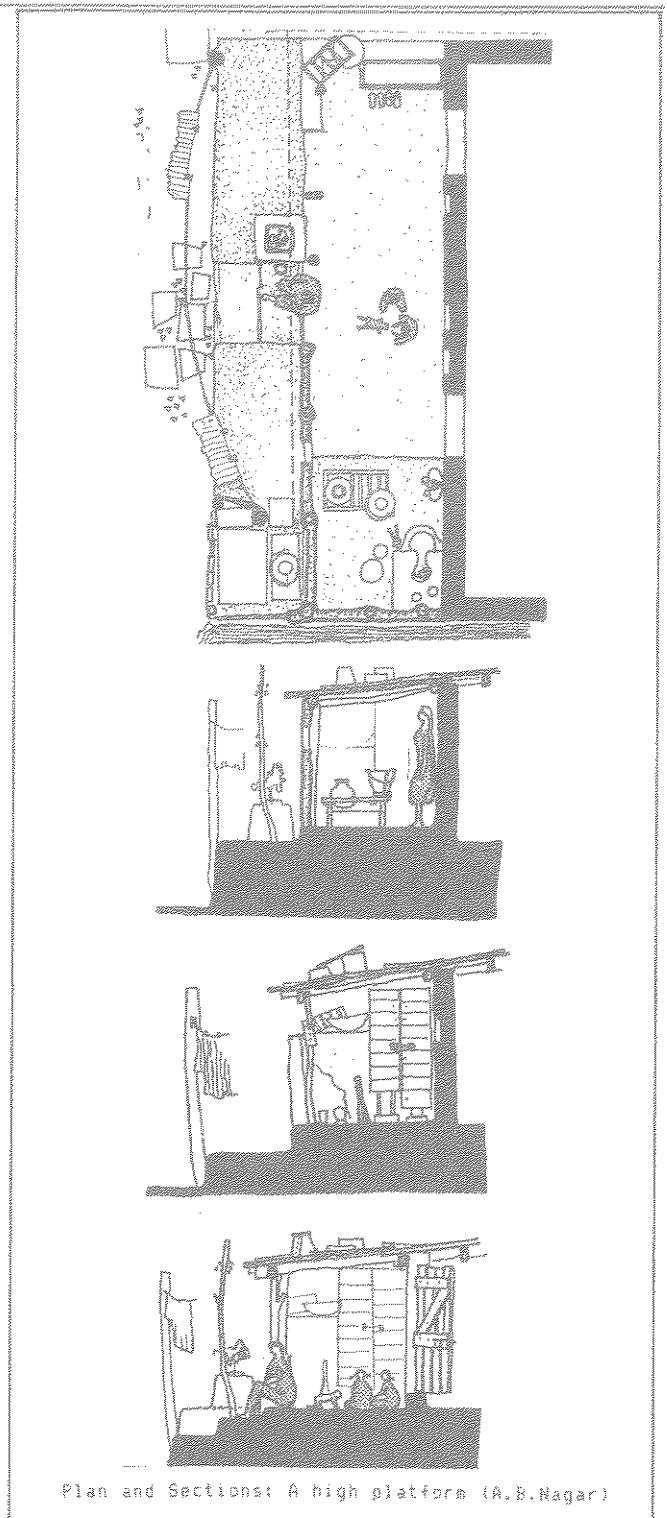
**RAISED PLATFORM (above)**

The roof extensions of two dwelling units cover the width of this dead-end street. The roof consists of corrugated tin sheets supported on a framework of bamboo and twigs held up by tree posts. On the ground in front of the dwelling units, cow dung has been laid to form a floor on which activities can take place.



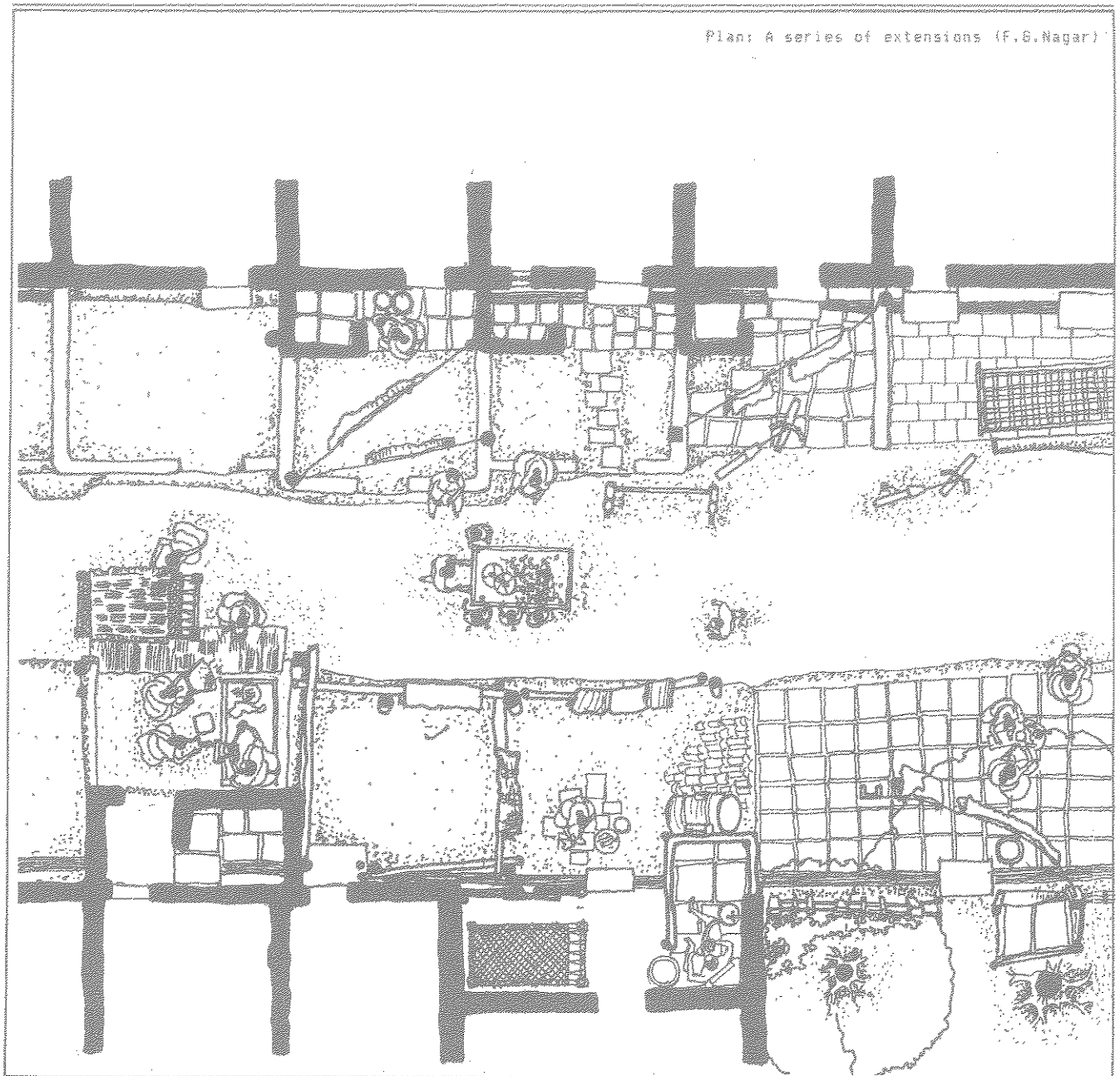
## WASHPLACE (above)

This neighborhood has individually-supplied piped water, although other parts of the community use public stand-pipes. Since water supply in this slum runs for about two hours per day, as in most other urban centers in India, people have to collect and store their daily water needs. This extension is used both for storing water and for washing. The wash place is paved with stones, while the remaining part of the extension is covered with dung plaster. An enclosure around the wash place provides privacy during bathing. The outer edge of the extension is protected from rain by a ledge.



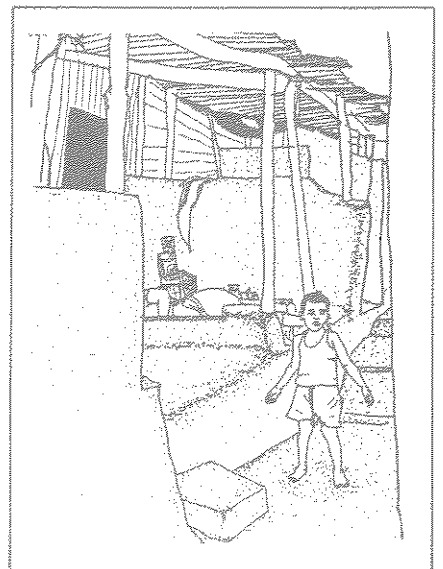
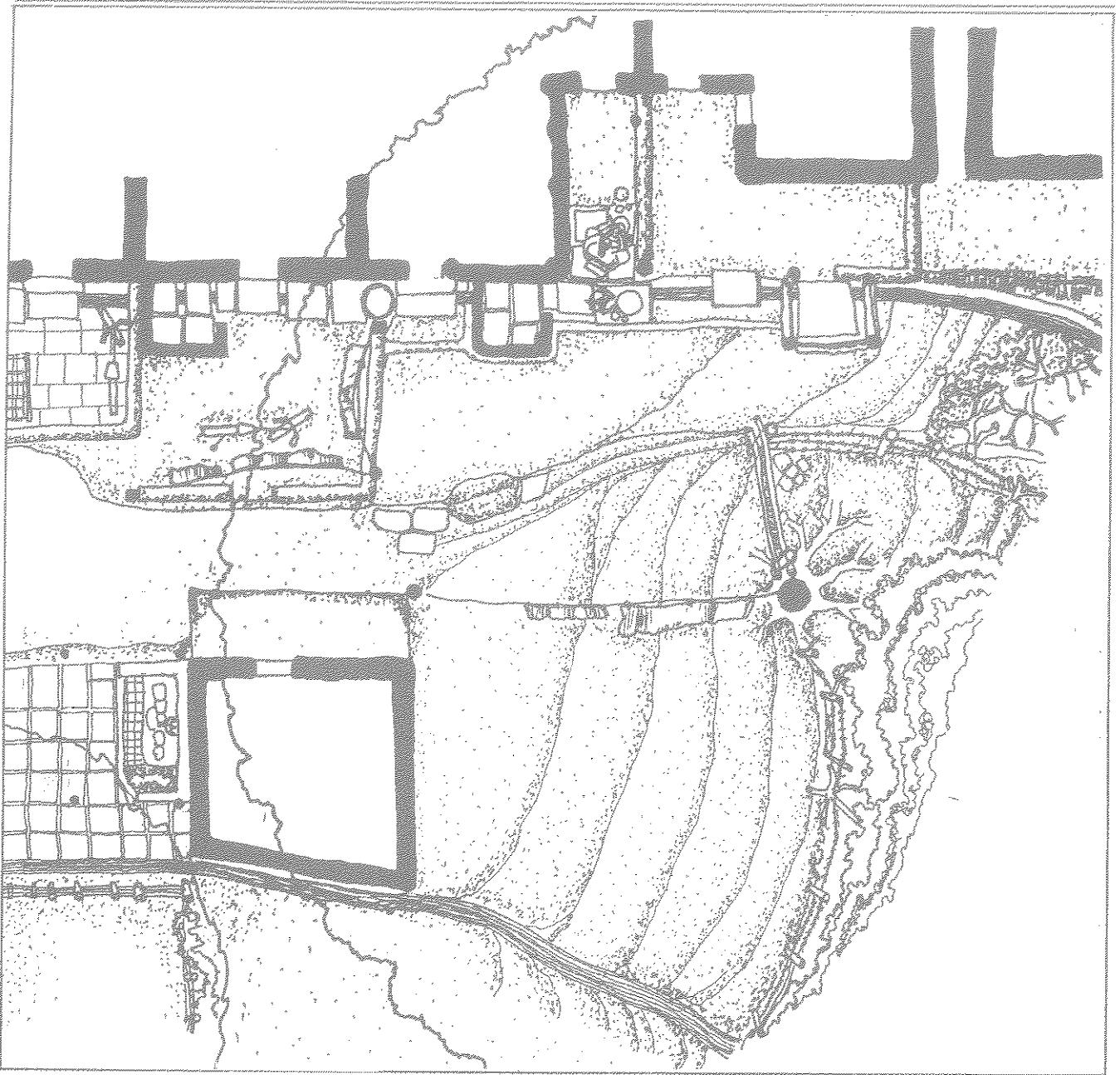
## HIGH PLATFORM (above)

This raised mud platform forms the locus of many of the family activities such as cooking, bathing and utensil cleaning, as well as storage. It also contains a Tulsi bush, which is the focus of daily worship. Situated along the river, this dwelling is raised above the monsoon river level. The whole extension is covered by a roof made of various materials such as tin (flattened kerosene cans), other metal scrap and plastic. This whole structure is weighed down with household items to prevent it from blowing away.

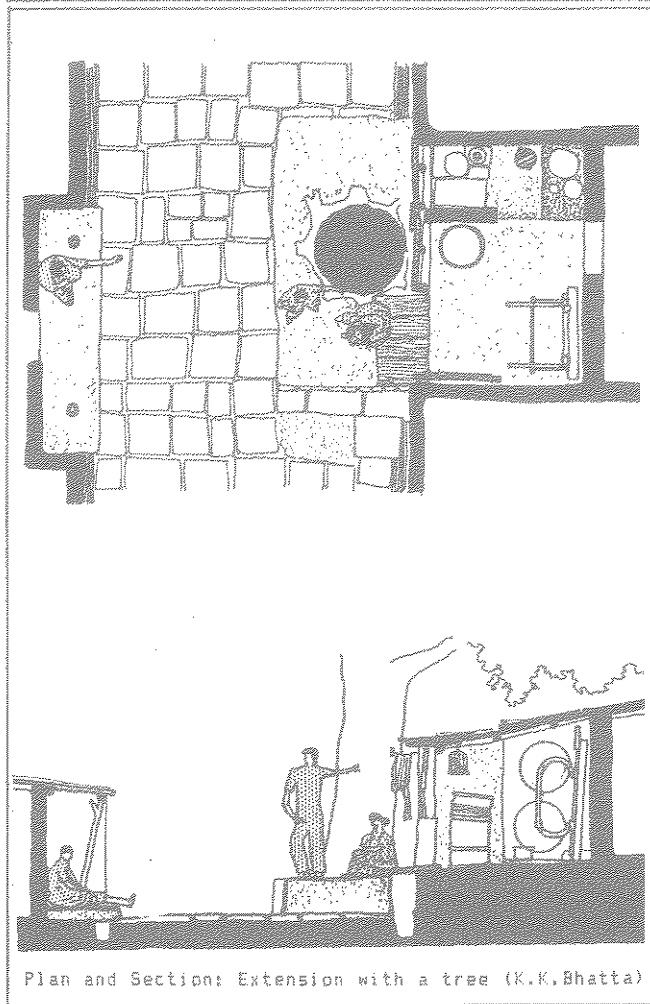


SERIES OF EXTENSIONS (above) (right)

A series of extensions on a dead-end street has produced a very rich character. Originally 10m wide, the public right-of-way is reduced to about 2.5m and even this is used as a place of work.







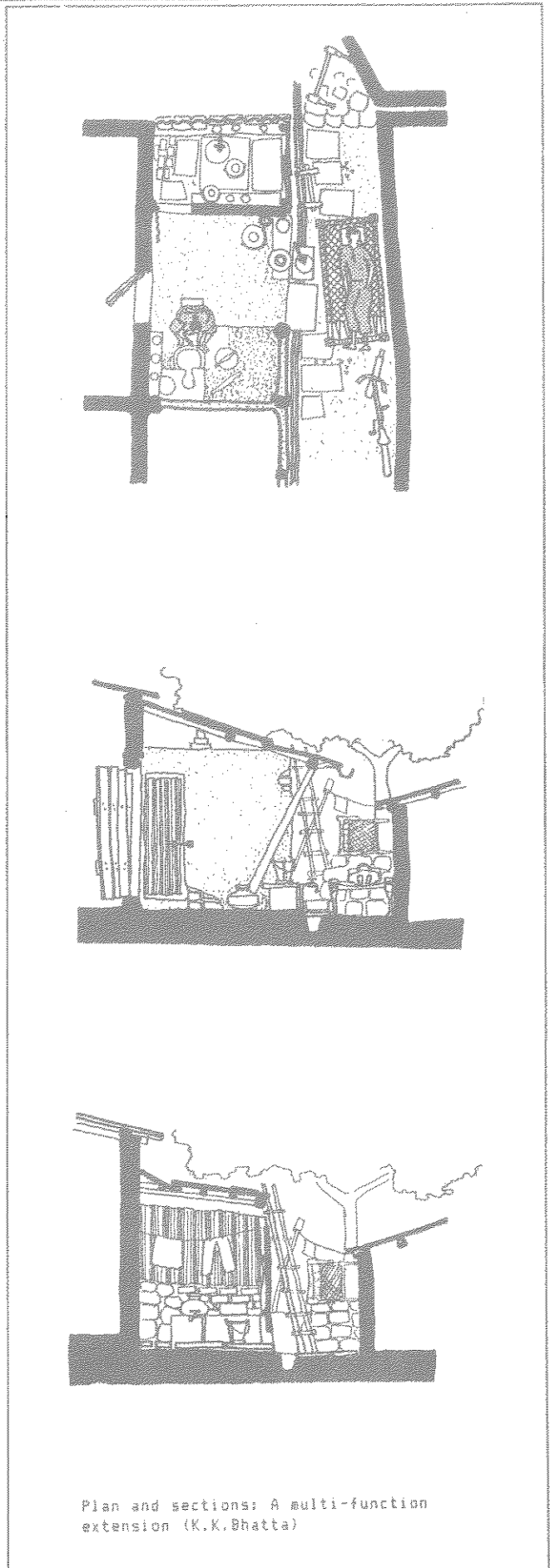
Plan and Section: Extension with a tree (K.K.Bhatta)

**TREE-EXTENSION (above)**

Here is an example of how trees become part of the dwelling space. It is common to see extensions built around trees and the tree used to support the roof of the extension and even the house itself; in this example the tree also supports a clothes-line. The density is inferred by the plan and section indicating the road width and the extension of the neighboring dwelling. Being about 2m wide, the road facilitates communication and social contact.

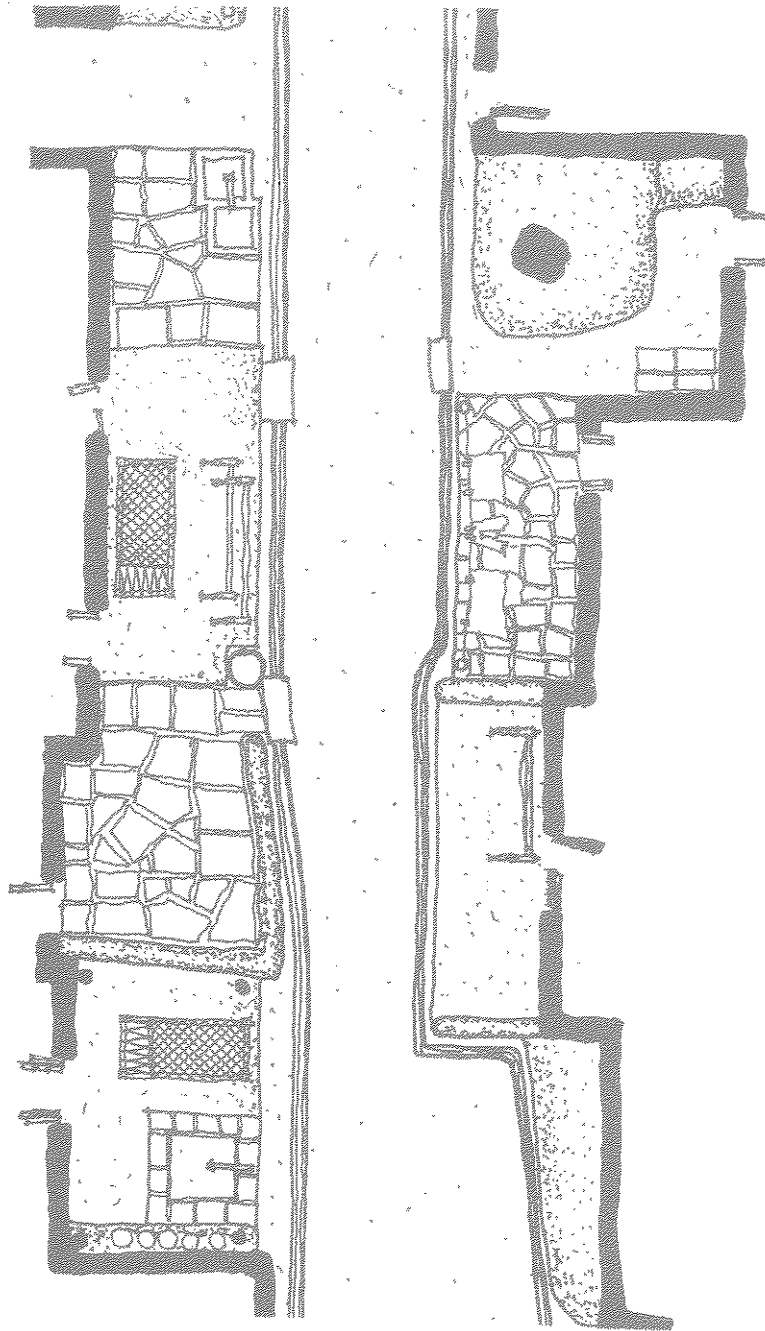
**MULTI-FUNCTION EXTENSION (right)**

There are many activities accommodated under the roof of this extension including cooking, bathing, utensil cleaning, water storage (note the water tap), extra beds and bicycles. A wide variety of building materials have been used, including stone, mud, tin, wood and a mud-plaster (kind of wattle & daub).

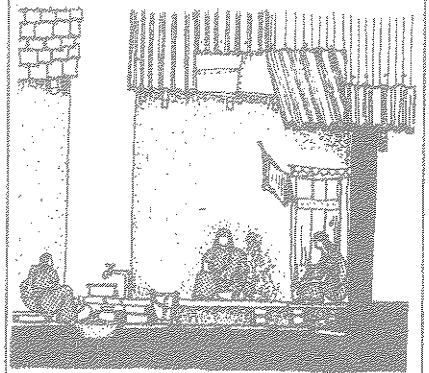
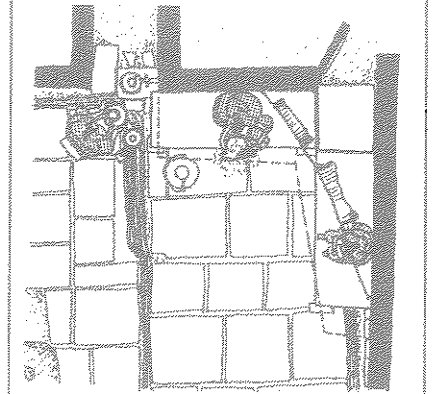
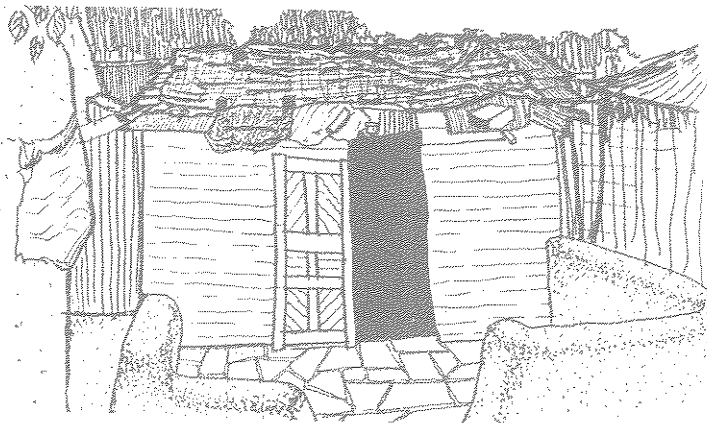


Plan and sections: A multi-function extension (K.K.Bhatta)





Plan: A group of extensions (K.K.Bhatta)



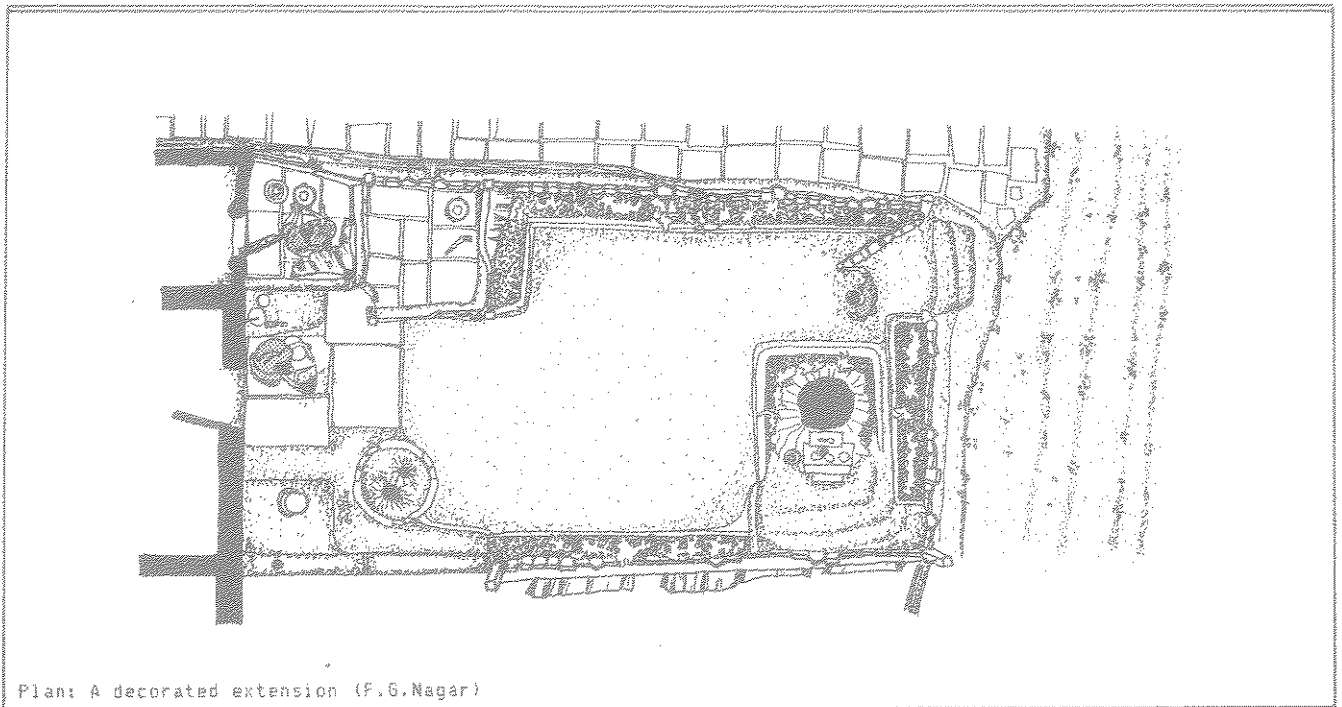
Plan and Section: Two extensions (K.K.Bhatta)

#### TWO EXTENSIONS (above)

Two extensions are located in this courtyard and are of a simple nature with a roofed bench for sitting. Tin for the roof and stone for the bench, which is supported on bricks, are the simple materials used. A stand-pipe allows access for bathing water, utensil washing and clothes washing.

#### GROUP EXTENSIONS (left)

A set of extensions, these extensions vary in depth from 1.6m to 2.5m and are stretched across the entire width of the dwelling which they service. Compared to the depth of these extensions the road width varies between 2.7m to 3.0m which indicates that the outdoor living areas are more important to the users than the public right-of-way. This is also made possible since the traffic on these roads is limited to smaller vehicles such as rickshaws, scooters and bicycles. The dwelling units in these settlements are extremely small, and that is one more reason that the outdoor living places are important and prominent.



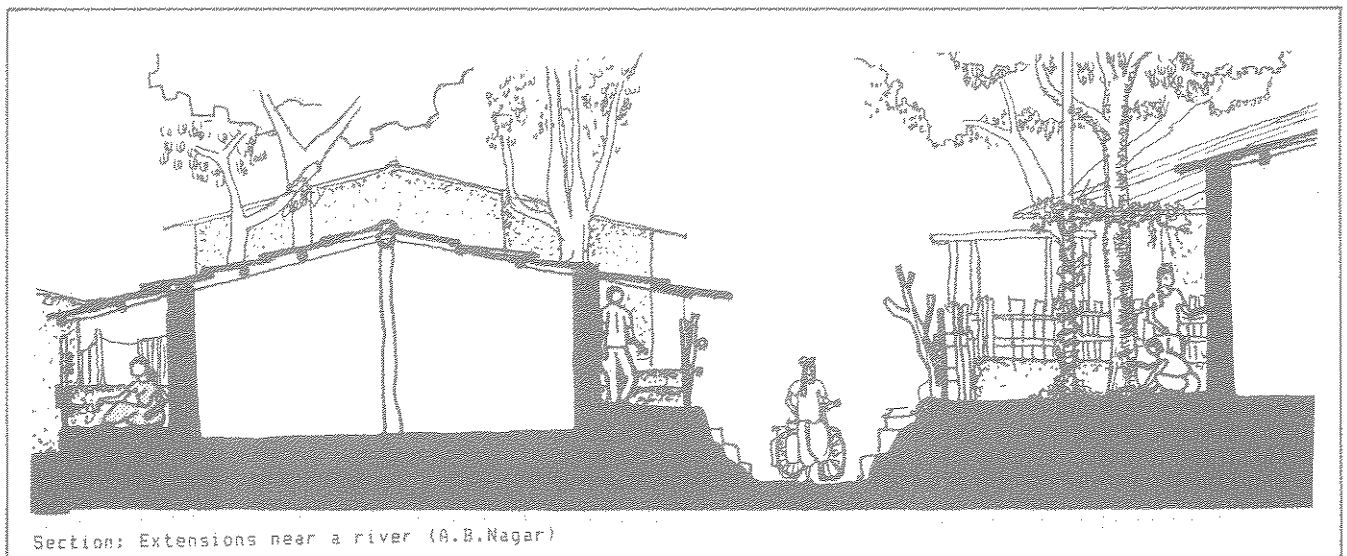
Plan: A decorated extension (F.G.Nagar)

#### DECORATED EXTENSION (above)

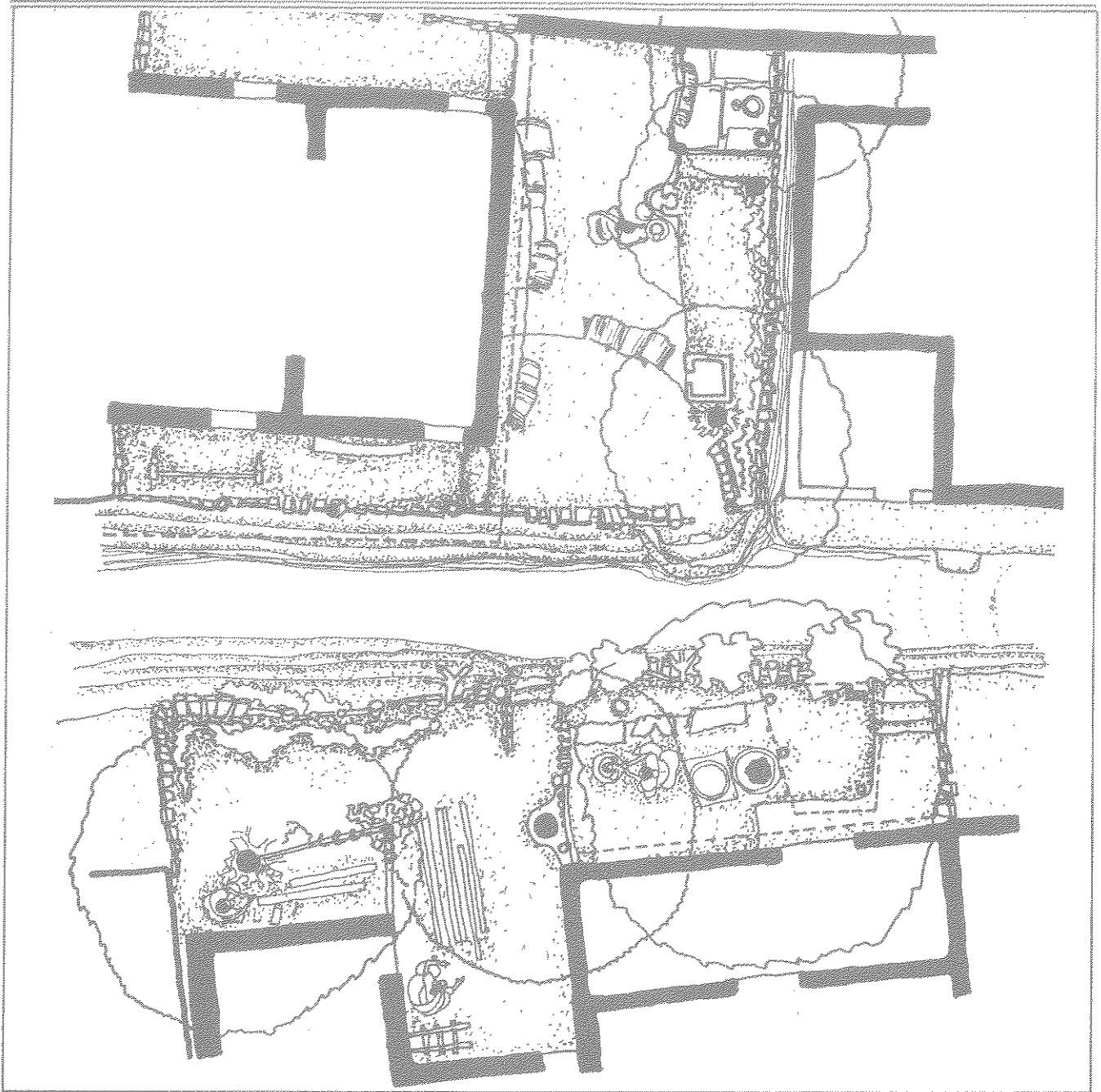
The extension at this dwelling has been elaborately "landscaped." The owner had a stable job in a nearby industry and also appeared to be a "Dada" (slum landlord). This is a large, cow dung-paved extension with many decorative plants as a border to the area and its own place of worship (of the god Shiva). One room of the dwelling unit has been rented out along with an accompanying area of the extension. The main area of the extension is "zoned." A semi-public area exists near the road where members of the community come to worship at the shrine. The second "zone" is the open courtyard and the third is a private area at the doorstep of the dwelling where the women sit to clean grain and wash utensils. In this private zone is also a bath place.

#### EXTENSIONS (below-opposite)

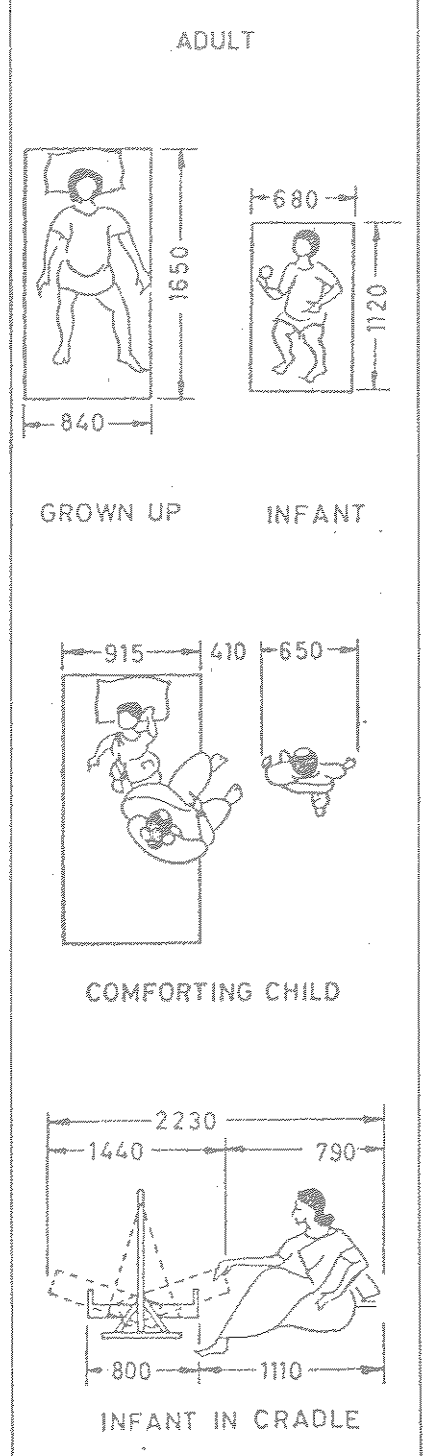
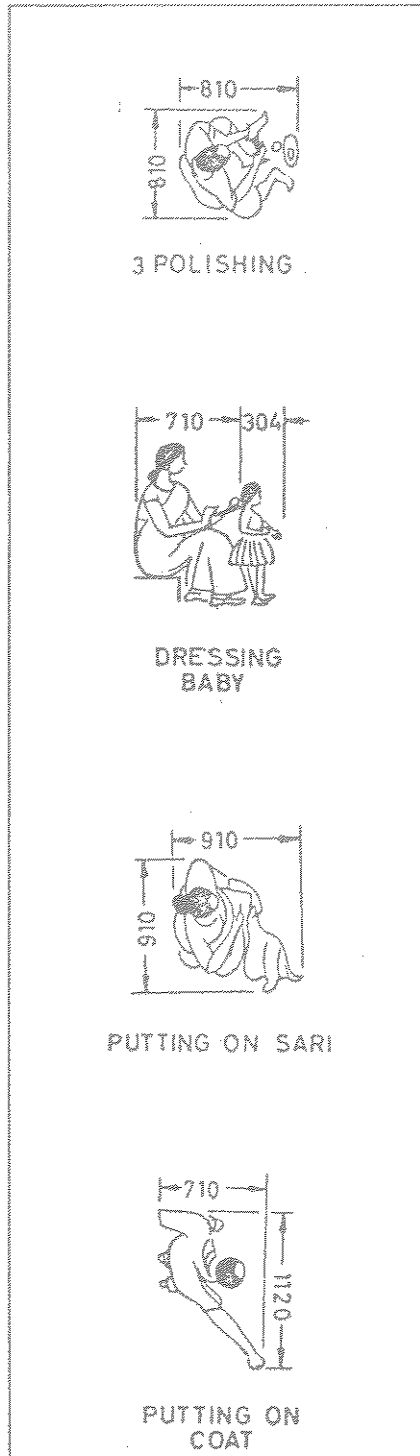
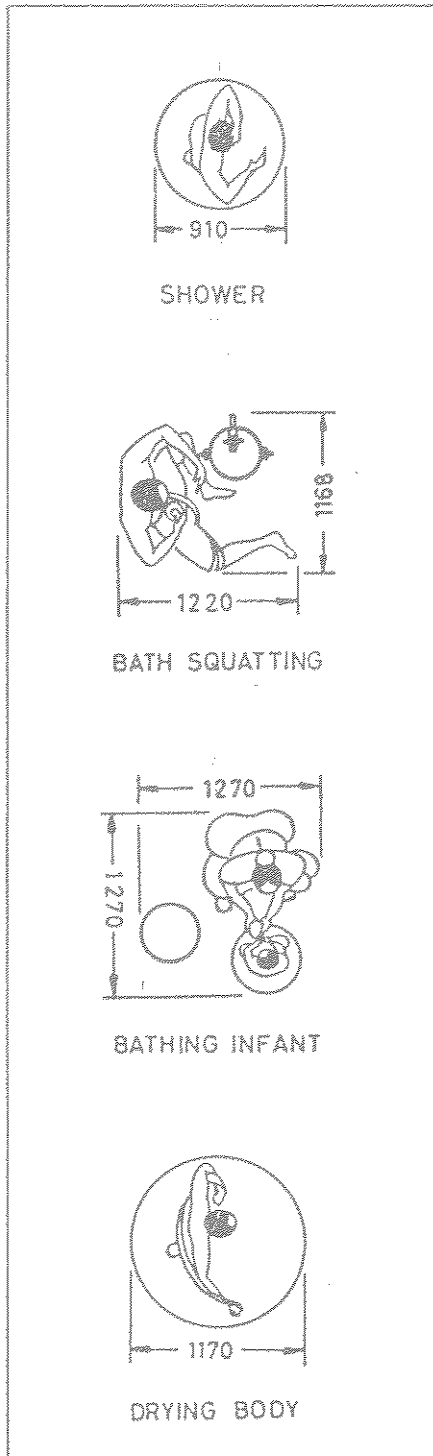
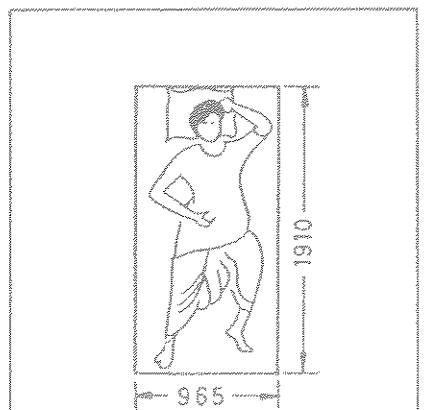
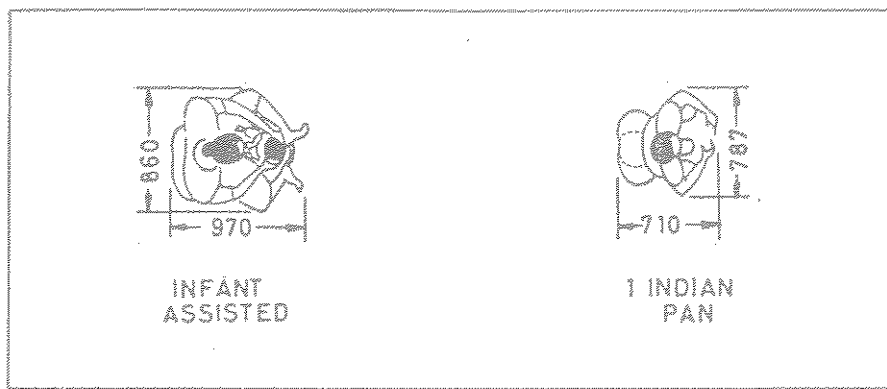
This group of dwelling units is located on a road sloping down towards the river. The land here has erosion and water runoff problems requiring the dwellings to be built on plinths as indicated in the section drawing. The road remains marshy because of the water runoff from the neighborhood. These dwellings and their extensions have maintained a rural character with their fences, animals and activities. Goats are kept in under a roofed area. The activities taking place in these extensions include bathing, clothes drying, cleaning grain, washing utensils, and cooking. Note that some carpentry work is being done as the owner is constructing an addition to his dwelling.

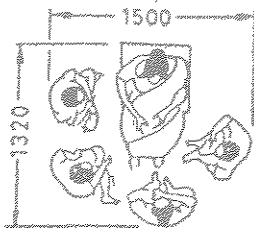


Section: Extensions near a river (A.B.Nagar)

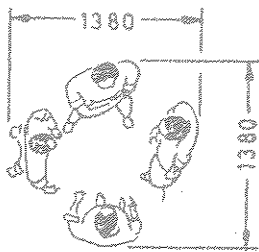


Plan and Section: Extensions near a river (A.B.Nagar)

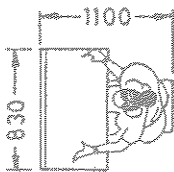




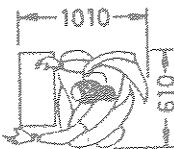
STORY TELLING



CHAT



SEWING SITTING



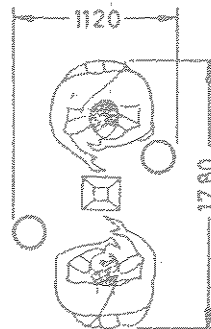
SQUATTING



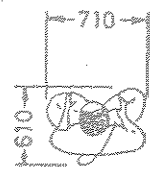
READING



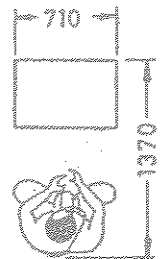
PERFORMING NAMAZ



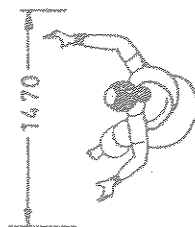
PERFORMING HAVAN



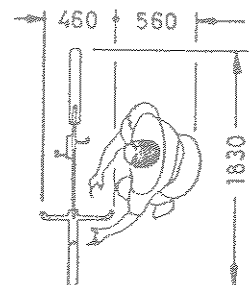
MEDITATION



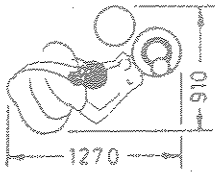
IN FRONT OF DEITY



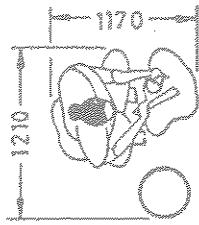
SPINNING



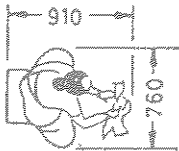
CLEANING BICYCLE



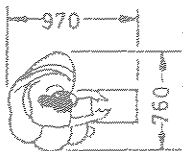
WASHING  
UTENSILS



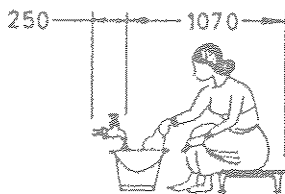
7 WASHING CLOTHES



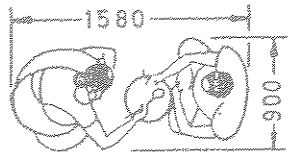
5 WASHING



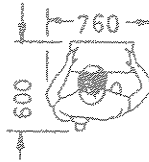
TAKING OUT



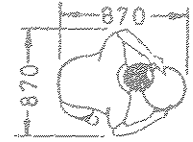
RINSING



POURING AND  
RECEIVING



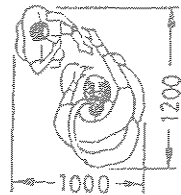
CARRYING TRAY



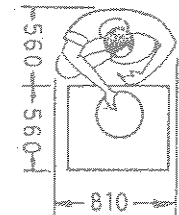
SERVING LOW



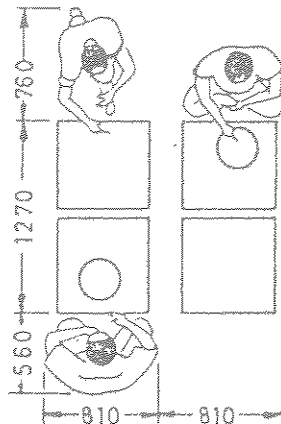
SITTING



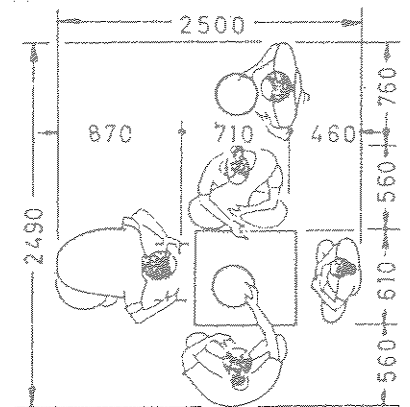
INFANT ASSISTED



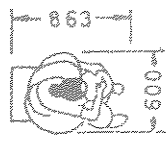
ON CHOWKI



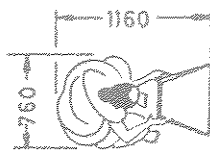
FORMAL



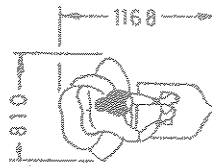
INFORMAL



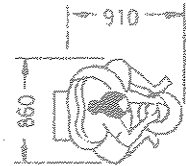
PICKING



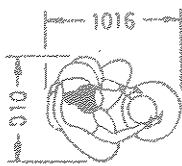
WINNOWING



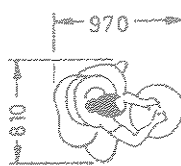
GRINDING



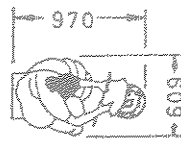
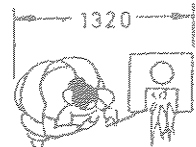
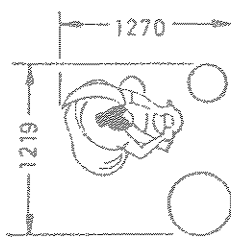
CHURNING



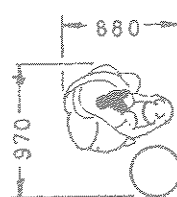
SIEVING



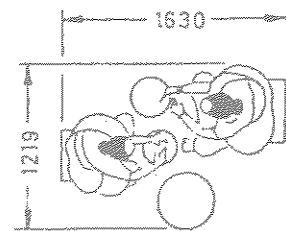
MIXING

LIGHTING  
ANGITHILIGHTING  
CHULLAH

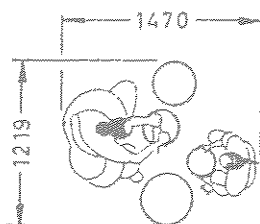
ROLLING



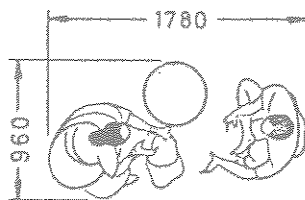
COOKING



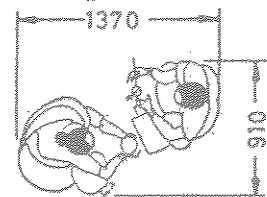
ASSISTED COOKING



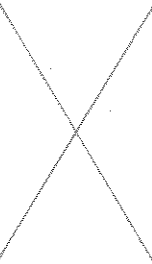
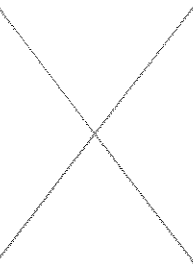
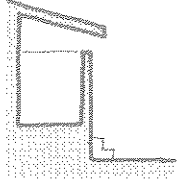
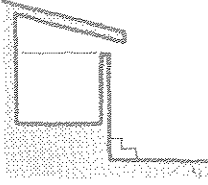
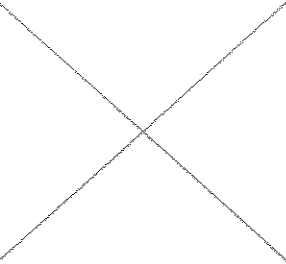

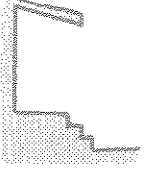
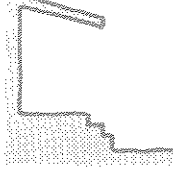
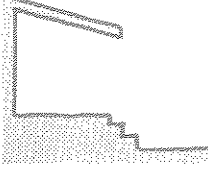
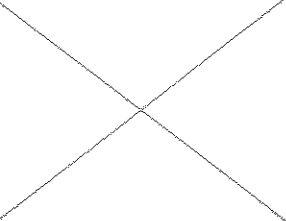

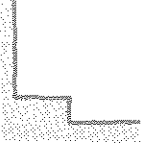
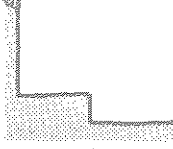
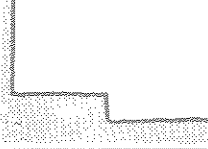
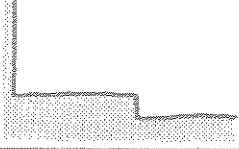
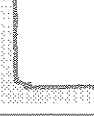
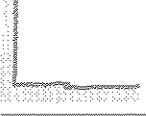
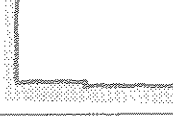
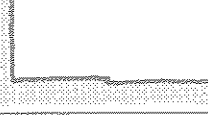
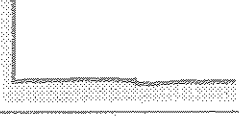
COOKING SERVICE



RECEIVING VENDOR



RECEIVING MILKMAN

CLOSED PORCH					
PORCH					
PLATFORM					
STOOP					
K * 1000 * 2000 * 2500 * 3000 >					



## 2. Work Places

It has long been known that slums are not only places for living, but also places for working. The popular term "informal sector" precisely describes this phenomenon. Just as the urban poor take into their own hands the provision of inexpensive, appropriate shelter, so also do they participate in economic activities whose importance, and complexity, has only recently been recognized.

These economic activities take many forms. Some of them are, in effect, service industries serving the slum directly. Inexpensive, usually recycled, construction materials and building components are produced for immediate, local consumption. Carpentry, metalwork and certain food processing fall into this category.

Another category of work activities involves producing items, such as fabricating brooms, animal harnesses and cigarette-making, for the broader urban market. In many cases raw materials are purchased in the city, and reprocessed into sellable items. Often a complex chain of sub-processors and retailers are involved. The raw material for making sandal-soles--tire treads--are bought from suppliers who first strip and separate the treads from the tire walls. People who sort garbage collect the scrap from throughout the city, sort it, and then sell it to specialized jobbers, who in turn sell it to scrap merchants.

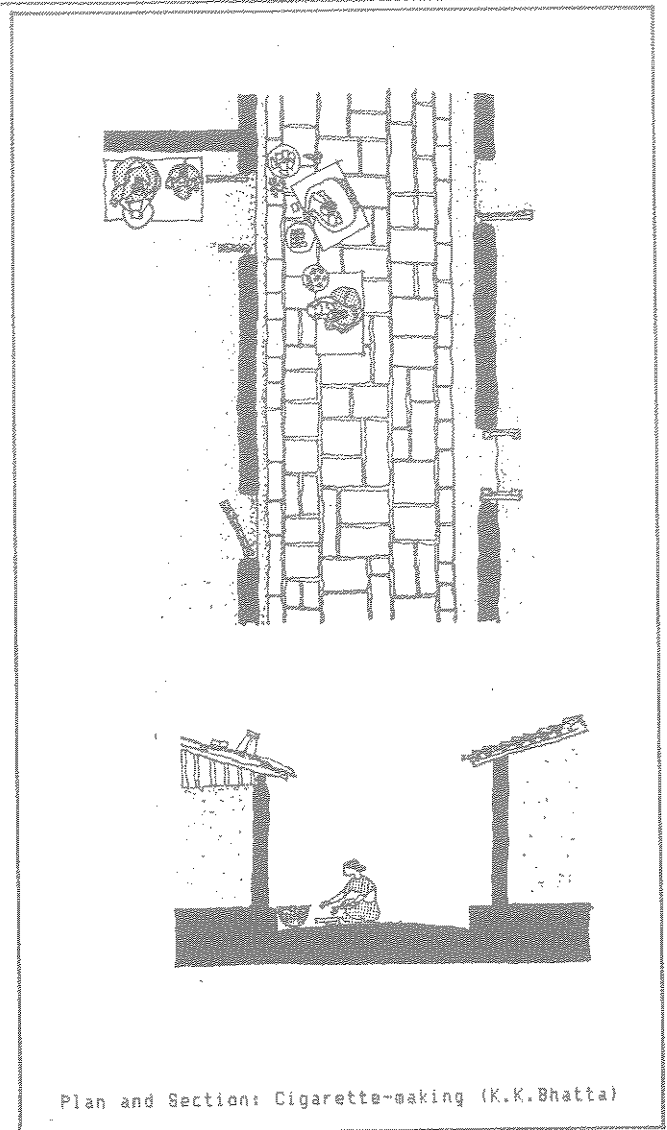
There are also many work activities which qualify as cottage industries, that is, the raw materials are provided by entrepreneurs, who purchase the finished product from the slum worker. Kitchen utensils, in rough, unfinished form, are filed and polished in the slum, and returned to the hardware merchant. Clothes are assembled from pieces provided by jobbers.

Our visits to the two Indore slums demonstrated not only the variety and complexity of the types of work involved, but also the variety of spatial requirements that the different work activities demanded. They varied from as small as 2 square meters, in the case of paper-bracelets, to as much as 36 square meters for the repair and refurbishment of wooden crates. Some of the activities needed shelter, others did not. Most required not only a work space, but also a space for storing either raw materials or finished products, or both.

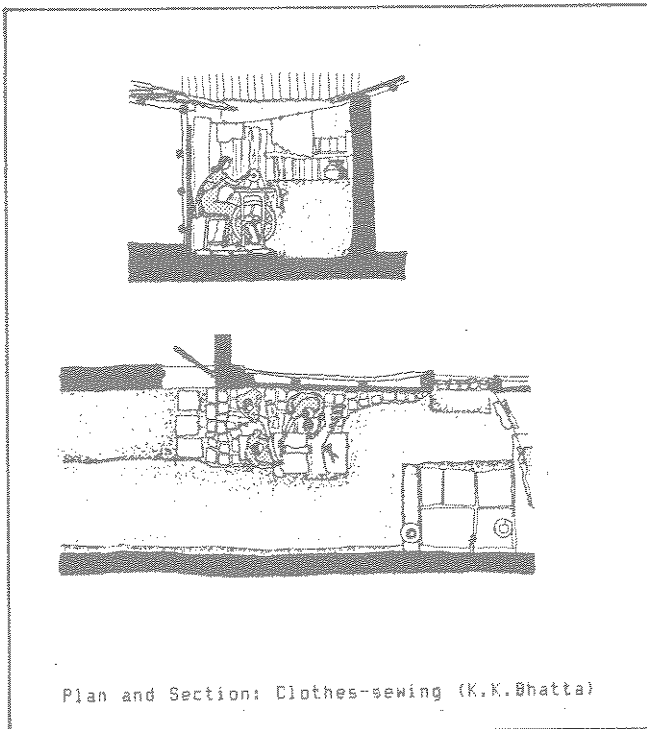
Slum work-places are characterized by simple hand-tools and primitive, although by no means crude, techniques. Most of the work activities require neither water nor electricity. As a result, the work-place is often mobile, moving easily in and out of the house, and not requiring a fixed enclosure. In most cases the work-place was either directly on the street, or immediately in front of the house, in what we have called house-extensions. This calls attention to the importance of streets and walkways as not just circulation spaces, and socializing spaces, but also as work spaces. Unlike conventional housing, in which work and living are always physically separate, and distinct, low-income urban shelter requires the planner to be sensitive to a such richer mix of family, social and work activities.

CIGARETTES (right, below)

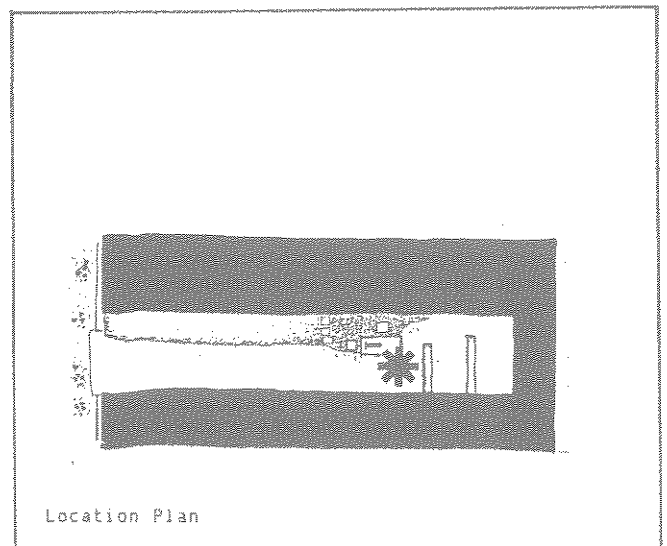
This full-time activity involves a minimum of two persons working in an assembly line fashion. The raw materials which include special dry leaves, tobacco and thread for wrapping, are generally given out on a consignment basis by a distributor or retailer. The finished product is then returned to them in exchange for cash. The labor usually consists of one person cutting the leaves using the template and rolling the leaves; the second person then fills the leaves with tobacco, folds over the ends and ties them with the string. Neither the finished product nor the raw material involves specific storage. Both are stored in baskets and the baskets are piled one on top of another. The work performed can be either inside the home or outside in the street.



Plan and Section: Cigarette-making (K.K.Bhatta)



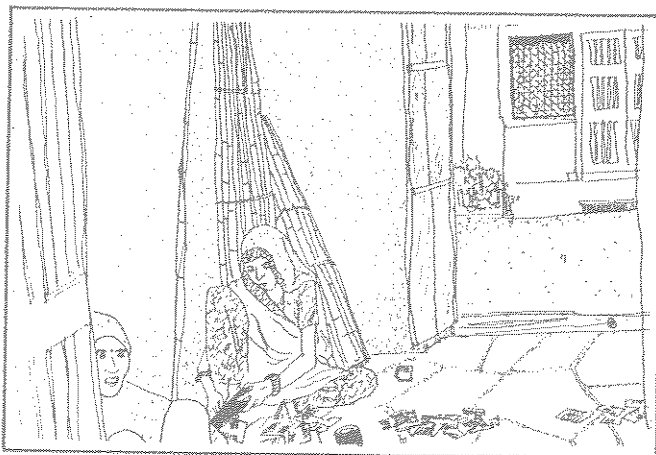
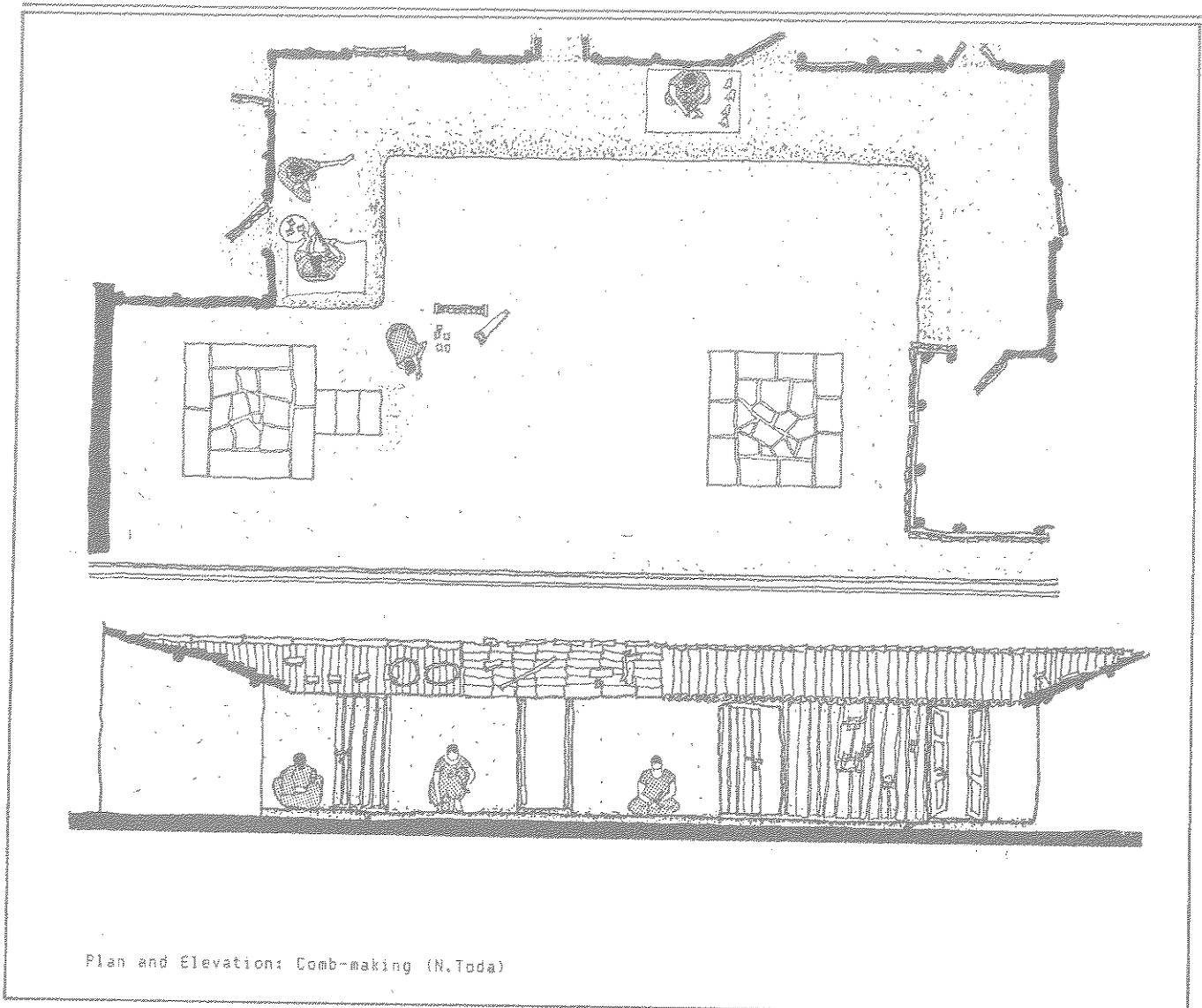
Plan and Section: Clothes-sewing (K.K.Bhatta)



Location Plan

CLOTHES-SEWING (left, above)

School dresses and other uniforms sold through retailers in the market are made here, mostly by women. It is a cottage industry, since wholesalers supply material (sometimes in pre-cut pieces) and collect the finished garments.



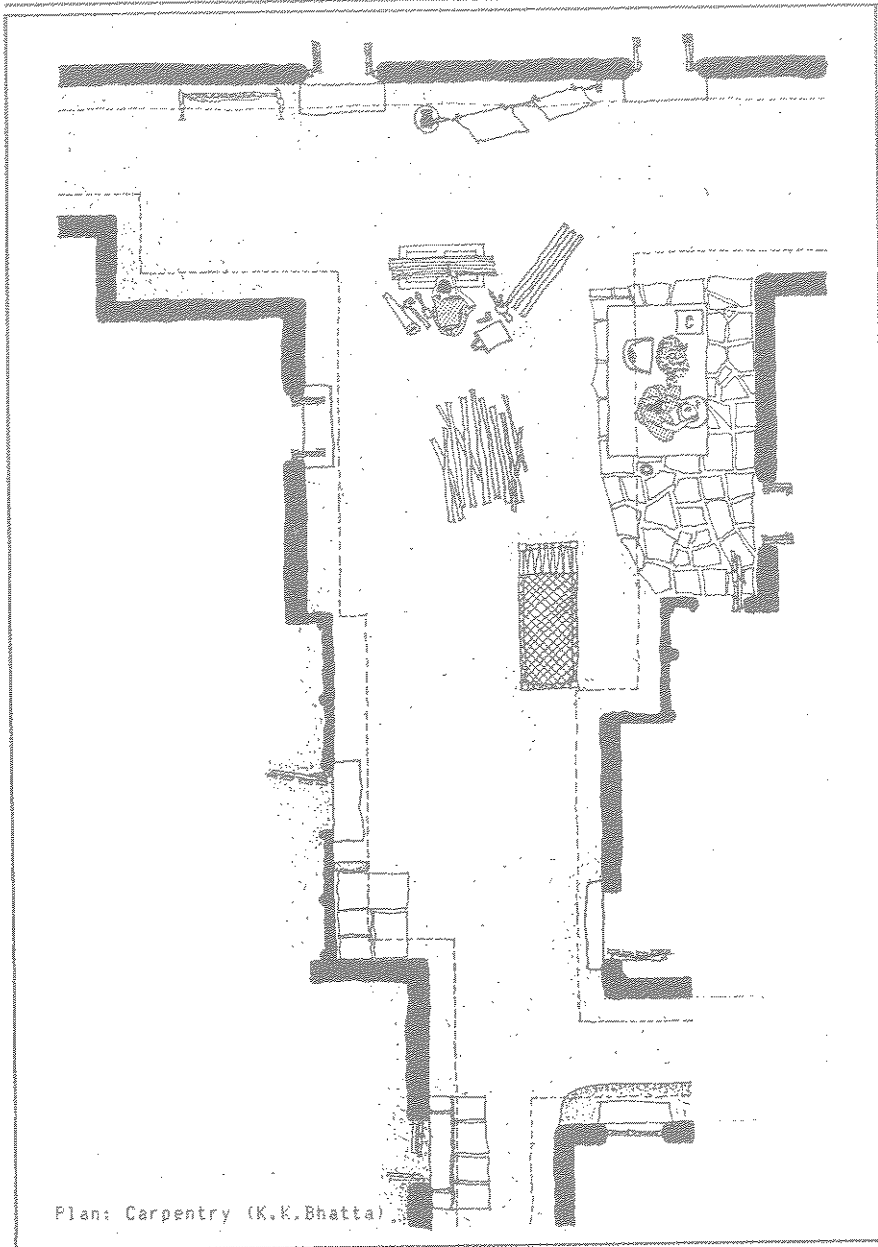
BROOMS (right)

The production of hand-made brooms involves the use of dried palm leaves. Brooms are made in various lengths, and different types of brooms can be made using the different parts of the palm leaf. A soft broom can be made from the outer "feathery" part of the leaf. The inner "spine" makes a more rigid broom. Brooms can be fabricated by one person and the working area and storage requirements are very minimal.

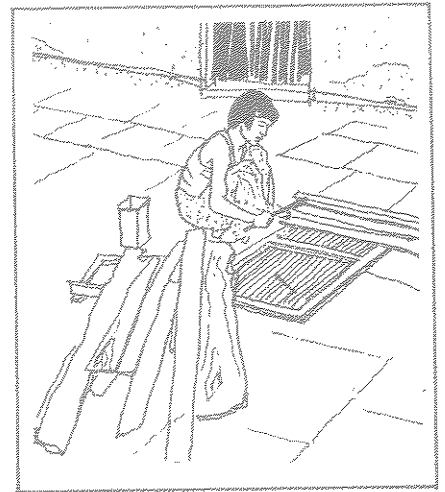
WOODEN COMBS (left, above)

All members of the household are involved in making wooden combs, each person working at a specific task in this assembly-type line. The first task involves the rough cutting of each block of wood to be carved. Second is the actual carving of the comb-teeth, and finally the finishing of the comb. These combs are sold to retailers on a contract basis. The job is usually done outside the dwelling unit, especially the initial wood cutting, while the rest of the process can be done inside the home. Storage of the raw material depends on the size of the contract. The finished product takes up a little space.





Plan: Carpentry (K.K.Bhatta)



CARPENTRY (left, above)

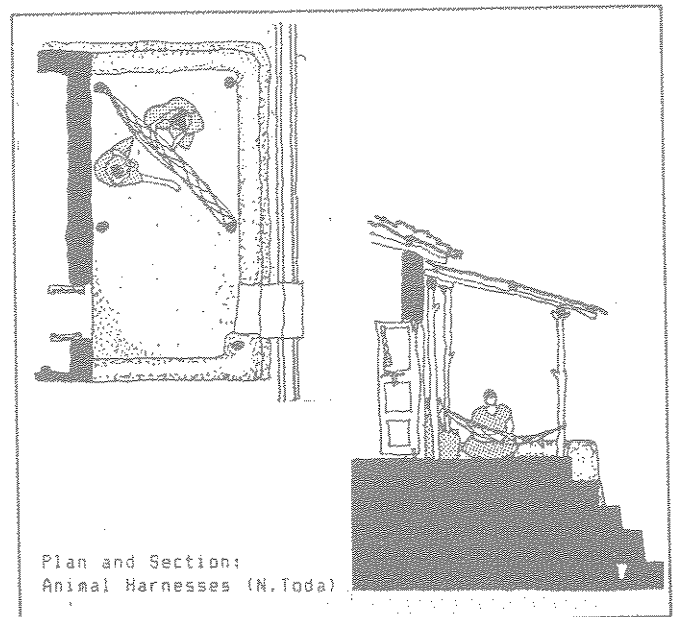
Craftsmen like carpenters, bricklayers, tinsmiths etc can be hired as temporary help. There is a central hiring location in the city (popularly called Kadiya-Naka) where they go in morning. Once hired, the craftsman goes to the house or a site where construction is to be carried out. While the work is in progress they are treated almost like a family member and are offered morning tea, lunch and afternoon meals.

Depending upon the type and size of the job the carpenter selects an open space and sets up his temporary work-shop. Most of his tools are carried in a canvas bag. Public open space, especially under a tree is preferred. Sometimes the craftsman is accompanied by an apprentice helper. This carpenter was making doors and windows for an extension for which the owner had collected old window frames and some scrap pieces of wood which was to be converted into new windows.

HARNESS-MAKING (right)

Waste materials such as pieces of cloth and raw wool are made into harnesses for animals; a household activity carried out mainly by women in their spare time. Long pieces of cotton and wool are wrapped around a vertical support and intricately braided; glass beads are sometimes threaded in as decoration. The material for making the harnesses is purchased by the craftsmen and finished harnesses are sold to the retailers for cash. This is a seasonal activity, since there is a demand for the harnesses only during the months following the harvest at the end of rainy season.

The raw material is stored in bamboo baskets, and the finished products are stacked on the top of the unused material. In the illustration, the house extension was used as a work space and the vertical verandah roof supports were used for stretching the material.



Plan and Section: Animal Harnesses (N.Toda)

## STRING-MAKING (left)

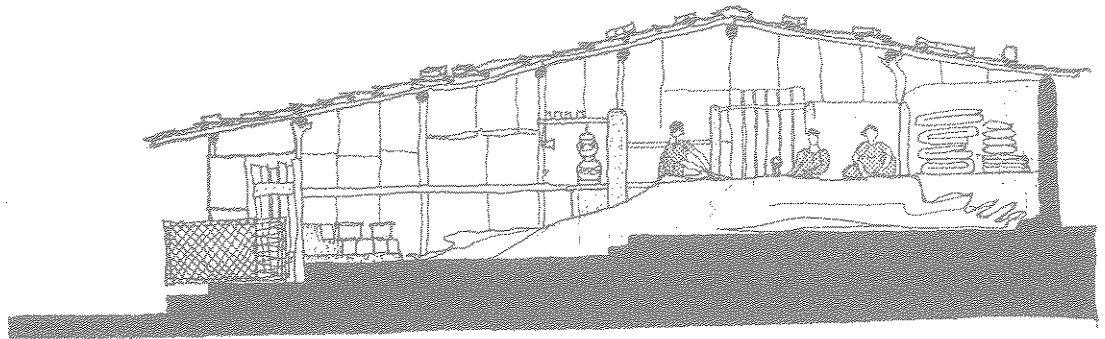
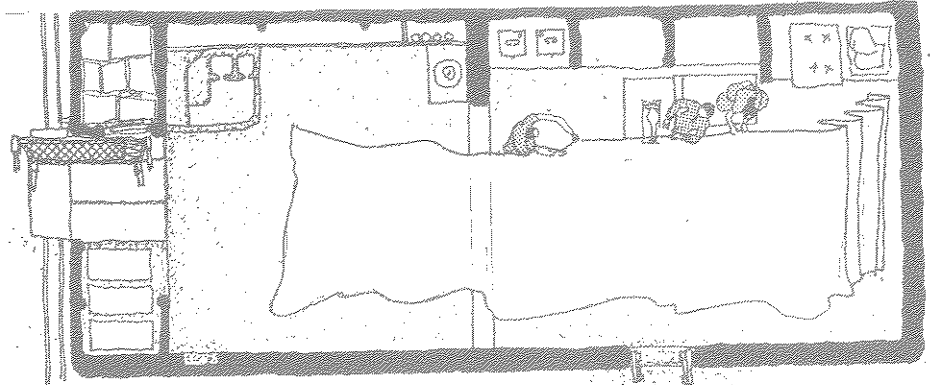
This seasonal activity is performed by the woman of the household, assisted by the children, as an supplement to the husband's income. The raw material is cotton waste picked up from a ginning mill and taken home to be sorted. Once sorted, it is rolled to create balls or reels of thread which will then be sold to local shopkeepers for use in tying up packages. The task is usually done outside the dwelling unit. Storage requirements are minimal because the raw material and the finished product are kept in baskets piled one on top of another.

## BRACELETS (below)

The Hindu festival of Rakshabandhan is celebrated on the full moon of Shravan (the Indian lunar month closest to August). On this day a decorative bracelet made from silk, silver threads, beads, and colored pieces of foam is tied on the right hand of brothers by sisters as a protective amulet. Consequently, rakhi-making is a seasonal activity concentrated around the month of July. Usually adults as well as children of both sexes participate in this work. The material for making rakhis is kept in a small (about 30cm diameter) metal dish called a thali; ready rakhis are generally stored in a separate thali. Rakhis are sold directly to retailers. While working, people sit around an open area on old jute bags or duris.

Plan: String-making (K.K.Bhatta)

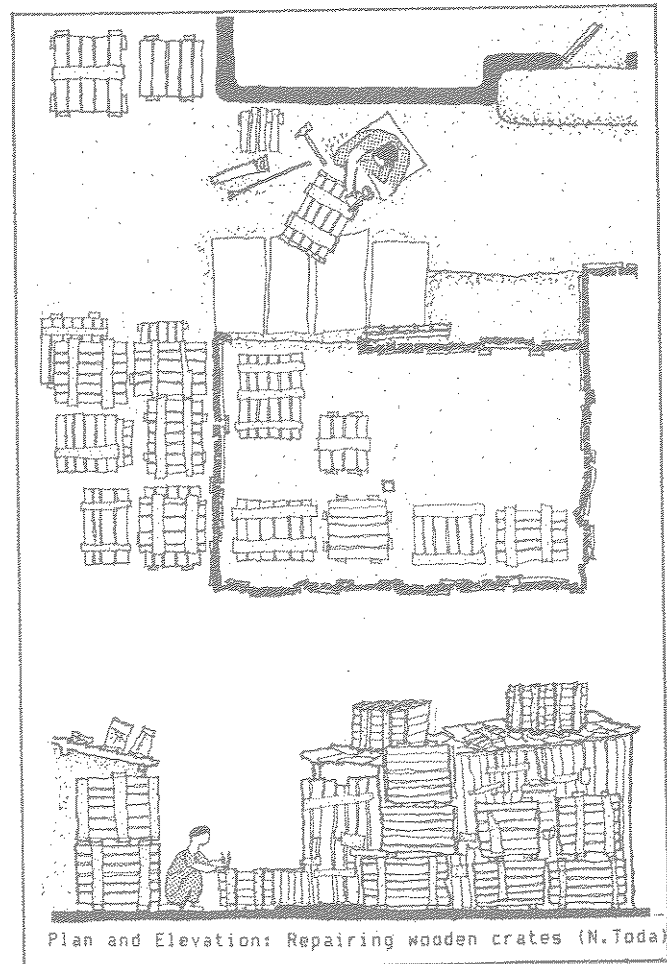
Plan: Bracelet-making (K.K.Bhatta)



Plan and Elevation: Making awnings (N.Toda)

AWNINGS (above)

The production of these canvas awnings is performed on a contract basis with at least three persons doing the work; one person doing the stitching and two persons assisting. A very large floor area is required and the work is usually done outside the dwelling unit, except of course during the rainy season when it would have to be done inside, or at least under a roofed area. A long and narrow space approximately 3m wide and 8-10m long is required. For reasons of security, the storage of raw materials and finished awnings is always inside the dwelling unit. Since the canvas is expensive, it is purchased from the advance that is paid by the buyer



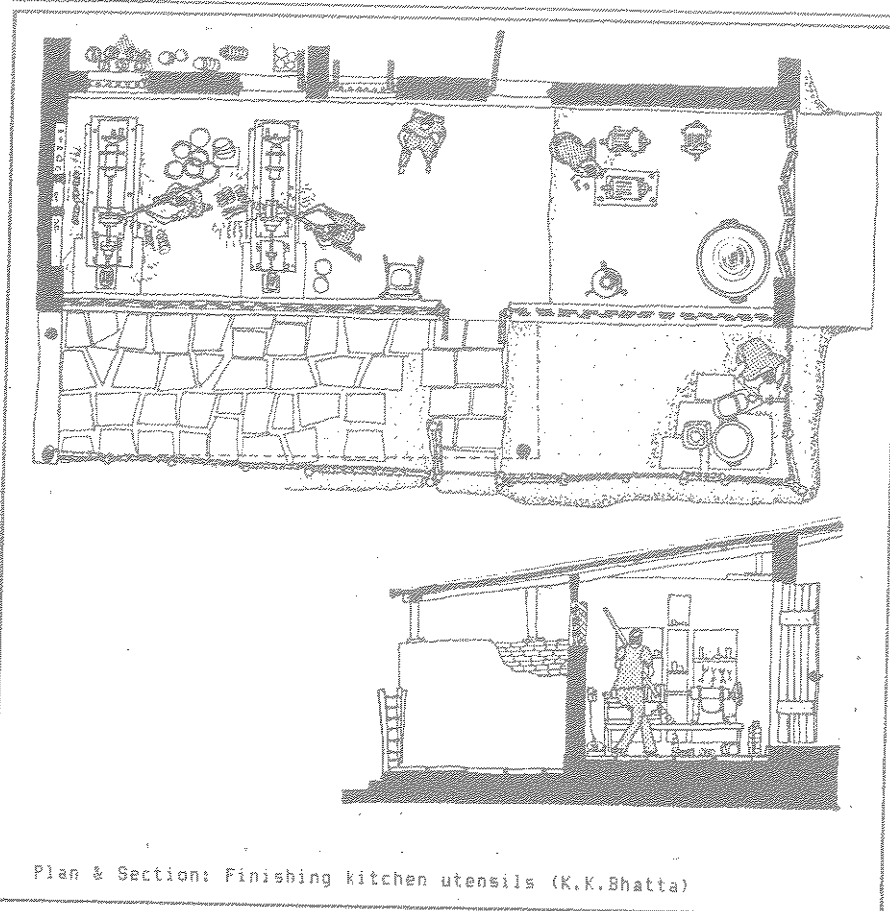
WOODEN CRATES (right)

This activity involves recycling of old wooden boxes and crates collected around the city. For most of the boxes either the wooden planks are missing or if they are made from plywood their corners are damaged and need reinforcing. A carpenter using a crowbar, a hammer, a saw and nails repairs these boxes. The storage of old and repaired boxes takes up a lot of space since each box is at least half a cubic meter in volume. As none of these containers can be nested, they are stacked one on top of another. An open work area is more suited for this activity, at least a 5 x 5m space is needed for this activity.

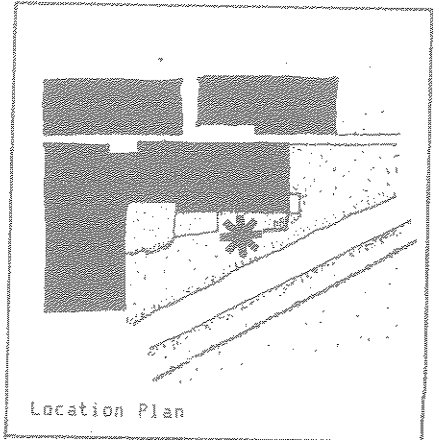
Plan and Elevation: Repairing wooden crates (N.Toda)

## UTENSILS (left)

This is a small workshop that polishes aluminum utensils. Cans and other utensils which are manufactured elsewhere must be trimmed (as they have sharp edges) and polished using a buffing machine. Four persons work here. Two storage spaces, one for the finished items and another for rough goods are required; small rooms at the back of the shop is used for this. Metal scrap is collected at the end of a work day and stored in large jute bags.



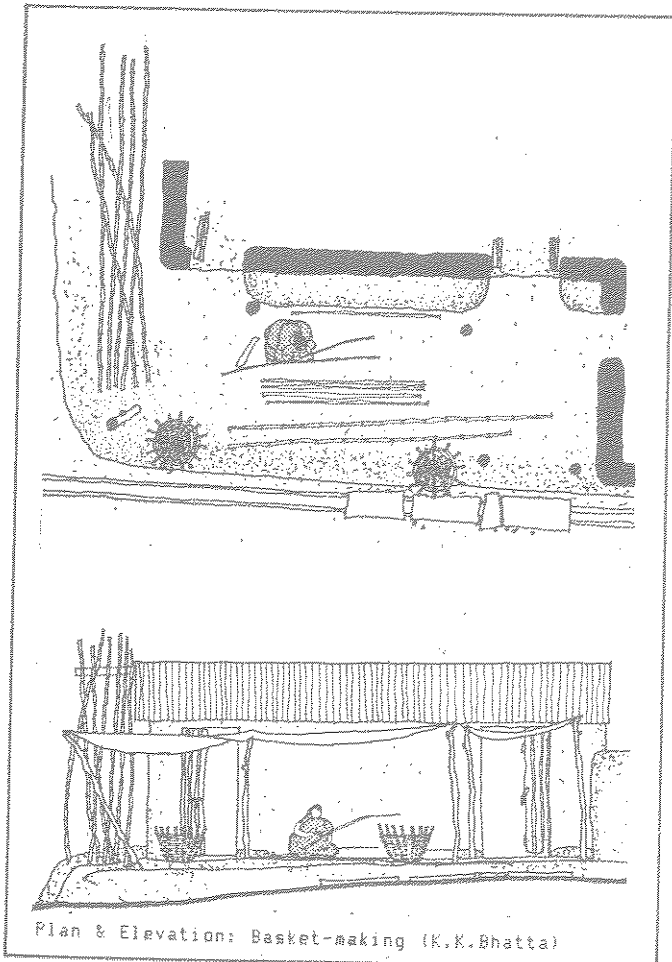
Plan &amp; Section: Finishing kitchen utensils (K.K.Bhatta)



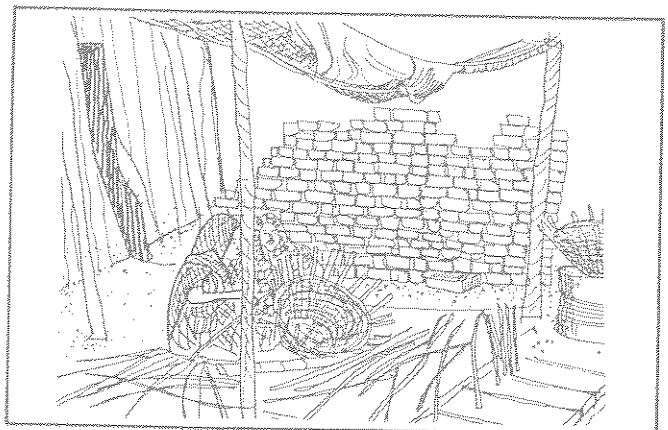
Location Plan

## BASKETS (left, below)

Baskets are woven from bamboo; long bamboos approximately 5-7m long are split lengthwise with the help of a sharp metal instrument that resembles a machete; split bamboo pieces are cut to a standard length of approximately 2m and are hammered with the help of a wooden mallet to facilitate further splitting of these pieces into thin strips. The thin bamboo strips can be bent easily and are woven around a cage in a spiral. Men and women both engage in this activity. Basket-makers also make bamboo screens which are used as sun protection. A large quantity of bamboo (up to about 100 pieces) is purchased and stored next to the house in an open space. It is not necessary to protect them from the elements. The ready baskets and screens are stored in the house and sold either to retailers or to individual buyers. Baskets nest and the screens roll up into a bundle and are easily stored in the house.

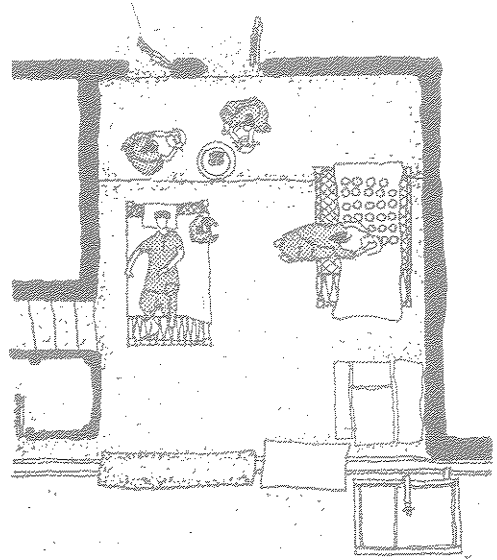
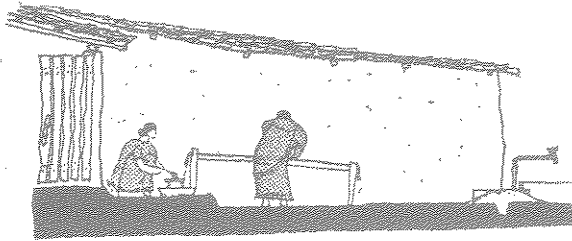


Plan &amp; Elevation: Basket-making (K.K.Bhatta)





## BREAD / METALWORK



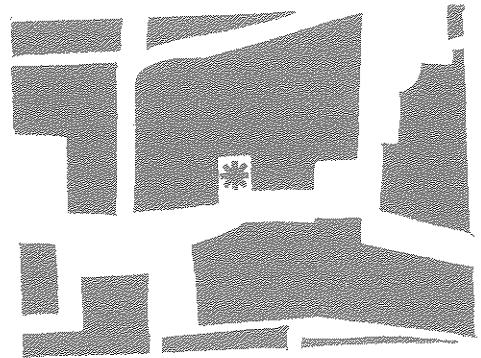
Plan and Section: Bread-making (K.K.Bhatta)

## BREAD-MAKING (right, above)

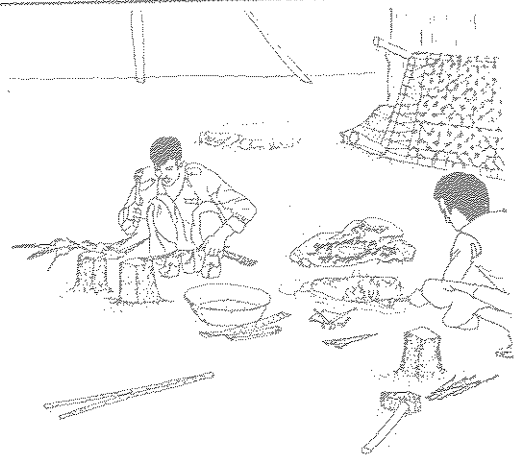
Papad is thin rolled bread that is sun dried and keeps for a long time. It is either baked on an open fire or deep fried immediately before eating. It is made from either black bean or mung bean flour mixed with spices. This activity is carried out during the summer by women from within a neighborhood working as a group. On a hot summer day a large quantity of these papads are hand rolled with the help of a rolling pin on small wooden boards, children helping to carry and spread the papada to be sun dried. The work place is an area under a sun shade which could be the front porch of a house, or a place in the sun where beds covered with old sarees are kept. This activity does not demand any special training therefore many women do this work during the summer as an additional source of revenue. Social organizations also promote this activity, for example Gandhian cooperative stores buy their supply of papads and other such items from marginal settlements. The storage of ready papads is in a container approximately 30cm in diameter with an air-tight lid.

## METALWORK (right)

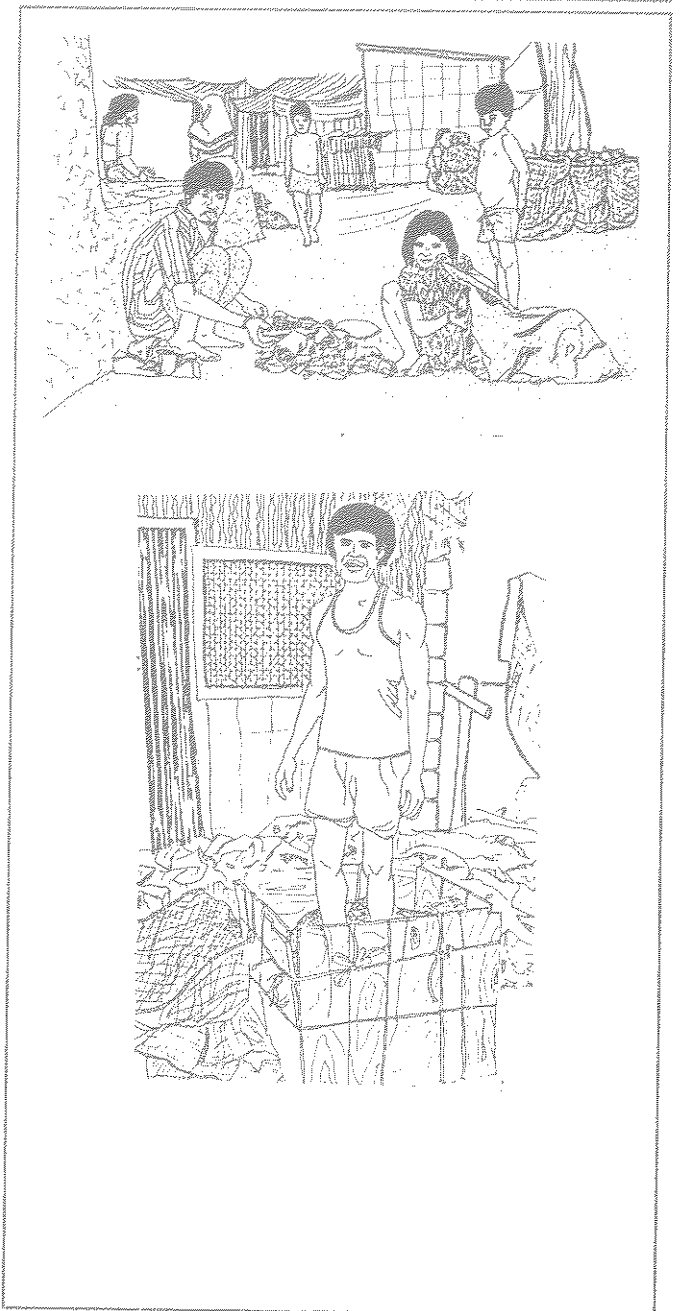
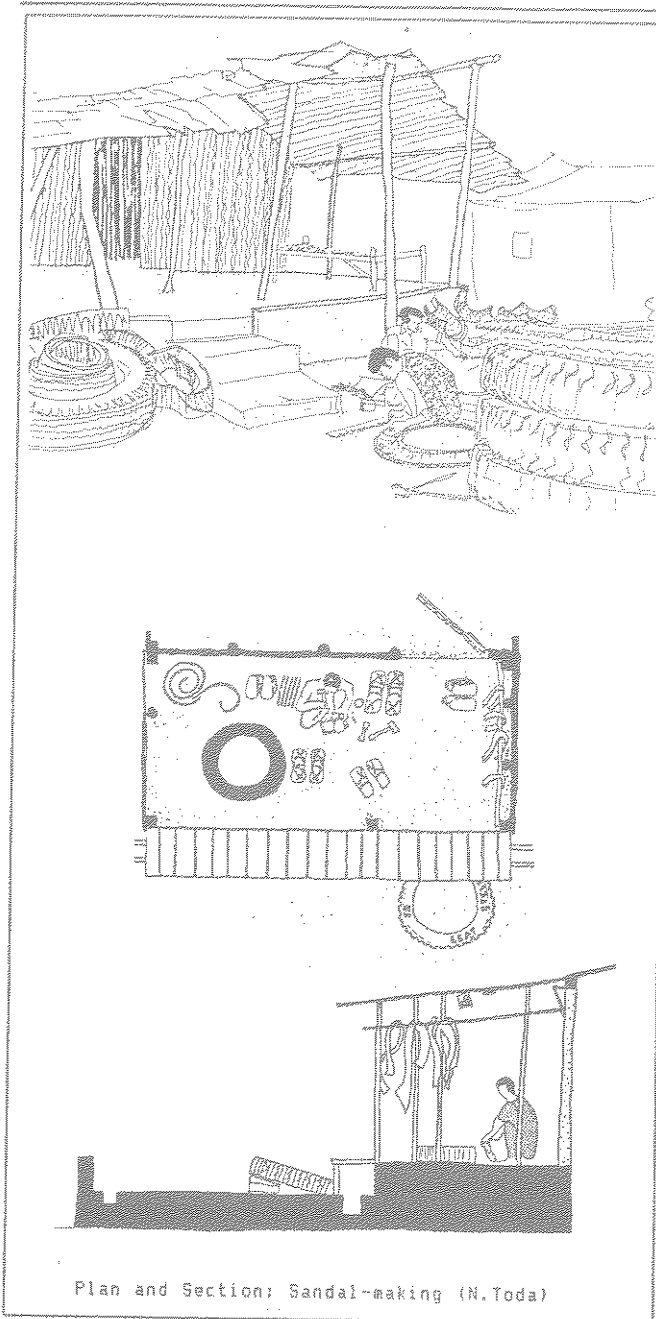
This activity involves the fabrication, repair and sharpening of various tools. These artisans recycle steel implements and the repair tools on "while-you-wait." The material required for this job includes steel scraps, coal and wood for the fire, a hand-operated air blower to fan the fire, and various other hand-tools. The basic fabrication job entails heating of the iron in the fire (a woman or child will usually operate the blower); the iron is then passed to the next person who will hammer the metal into the desired shape and complete the tempering process by immersing the item in the nearby basin of water. This is a specialized job at which migrants from Rajasthan are considered expert.



Location Plan





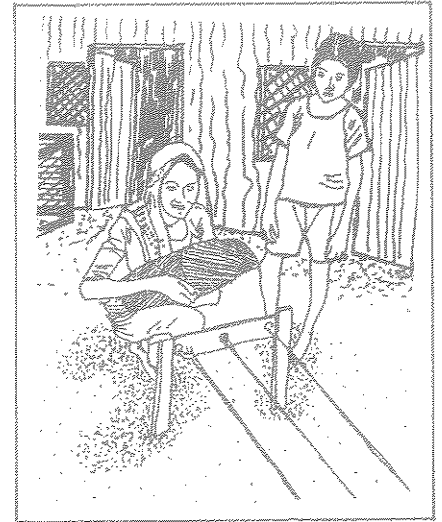
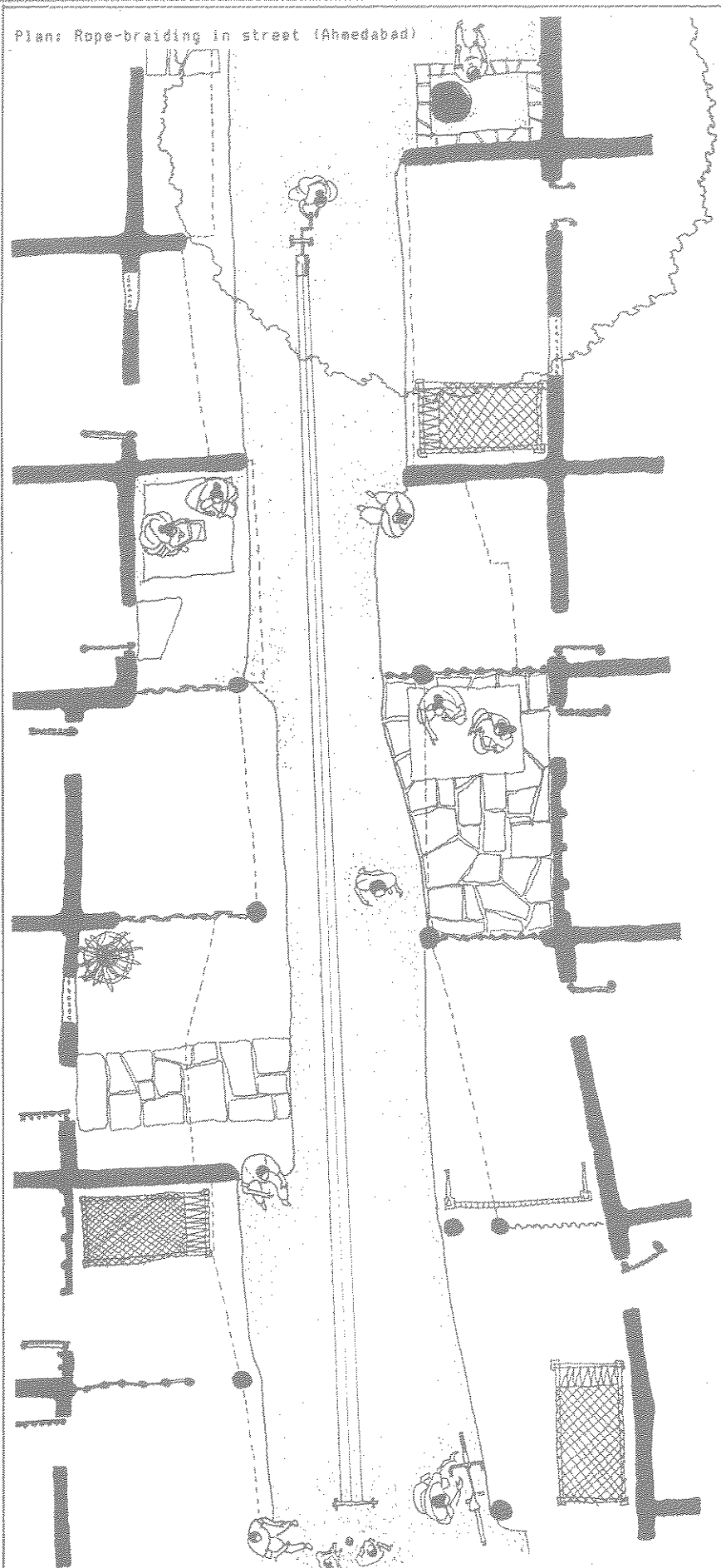


### SANDALS (above)

Old automobile tires and inner tubes are converted into components for making sandals. First the walls of old tires are cut away from the treads; since the walls are thinner than the treads they are better suited to making soles. The treads are further cut into thinner layers before being made into soles. It is possible to get three or four layers from each tread. The tires are cut using a special knife, and the layers of rubber are separated using large pliers. This activity usually involves two persons. Using a standard set of templates, soles are cut from the prepared rubber. Thin strips about 1cm wide are cut from inner tubes and are used to make sandal-straps. The lighter work is usually done by women and older people, while the more arduous stripping of tires is done by men. Small nails, 1cm long are used to attach the inner tube strips to the soles. The storage of ready sandals is not difficult since they are stacked one on top of another in a corner of the house, before being taken to the retailer; the old tires are kept in the open and are piled five to six high.

### SORTING GARBAGE (above)

An activity of the poorest persons in which all family members participate is the sorting of garbage. Glass, paper and metals are separated and sold to dealers. These collectors will pick up any glass bottles that are unbroken or any large pieces of any item which may have a market value. Most of the collecting is done at the local garbage dump and the sorting is usually done at their dwelling unit before sale to the dealer. Garbage collection and sorting does not require any special skill and only a large plastic or jute bag is needed to collect the material; as a result new unskilled migrants take up this activity as their first job in the city. The most commonly recycled items are metals, plastics, glass, cotton, synthetic fabrics, glass, rubber and jute.



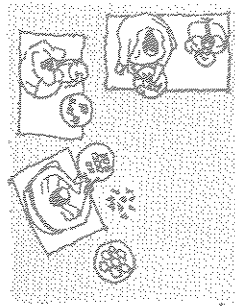
ROPE-BRAIDING

Rope-making, like clothes-making, is a cottage industry. Cotton fibers or synthetic monofilaments are used. Long open spaces are required since the unit lengths of rope is about 30m and they are plaited in their full length. Open spaces under trees and the verges of roads lined with trees are used to carry out this activity. A pair of wooden stands placed at either end are used to plait the fibers into a rope. There is usually an adult at one end and maybe a couple of children at the other. The storage of finished ropes do not require much space--generally they are hung up on a wooden support, inside the house, and turned over to retailers a number at a time.

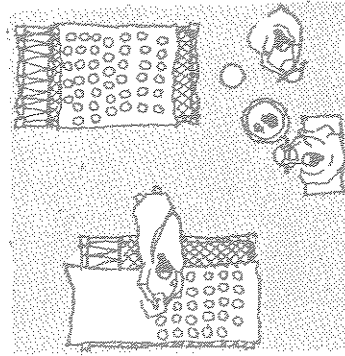
ACTIVITY	TOTAL AREA M2	WORK SPACE			STORAGE		VEHICLE REQU'D	ENERGY REQ'D
		AREA M2	SHAPE	TYPE	AREA M2	TYPE		
BRACELETS	2	2	Square	Public/Open	--	Interior	--	--
STRING	4	4	Rect.	Private/Open	--	Interior	--	--
CARPENTRY	4	4	Square	Public/Open Private/Open	--	Interior	--	--
ANIMAL HARNESS	4	4	Long.	Public/Open Private/Open	--	Interior	--	--
CLOTHES	4	2	Square	Public/Open Private/Open	2	Interior	--	--
BROOMS	4	2	Square	Public/Open Private/Open	2	Interior/ Exterior	--	--
CIGARETTES	6	6	Square	Public/Open Private/Open	--	Interior	--	--
WOODEN COMBS	4	2	Rect.	Private/Open	2	Interior/ Exterior	--	--
BREAD	6	6	Rect.	Public/Open Private/Open	--	Interior	--	Gas
METALWORK	6	6	Square	Public	--	Interior	--	Fire
GARBAGE SORTING	6	4	Square	Public	2	Exterior	Pushcart	--
BASKETS	16	8	Rect.	Public/Open Private/Open	8	Interior/ Exterior	Pushcart	--
UTENSILS	18	14	Rect.	Private/ Enclosed	4	Interior	--	Elec.
SANDALS	20	12	Square	Public/Open Roofed	8	Interior/ Exterior	Pushcart	--
AWNINGS	32	28	Long.	Private/Open Roofed	4	Interior	--	--
ROPE	32	30	Long.	Public/Open	2	Interior	--	--
WOODEN CRATES	36	24	Square	Public/Open Roofed	14	Interior/ Exterior	Pushcart	--



BRACELETS



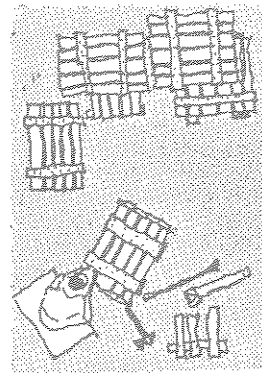
CIGARETTES



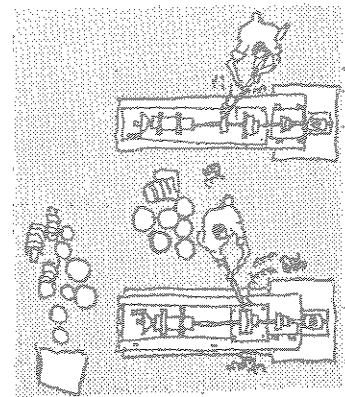
BREAD



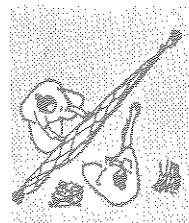
CLOTHES



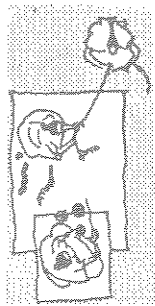
WOODEN CRATES



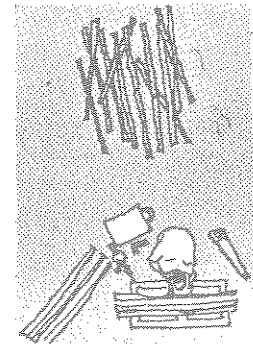
UTENSILS



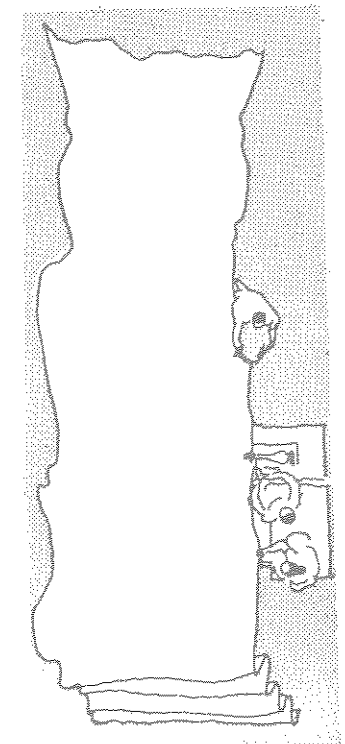
ANIMAL HARNESS



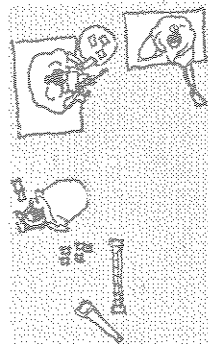
STRING



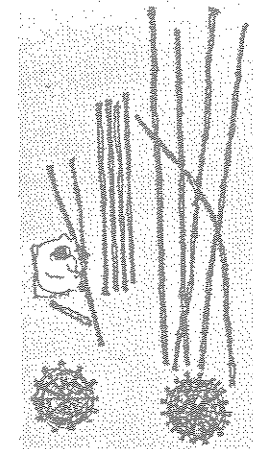
CARPENTRY



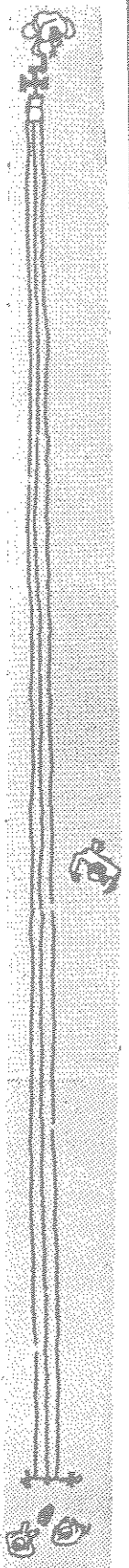
AWNINGS



WOODEN COMBS



BASKETS



ROPE

## 3. Small Shops

As we discuss in Chapter 2: Work Places, informal sector housing is characterized by the integration of work and living activities in a way that is quite different from what is found in conventional modern housing, although similar to "traditional" neighborhoods in developing country towns and cities, and, incidentally, to older districts in European towns. A similar situation exists with regard to small shops, which are interspersed next to, among and within houses.

Small neighborhood shops exist in addition to formal markets or more public shopping-streets. They are usually distinguished by their extremely small size, the nature of their commerce, which is exclusively oriented to local needs, and their intimate proximity to the home.

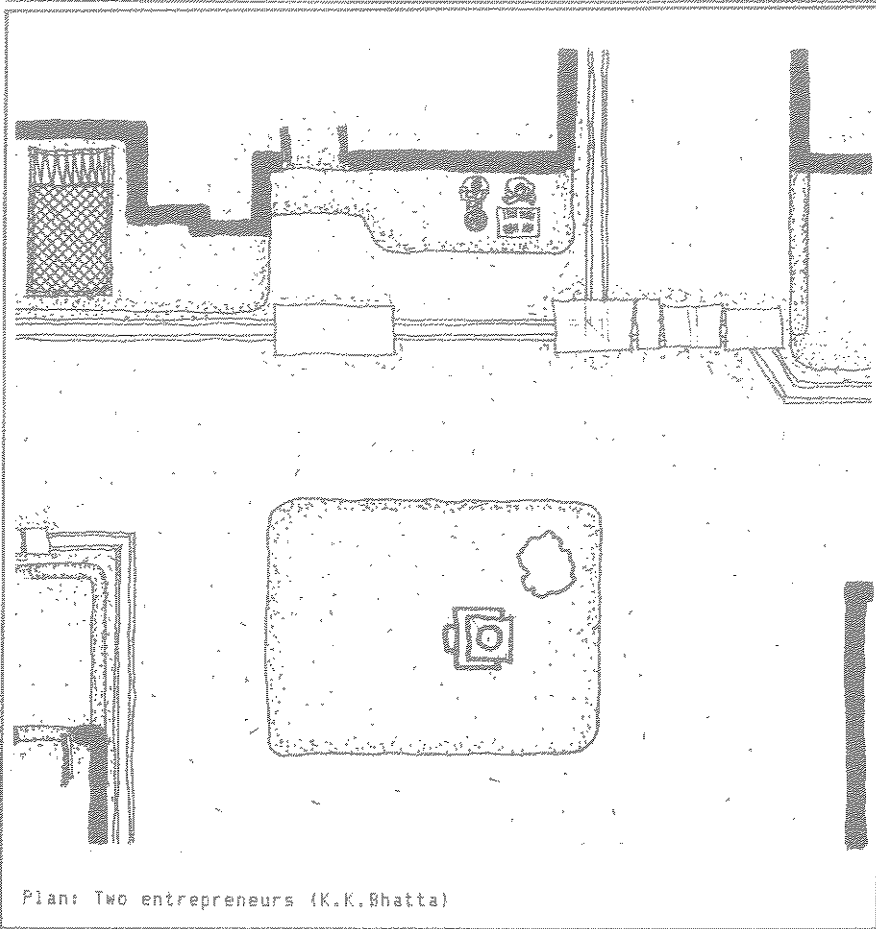
The location of small shops follows sound commercial principles, that is, they tend to be located where there is the greatest exposure to passersby. As in so many parts of our study, this can be expressed as a hierarchy: along main streets, around squares and open spaces, at street corners, and, least desirably, along smaller streets.

There are two distinct types of small shops: first, those that are adjacent to, but independent of, the living unit. These are usually larger, such as repair shops, or located on main streets. Secondly, and more commonly, are small shops which simply occupy the front room, or house extension, of the home. In many cases, "shop" area and "living" area are overlapped, the one giving way to the other, as the need arises. In such cases, the family is able to undertake commercial activity with the smallest investment on its own premises, always assuming that the house location is amenable.

In addition to permanent small shops, there are also mobile shops--carts and moveable kiosks--that are operated by hawkers and peddlers. The distinction between mobile and fixed shops can be blurred, since frequently the first stage of establishing a permanent shop is simply to park a pushcart in one location, and eventually to upgrade it into a semi-permanent structure.

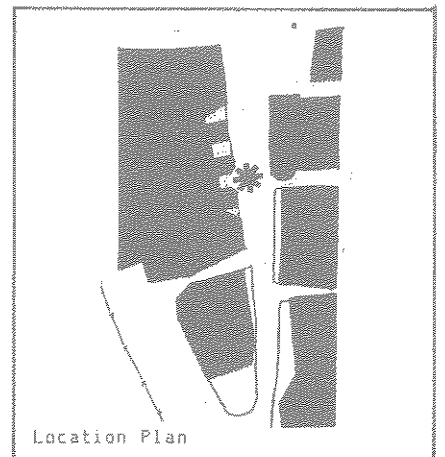
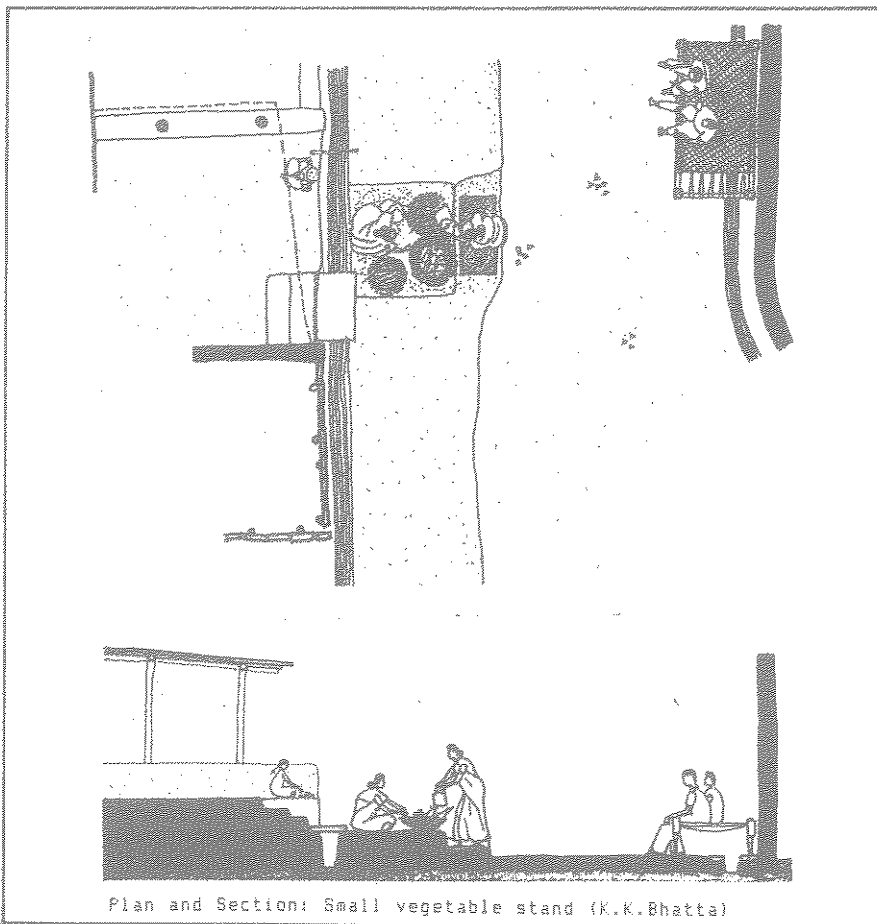
Like small-scale workplaces, small shops are an important income generator in informal sector housing. They also distribute goods that are economically attuned to local resources and needs. This is especially true of repair-shops (bicycles, tinsmiths), which provide a much-needed service. In the case of tea-shops, they function as neighborhood meeting places and informal social centers.

A close examination of small shops in marginal housing helps to explain why the "commercial centers" and "markets" that are planned for sites and services projects frequently stand empty and unused. Not only is the concept of centralized shopping inappropriate to the living patterns found in informal sector housing, it also fails to provide the economic and social benefits of "living-over-the-store."



TWO ENTREPRENEURS

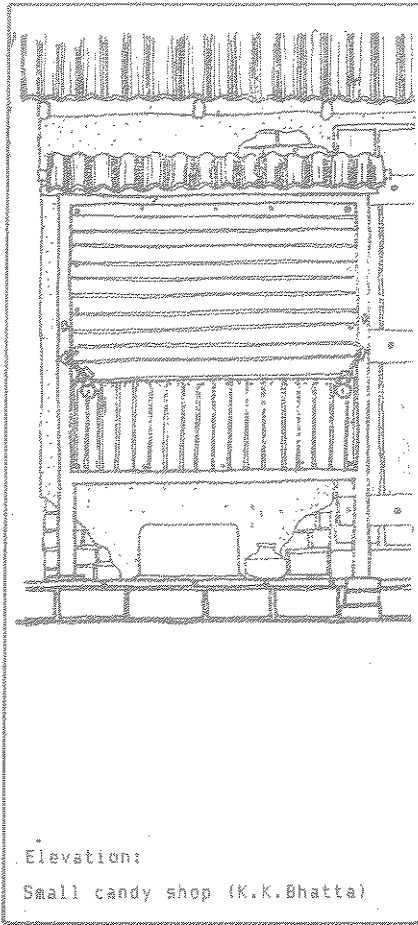
Two sisters have set up this street corner shop, using their house extension. One sells home-made rice rolls and the other fruits; a ground cover made from old jute bags and a bamboo basket are the only items required to operate this small shop. Children from the neighborhood using the tree place opposite this shop are often customers here.



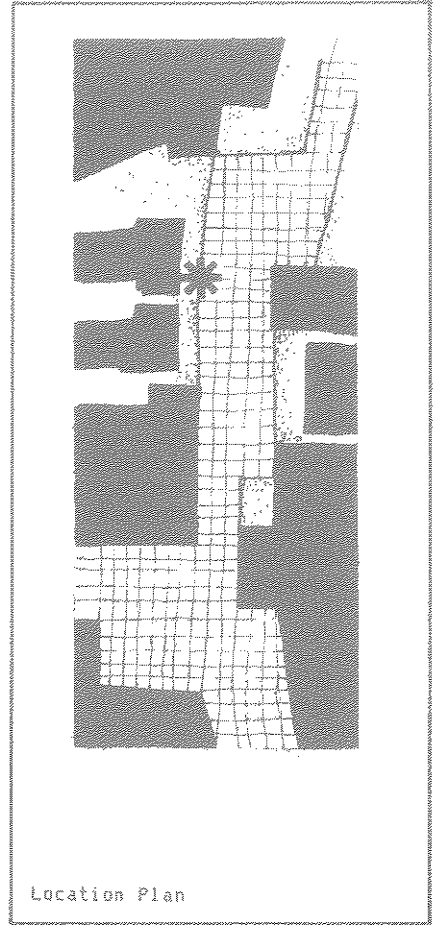
SMALL VEGETABLE STAND (left, above)

This vegetable stand has been set up as a part of a small extension. This stand is not open all day--it stays open only for few hours during morning and evening. Only a limited variety of vegetables is sold here. One key item are herbs like chillies, curry leaves and coriander, used as a seasoning in lentil and vegetable curries.

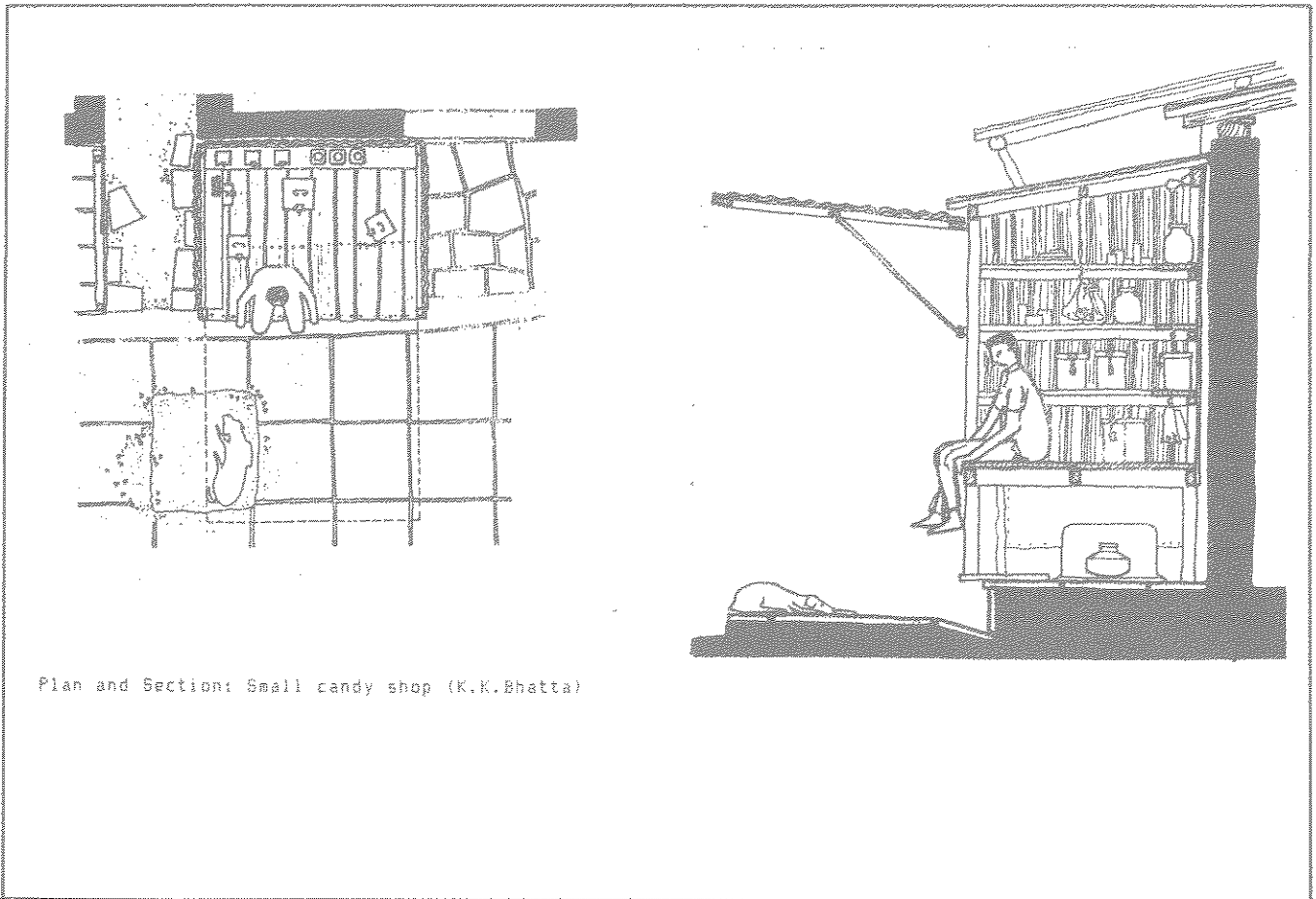
**SMALL CANDY SHOP (right, below)**  
 This is a typical small convenience-type store, that was observed throughout these settlements. It carries items such as sweets, biscuits, and other small edible items for children. It also sells essential household items such as packets of tea, sugar, match boxes, cigarettes and candles (which are often needed at short notice!). These shops can be integral part of the house or may be situated in the extension. Here it has been set up in a converted pushcart.



Elevation:  
 Small candy shop (K.K.Bhatta)



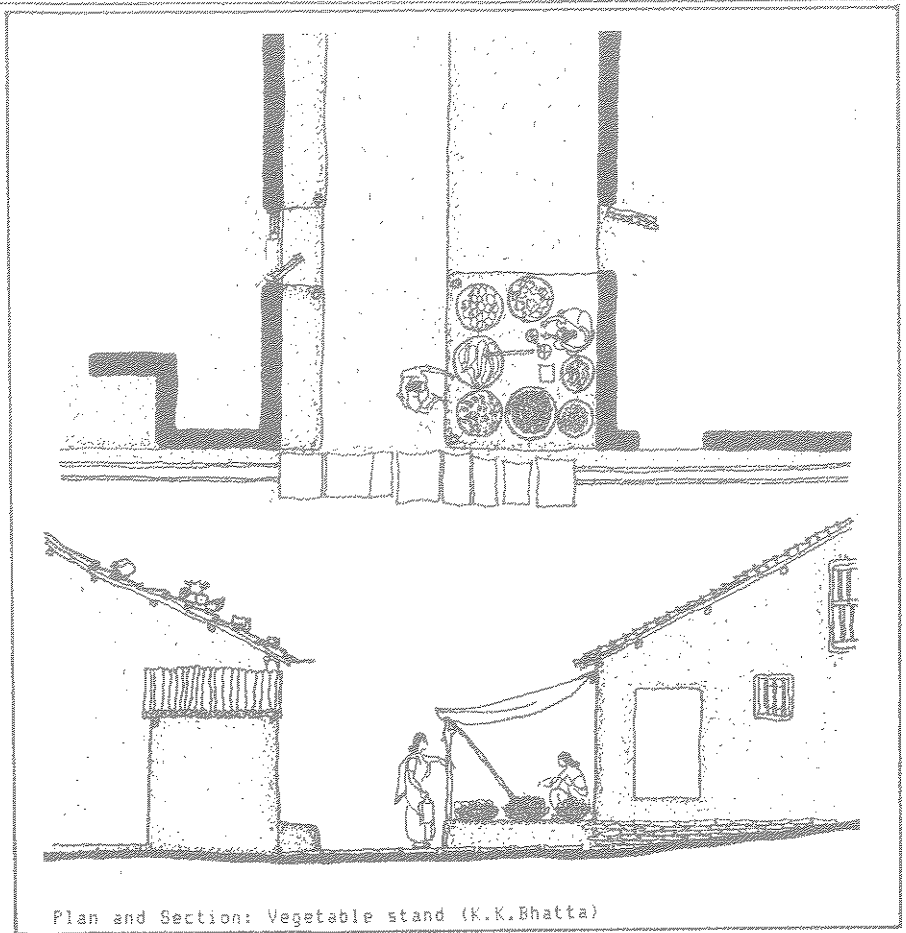
Location Plan



Plan and Section: Small candy shop (K.K.Bhatta)

VEGETABLE STAND (right)

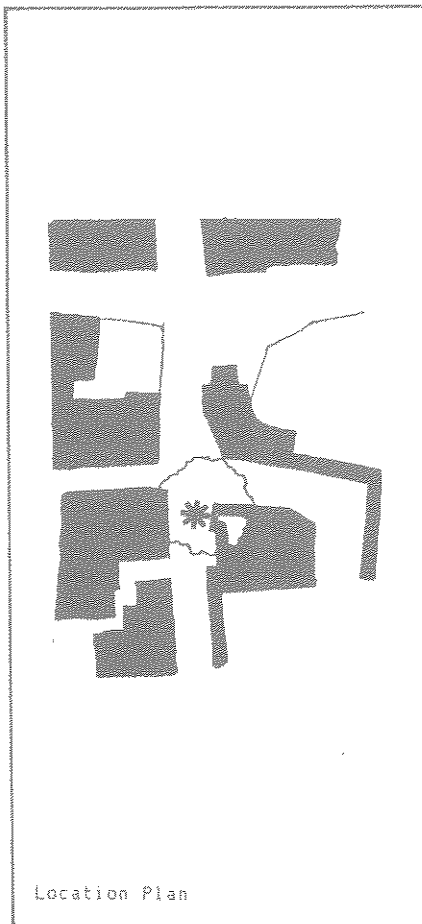
A vegetable and fruit stand at a street corner, which is part of a house extension. A canvas cover protect the merchandise from the sun. Without refrigeration it is difficult to keep fresh produce for an extended time therefore green vegetables and herbs are purchased daily. Those who cannot go to the main market every day, buy vegetables from these shops or from pushcart vendors. It is a common practice to go to the main vegetable market once a week for root vegetables like potatoes, onions and yams, which can be easily stored. The vendors and small stand keepers buy their supplies from the market at the daily sale in the morning and bring the produce to the community to sell it during the day. In this particular shop, family members take turns looking after the shop.



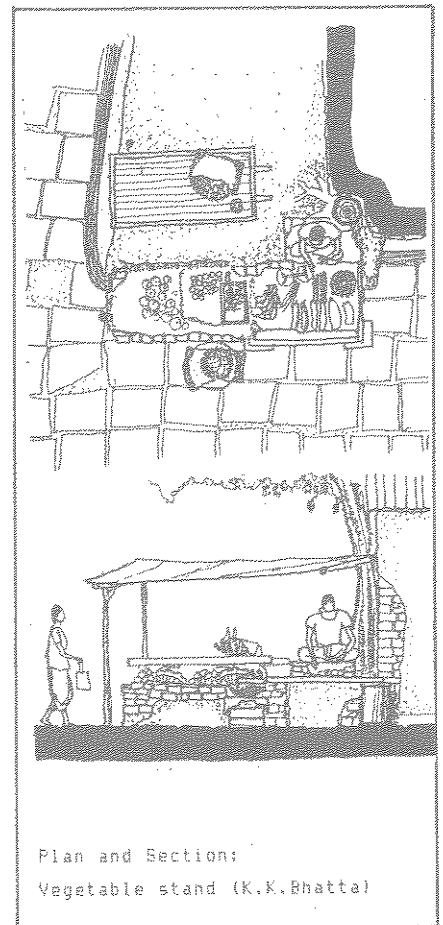
Plan and Section: Vegetable stand (K.K.Bhatta)

VEGETABLE STAND (right)

This stand is located at a street corner under a large tree; a platform is being built here to make a more permanent shop. The owner uses his pushcart to transport his supplies, and at the same time uses it as a part of the stand.

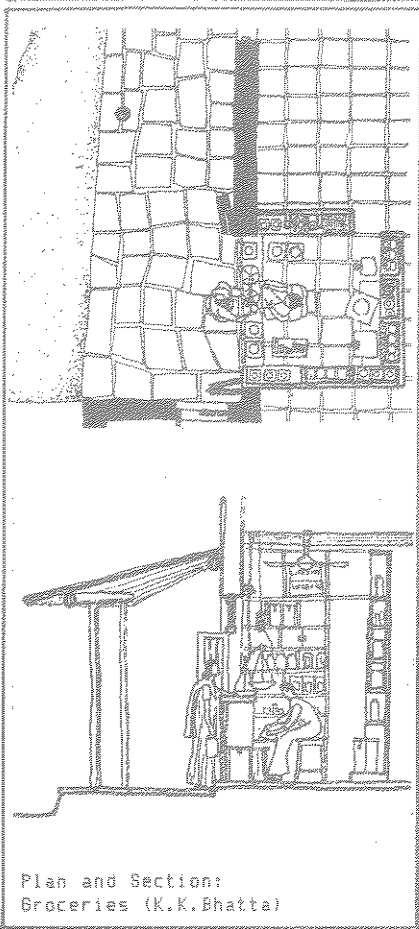


Location Plan

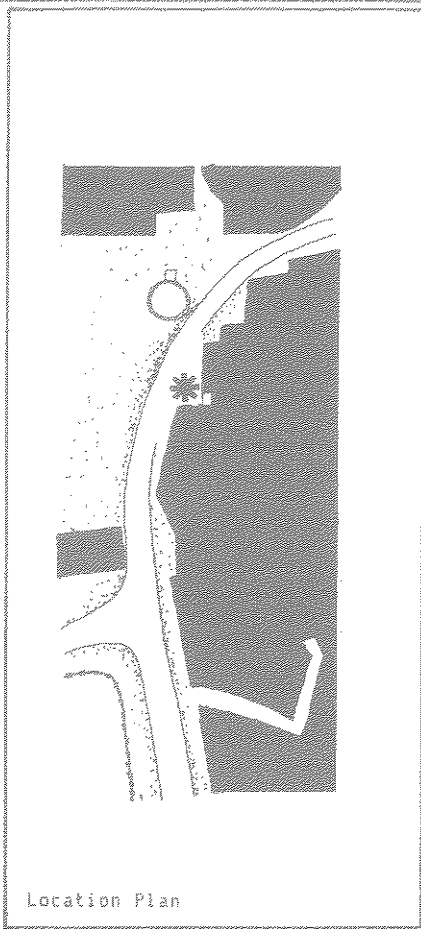


Plan and Section: Vegetable stand (K.K.Bhatta)





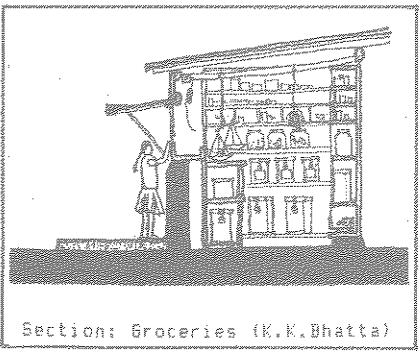
Plan and Section:  
Groceries (K.K.Bhatta)



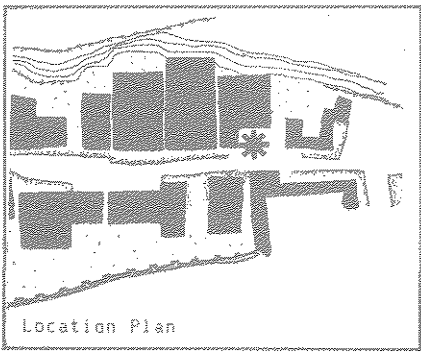
Location Plan

GROCERIES (left)

A corner room off the front porch has been converted to a shop, and although the room size is limited a well organized shelving system provides good storage capacity. Large and heavy items are kept at the lower level, and sweets and biscuits are kept in transparent glass jars at eye level to attract young customers. A weight-balance is hung in the front as a part of the sales counter. An electric ceiling fan cools the shop keeper.



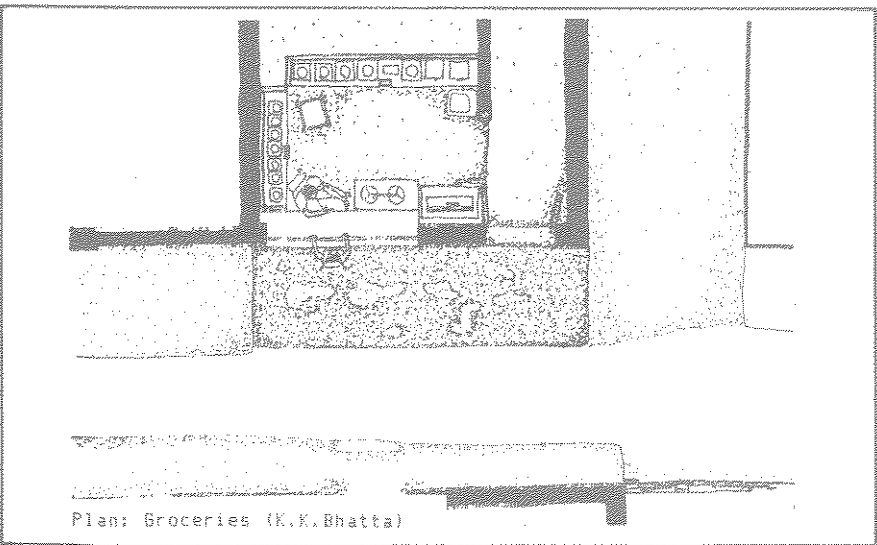
Section: Groceries (K.K.Bhatta)



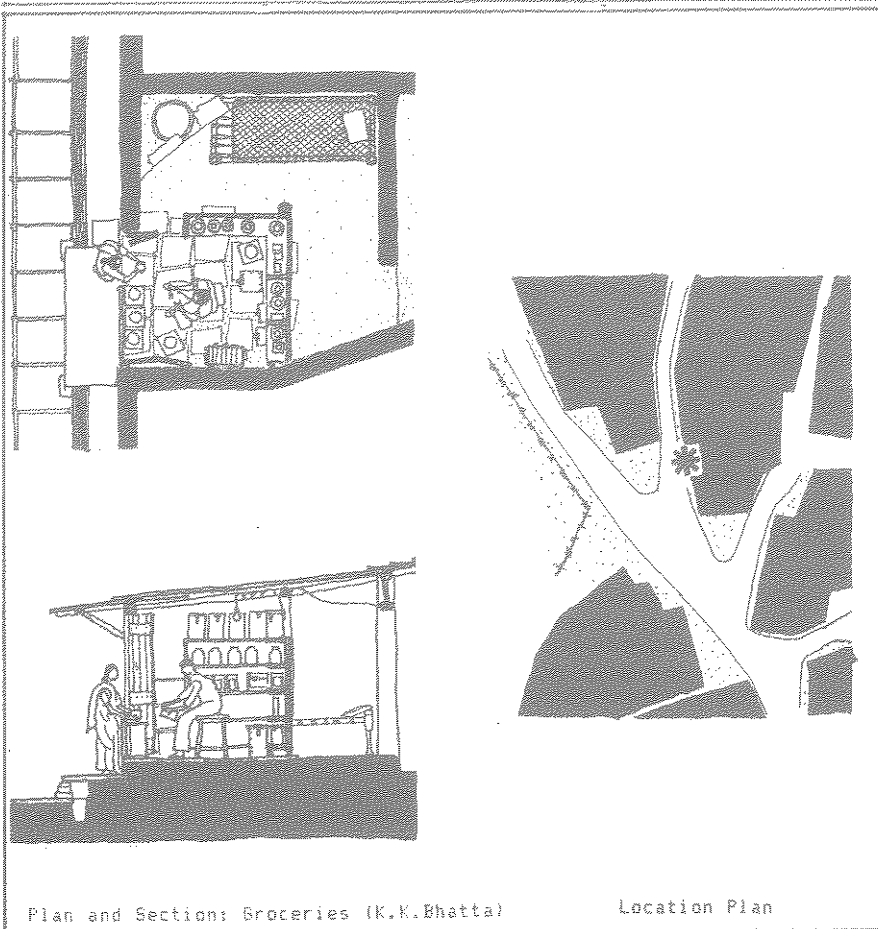
Location Plan

GROCERIES (left)

A typical grocery store—dry food items are sold here. Residents in this community do not have enough money to buy their annual supplies of grains and dried food (a common practice among middle class families), and they use these outlets. These stores occur at major street intersections.



Plan: Groceries (K.K.Bhatta)

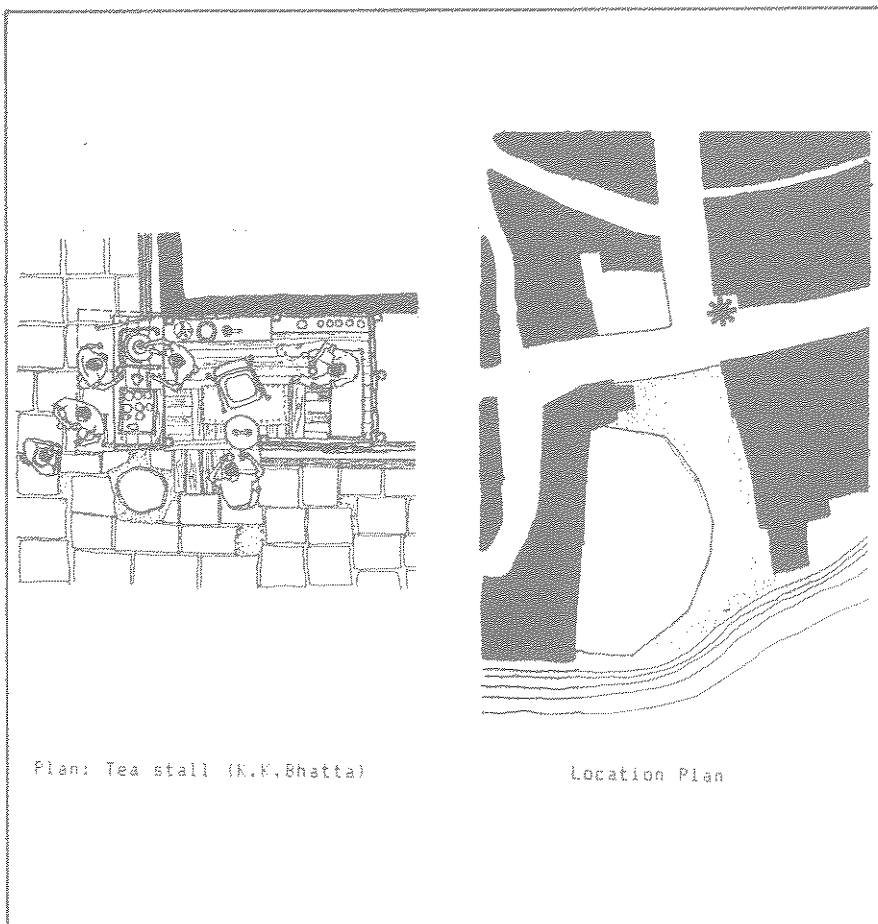


GROCERIES (left)

This extension has been converted to a small shop using wooden shelves; the remaining space is still used as a house extension. During hot summer afternoon when the flow of customers is slow the owner uses the extension to rest at the same time keeping an eye on the shop front.

Plan and Section: Groceries (K.K.Bhatta)

Location Plan



TEA STALL (left)

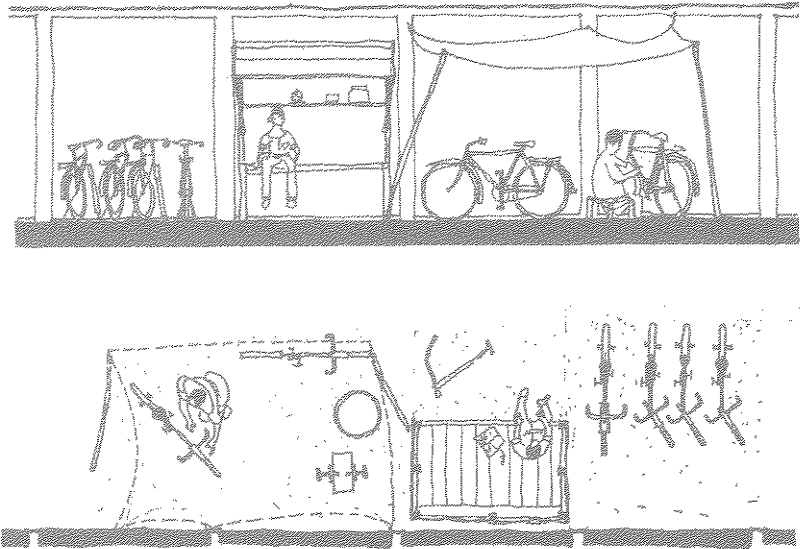
Tea is the most popular beverage in India. It is common to drink it three or four times a day, and it is a routine practice to invite friends out for a cup of tea, generally at a tea stall. Tea stalls are at major street intersections, as in this example, or near public structures like temples or markets. Stalls usually provide a few wooden benches. They also have delivery service, young children (usually under the legal working age) carry out this service.

Plan: Tea stall (K.K.Bhatta)

Location Plan

BICYCLE SHOP (right)

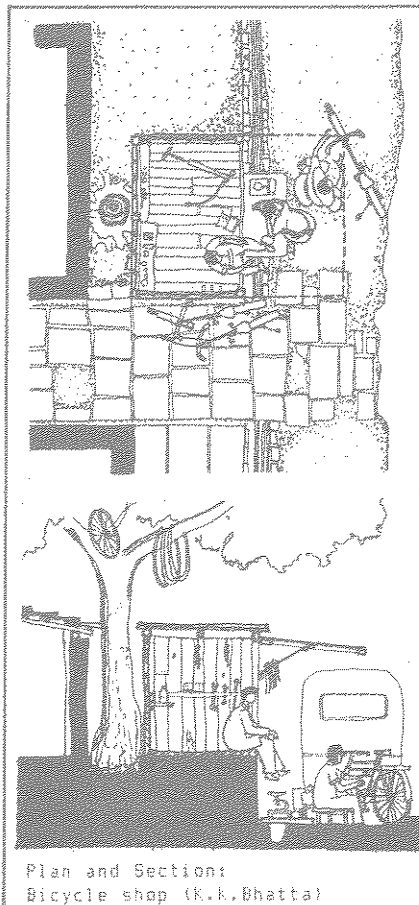
Bicycles are the most popular vehicle used for local transportation in India. A large portion of the population own bicycles but those who cannot afford to buy, rent them on an hourly or a daily basis. Bicycle repair shops are quite frequent; in K.K.Bhatta there are several. Because they service a small community group, the customers are known to the shop owners and chances of bicycle theft are few. The owners are experts at repairing bicycles--a puncture can be fixed within half an hour, and most repairs are done while the customer waits. At times, a bicycle shop is combined with a tea shop to serve the customers better and of course, to increase the revenue. Bicycle shops usually start as mobile shops, using a covered push cart, and slowly get converted to a more permanent form. This particular shop uses a canvas awning as a sun protection.



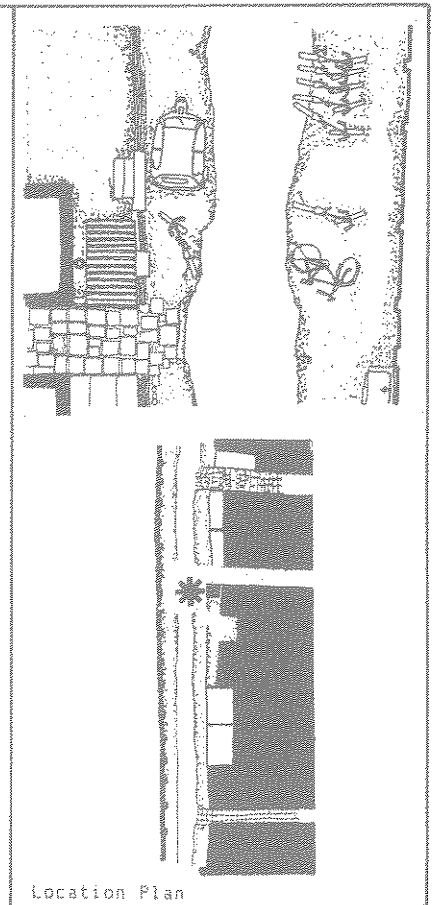
Plan and Elevation: Bicycle shop (K.K.Bhatta)

BICYCLE SHOP

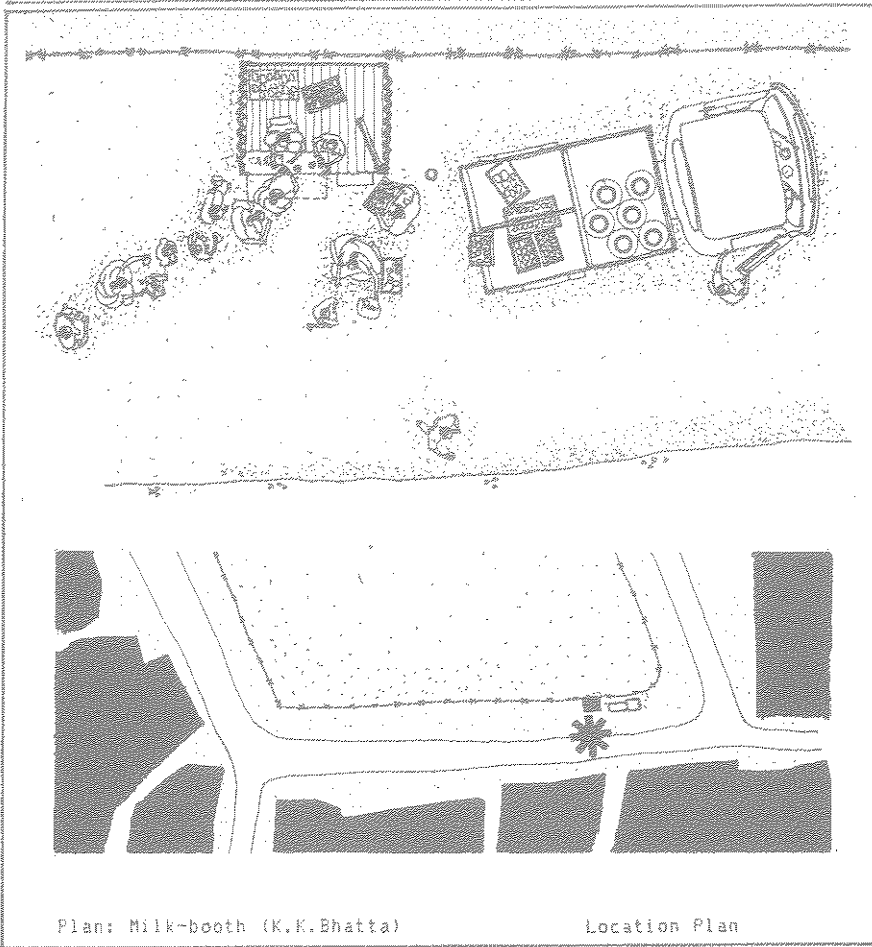
This is a more established bicycle shop in which the wheels of the old pushcart have been removed and the top placed on a raised platform. A large tree shades this location, making it a pleasant spot. Tree branches are used as to store old bicycle parts, which will be sold later as junk. The tree also protect parked bicycles from the hot tropical sun.



Plan and Section: Bicycle shop (K.k.Bhatta)

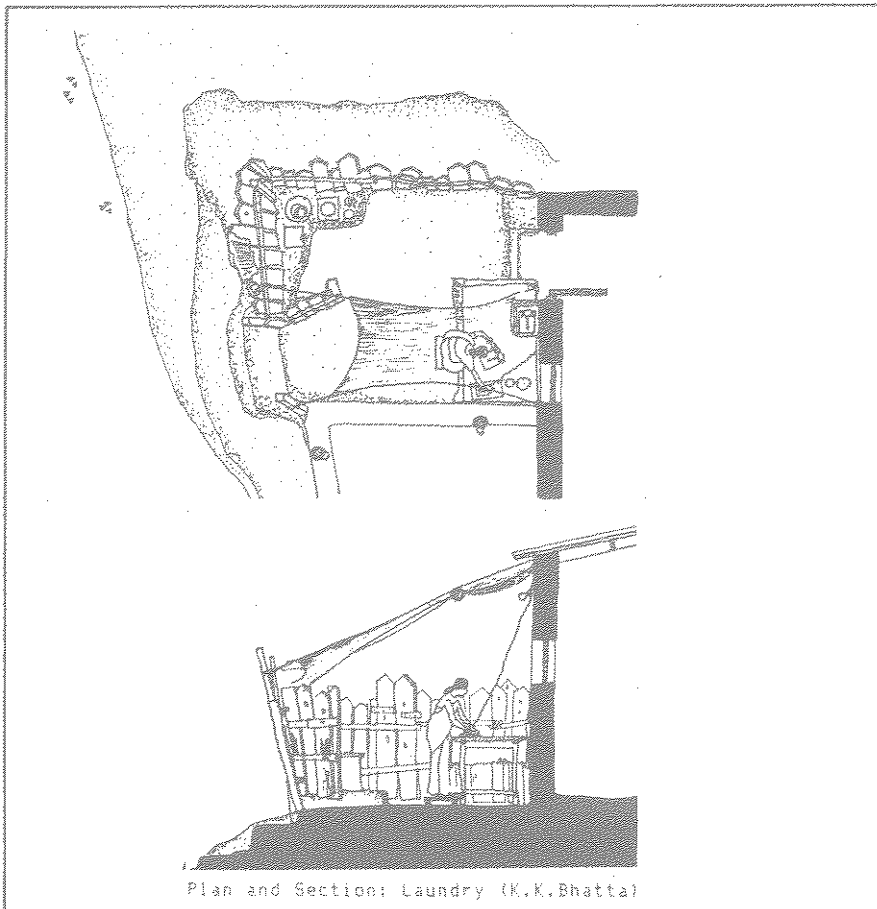


Location Plan



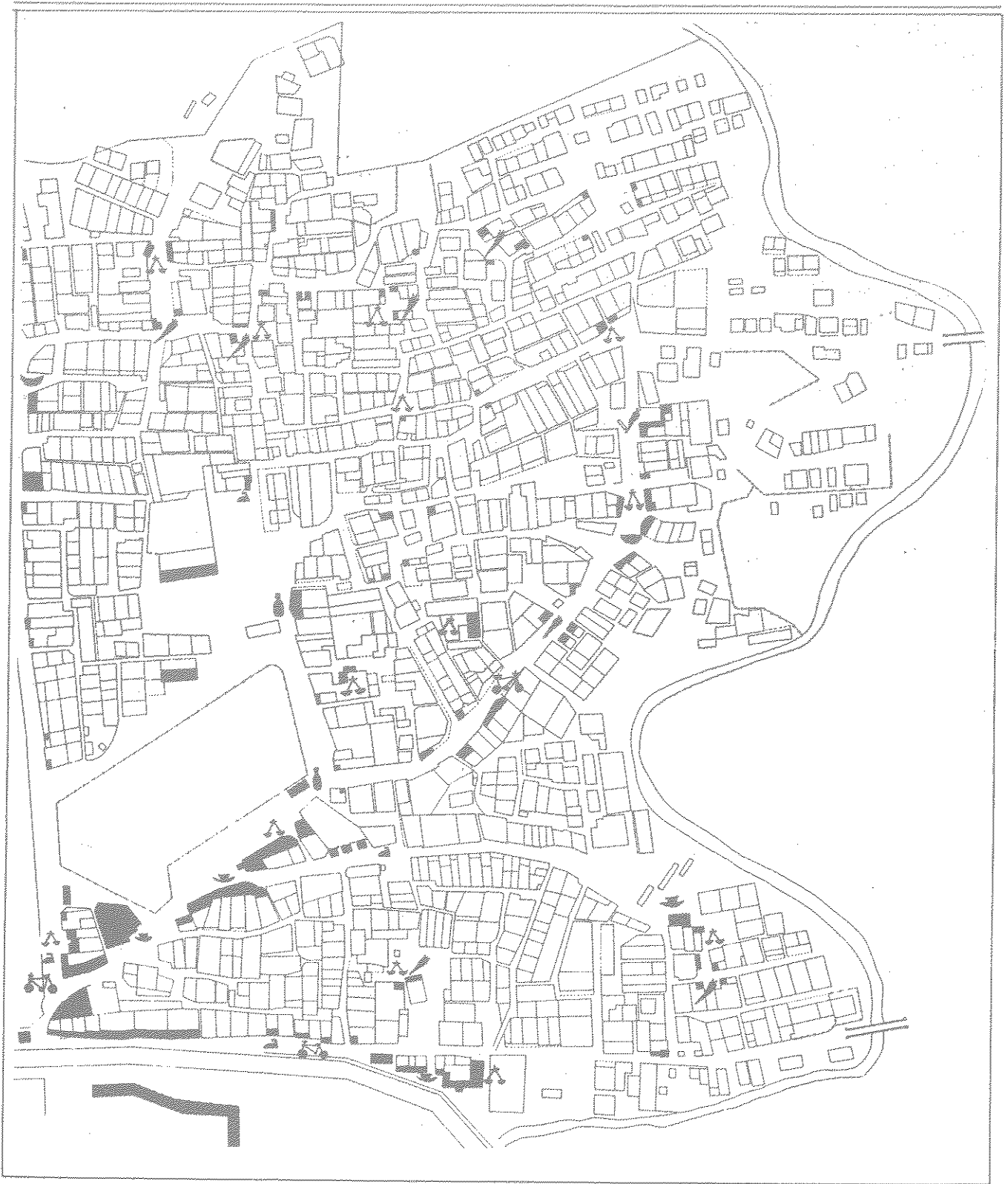
MILK-BOOTH (left)









This is the only milk-booth in K.K.Bhatta. It is centrally located next to an open play field. The booth is made using a wooden frame that is enclosed with steel sheets. A company delivery truck brings the supply for further distribution and people line up in the front of the booth to buy milk. The truck needs a wider circulation space therefore the booth is located on the widest road of this settlement. In hot climates it is difficult to preserve milk for a long time without refrigeration, and, since in India refrigerators are expensive people buy their milk supply twice a day. Generally, the milk delivery is once in the morning around five or six and another one in the after noon around four.



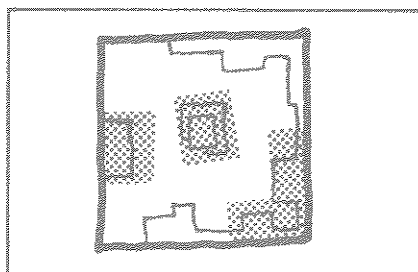
LAUNDRY (left)

The front yard is being used as a work place for an ironing table, and the wall serves to stretch a canvas lean-to roof. Clothes are collected and taken to the river or a main washing place in the city; once cleaned and dried in the sun, they are brought back to this shop and ironed. All the clothes are collected and delivered to the customers at home. This personalized service makes it possible to run a business of this nature without a large investment in physical plant.

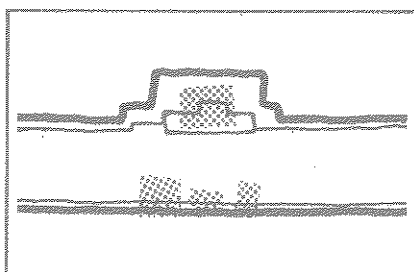


-  GROCERY
-  MILK-BOOTH
-  VEGETABLES
-  IRONING
-  BICYCLES
-  TEA STALL
-  HAWKERS
-  COMMERCIAL ACTIVITY AREAS

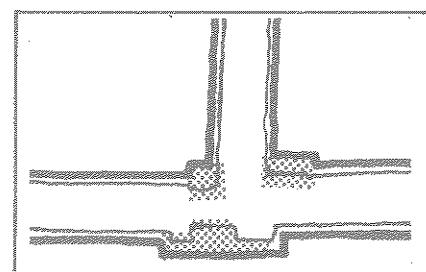
SHOPS	SIZE (M2)	LOCATION	COMMENTS
Seasonal fruits and Vegetables	3-6	House extension, street-corner, main street, public square.	Vegetables, fruits, herbs, sweets and berries are all sold in these kinds of shops.
Groceries	4-8	Front-room, house extension, street-corner, main street.	Spices, grains, betel leaves, cigarettes and dry vegetables, as well as groceries, are sold here.
Ironing	3-8	Front-room, house extension.	Both coal-heated and electric irons are used.
Bicycle repair	10-20	House extension, street-corner, main street.	Bicycles and pushcarts are repaired in this shop, which also rents and sells used bicycles
Tea stall	3-10	Street corner, main street, public square.	Snacks, biscuits, betel leaves and cigarettes are also sold here.
Milk booth	2-3	Main street	The booth is owned by the milk company, which delivers milk to it twice daily.
Hawkers	1-2	Street corner, public square.	Hawkers often find a shaded spot under a tree. They sell fruits, vegetables and other edibles.



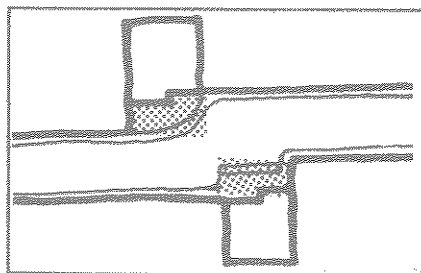
**PUBLIC SQUARE**  
 Seasonal fruits and vegetables  
 Tea stalls  
 Hawkerc



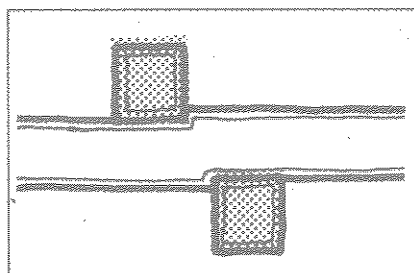
**MAIN STREET**  
 Seasonal fruits and vegetables  
 Groceries, Milk booth  
 Bicycle repair, Tea stall



**STREET CORNER**  
 Seasonal fruits and vegetables  
 Groceries, Tea stall  
 Bicycle repair, Hawkerc



**HOUSE EXTENSIONS**  
 Seasonal fruits and vegetables  
 Groceries, Ironing  
 Bicycle repair



**FRONT-ROOM**  
 Groceries  
 Ironing

## 5. Public Structures

This examination of public structures in informal sector housing requires some explanation. Traditional housing areas in Indian towns contain temples, sitting platforms, stairs, water fountains, bird-feeders (a uniquely Indian construction, described on the following page), arcades, signs and entry gates. These public structures--as opposed to private house extensions--play an important role in establishing neighborhood identity and are important landmarks and visual reference points. They contribute to the rich texture of traditional Indian towns.

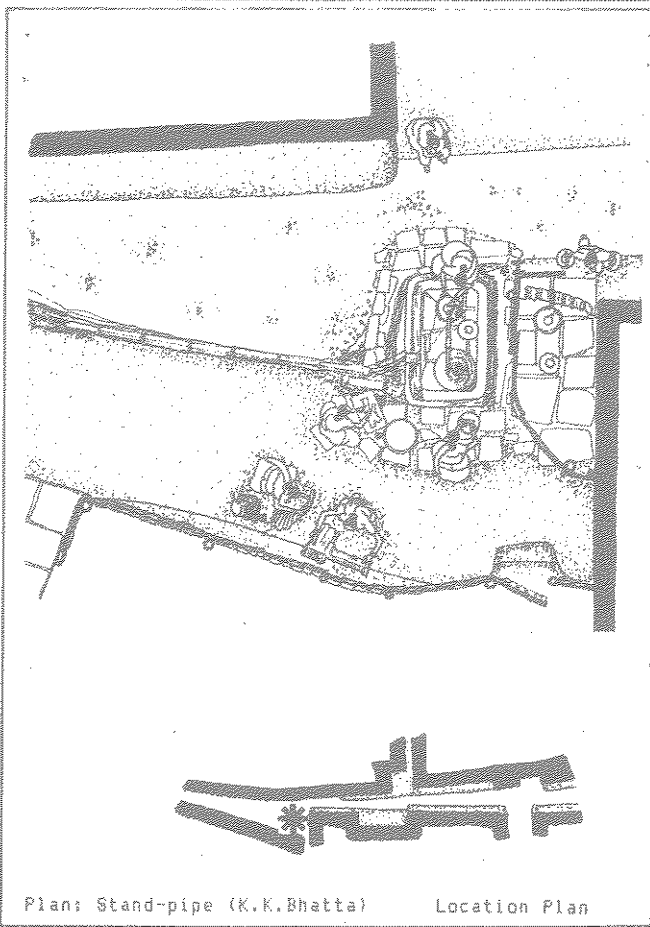
The public spaces of most planned low-income shelter projects are characterized by roads, drainage ditches, perhaps street lighting...and that is all.

"Infrastructure," in this context, is largely confined to underground services. As a result, these planned human settlements, however successful the individual houses--and these often exhibit a high degree of ingenuity and imagination--lack many of the environmental qualities that are essential for a successful housing environment. The public spaces are disorienting and lack personal definition. The planning is barrack-like, streets are simply movement spaces, nothing more.

It could be argued that in "basic" shelter, anything more would be a luxury, and would, in any case, not be required by the low-income users. Is this true? We wanted to begin to answer this question by examining the public spaces of informal sector housing for signs of public structures. What we found surprised us. While many of the traditional structures of Indian towns--gates and bird-feeders, for example--were absent, there were other signs of attempts to introduce identity into the public environment.

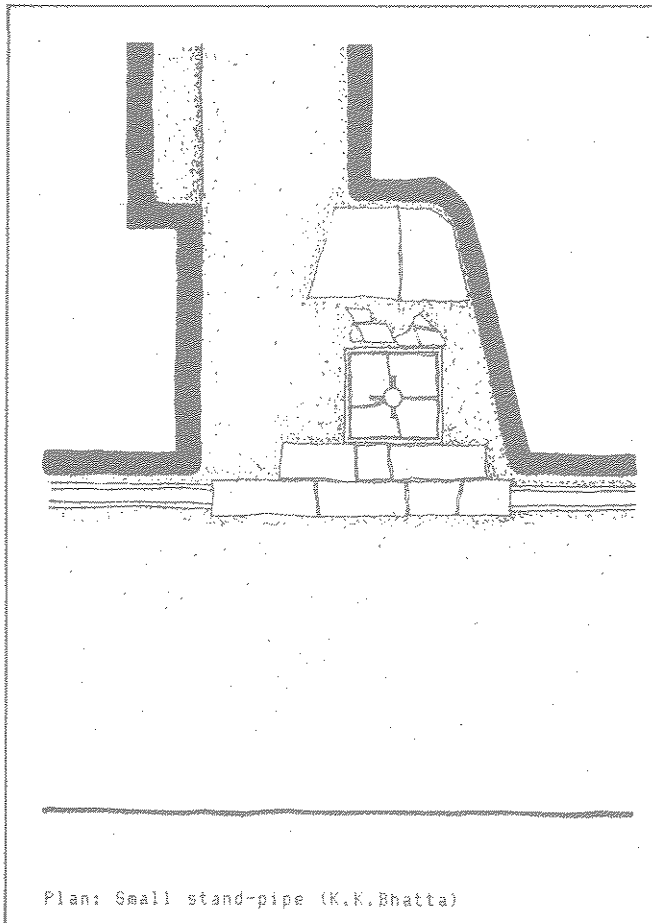
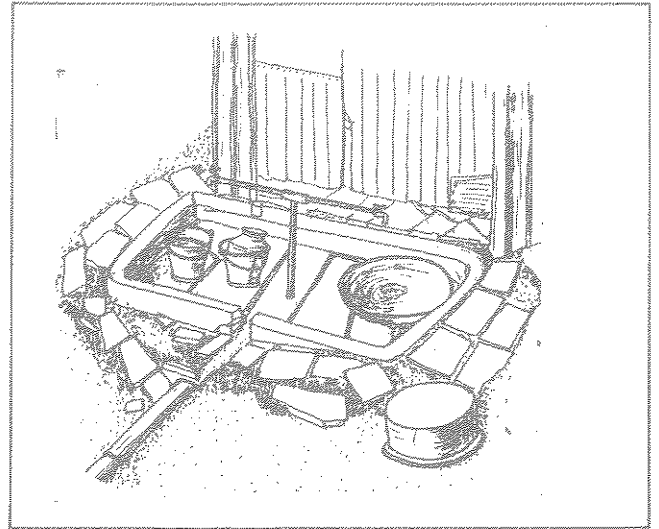
These attempts are minimal, true. For one thing, beyond the neighborhood level, there is no "public" authority in these settlements. Whatever is done must be carried out by small groups of individuals, with minimal resources, but this only gives more importance to those public structures that do exist. They indicate the desire, and need, for personalizing and giving identity to the public space.

There is enough evidence, even at this preliminary stage, to convince us that there is nothing luxurious or superfluous about public structures; they are a necessary requirement for successful public spaces.



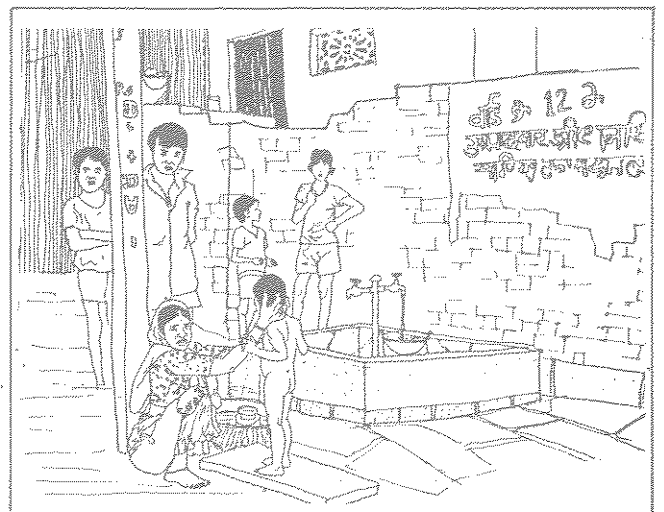
STAND-PIPE AND BATHROOM (left)

This stand-pipe is located at the widening of a street and therefore seems to function well. To take advantage of the stand-pipe location the occupants of the nearby house have extended the stone paving on the edge of their house and put up an enclosure to create a private bathroom. Note how the curvature of a wooden fence is utilized to stretch a clothes line.

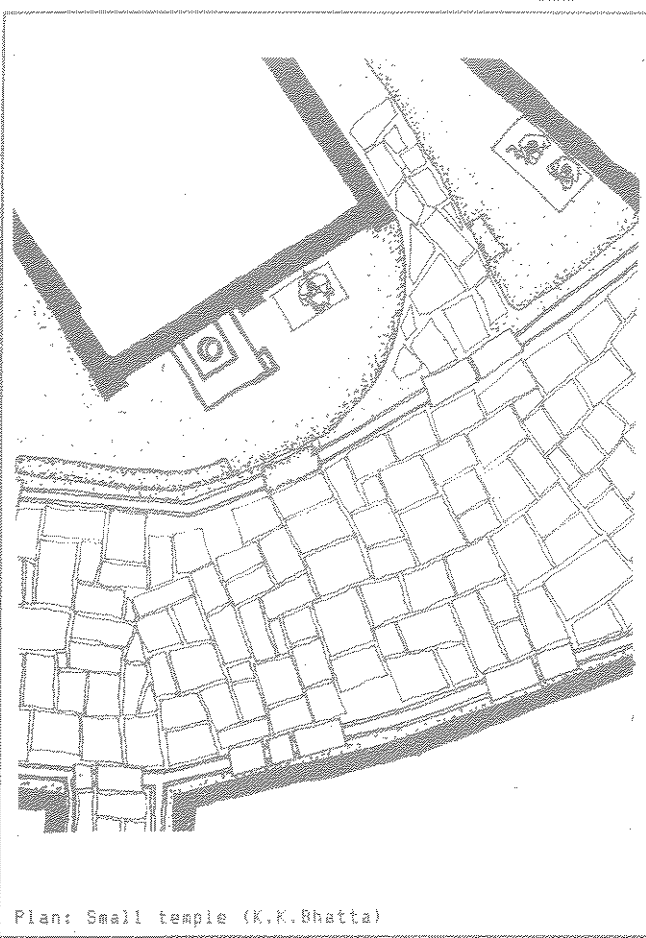


SMALL STAND-PIPE (left)

This public water stand-pipe has a small paved area around the supply tap; the paved area has a 30cm high edge made from stone slabs for protection against any splashing. The stand-pipe is located at a T-junction of two streets. The space required for washing either clothes or utensils is not provided at this stand-pipe, and, as a result, users have placed a few large stone slabs, which also function as drain covers, in front of the tap. The stone edges around the paved area too close to the water tap so it is difficult to accommodate more than a few water containers or buckets in this space.





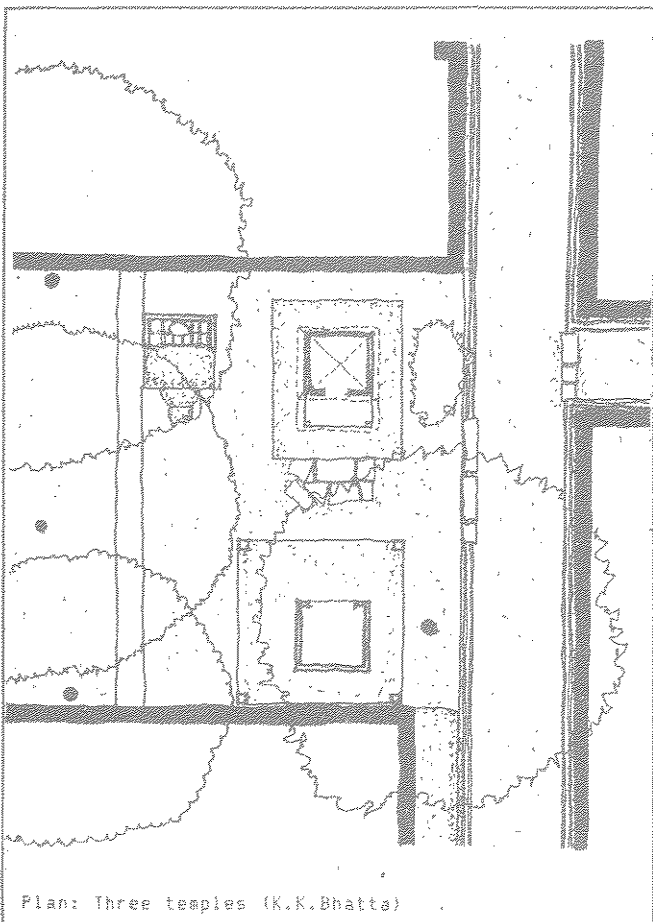


Plan: Small temple (K.K.Bhatta)

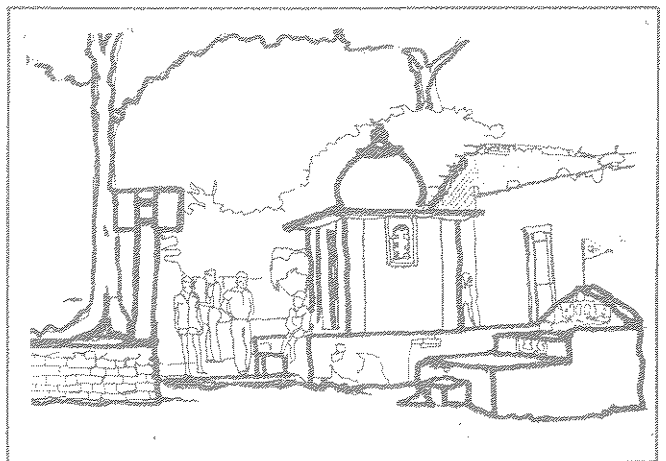


SMALL TEMPLE (left)

This is a Shiva shrine located at a junction of one large and another small street. The shrine is reached from the main street, making it convenient for passersby to stop for a moment, say their prayers and move along. The shrine is a part of a domestic extension but it is organized in two distinct halves, one private and other public. The family that lives behind the shrine looks after the upkeep of this structure and collects the small amount of money offered by the worshippers.

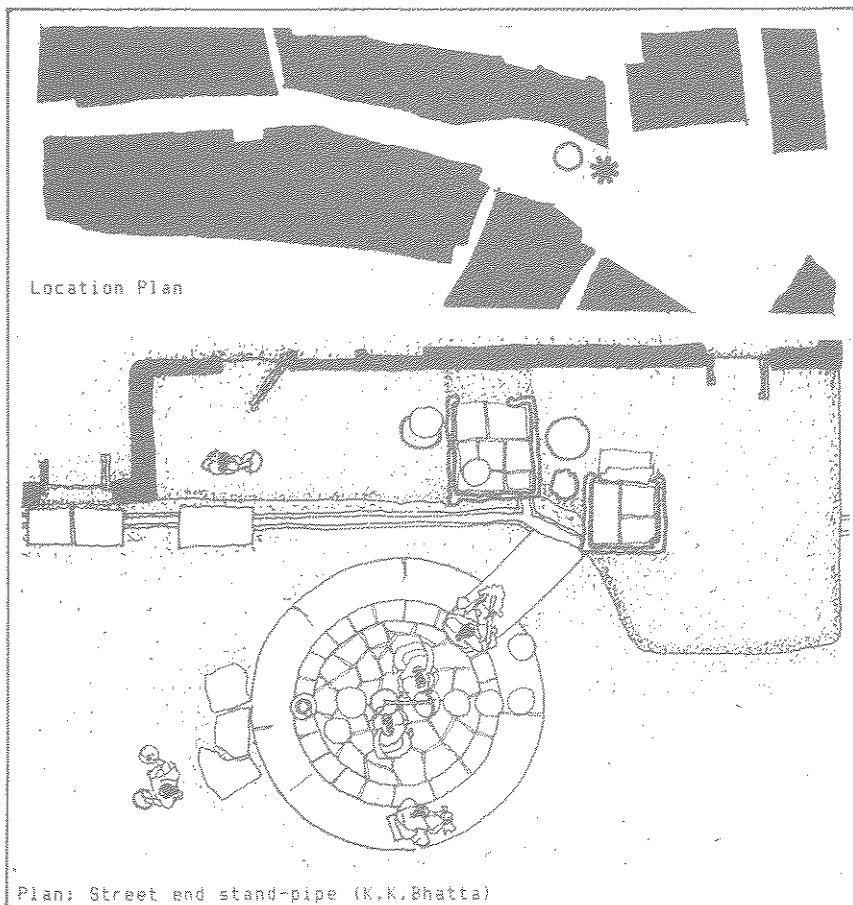


Plan: Three temples (K.K.Bhatta)



THREE TEMPLES (left)

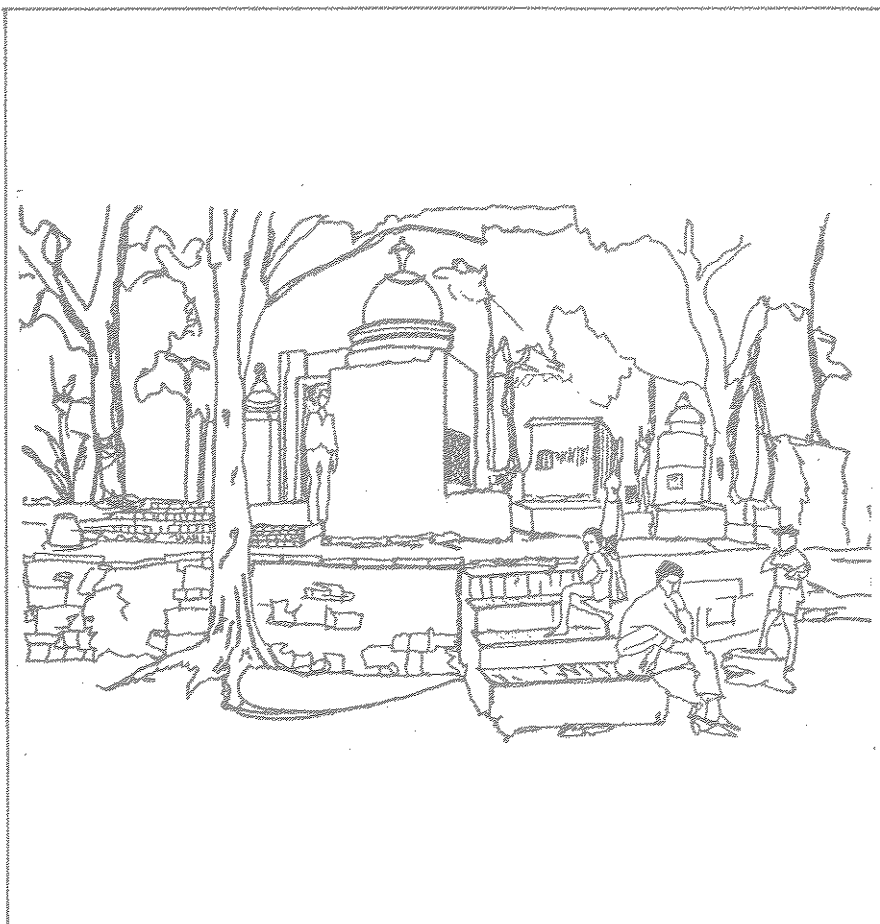
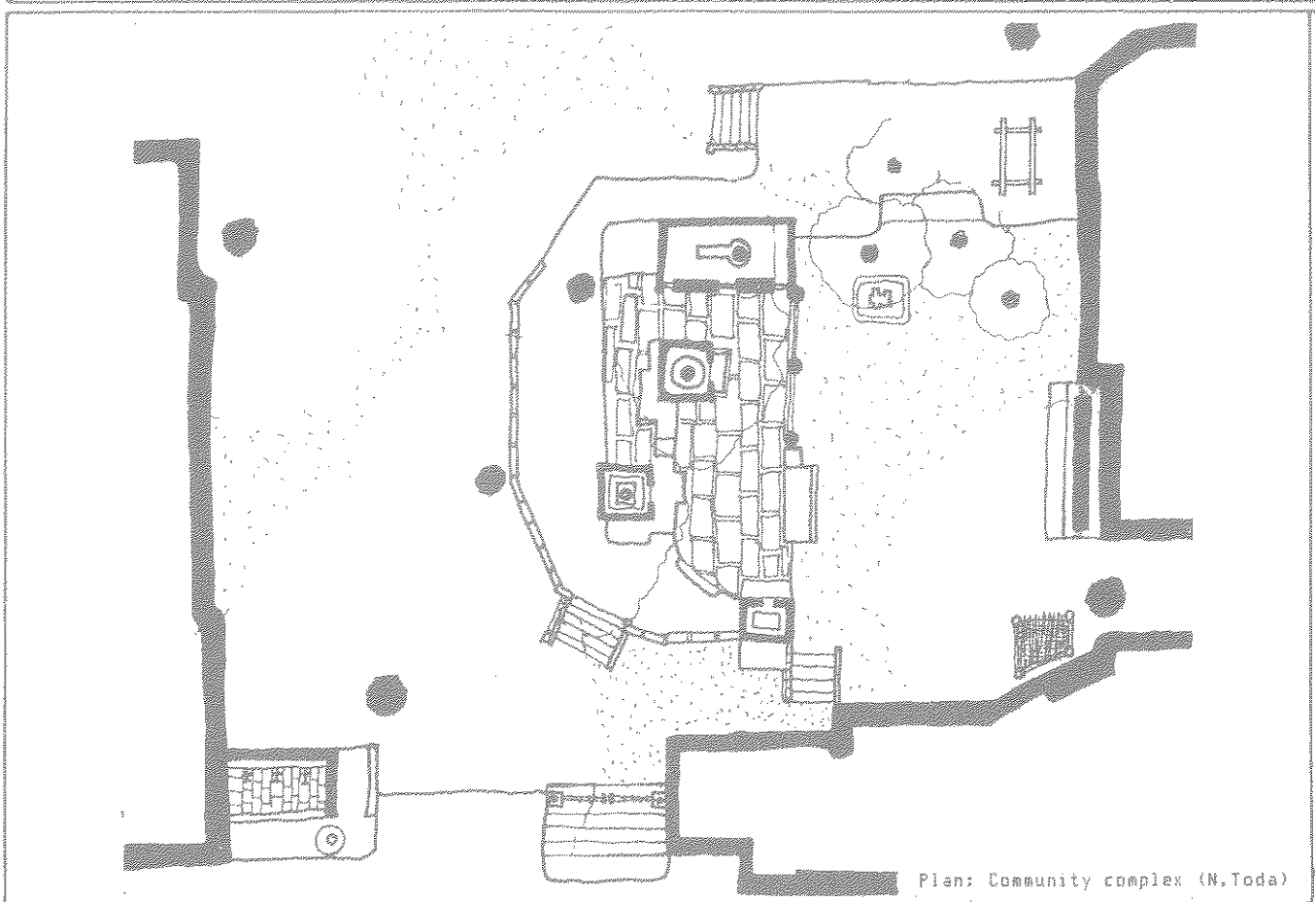
This is a small complex of temples located off a street facing a stream. The land which slopes down towards the water's edge is used as a play area and is lined with three trees. Each temple has a raised platform although only two platforms at the front edge of the plot are large enough to be used as public seats. The largest platform has vertical concrete supports, which permit it to be fitted with a roof and to be used as a pavillion. This area is well used by the community and liked by children.



STREET END STAND-PIPE (left)

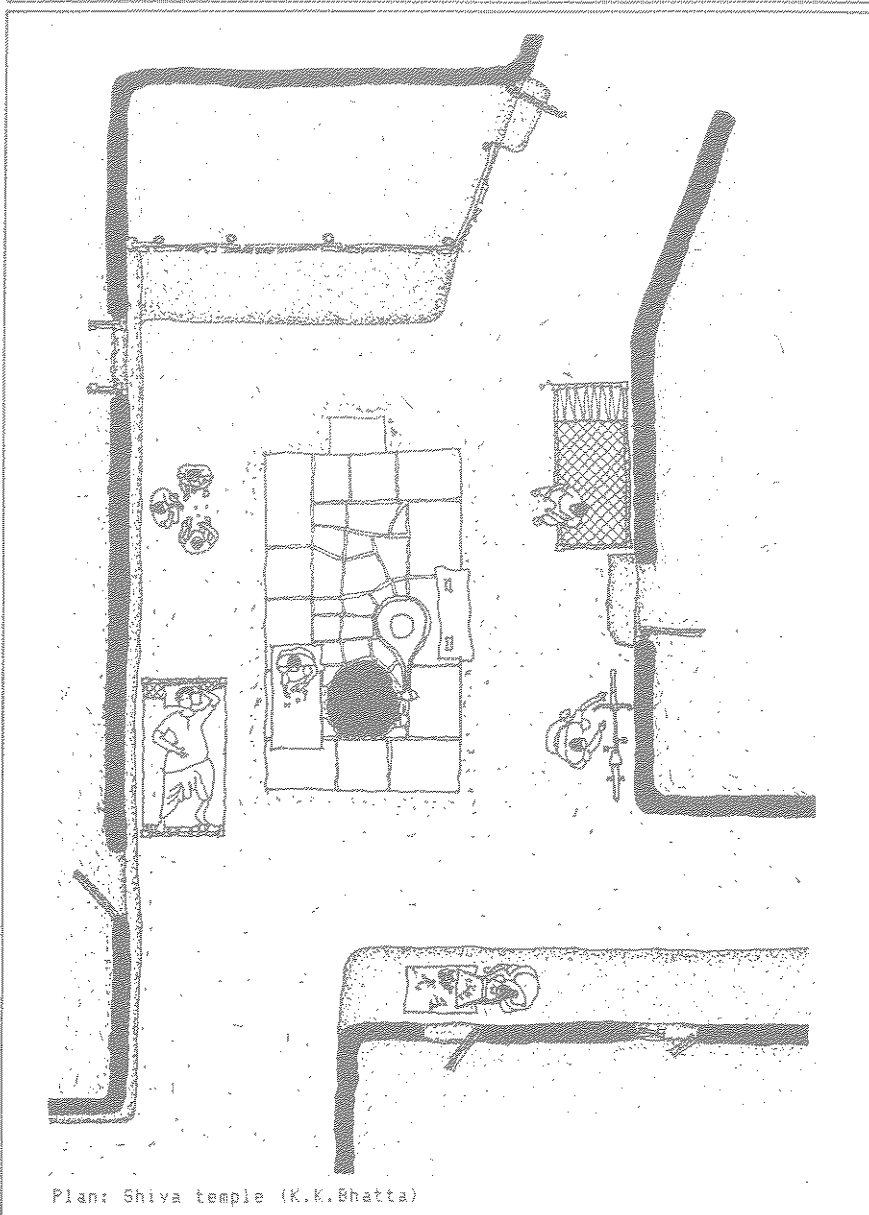
This stand-pipe is located at the end of a street with a circular wash place around it. The paved area is approximately 2.5m in diameter with another apron of about 50cm around it which makes this facility very comfortable to use; the large diameter of the stone paved area allows placement of lots of buckets and other utensils. The apron is also used for washing clothes and bathing children. This layout works especially well because while the washing activities are going on users in need of water do not have to wait in line. The other advantage of this stand-pipe is its location close to the public toilets which means it is easy to carry water to toilets from the tap (Indians use water for anal cleansing).

Plan: Street end stand-pipe (K.K.Bhatta)



COMUNITY COMPLEX (above)

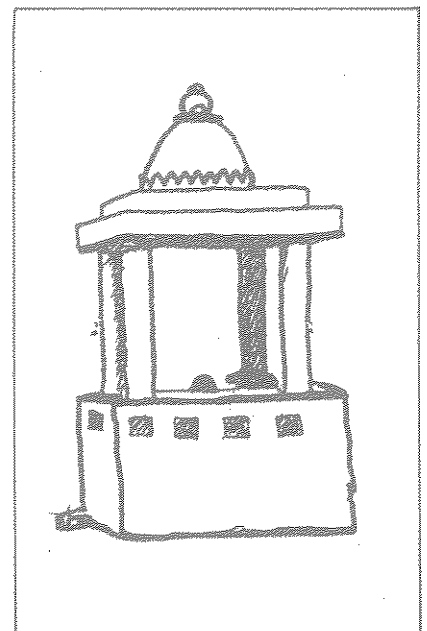
This is one of the key public facilities of N.Toda, it has three small temples, one shrine, an exercise area, open sitting areas with platforms and seats, a stand-pipe, a clump of trees and a gateway. This facility is located along a stream, and although it is polluted it does provide a good view. Raised platforms and lots of trees make this a pleasant place to relax or to carry out outdoor activities. Families from the neighborhood use this area extensively. Trees here are newly planted and once they mature this area will be greatly improved.

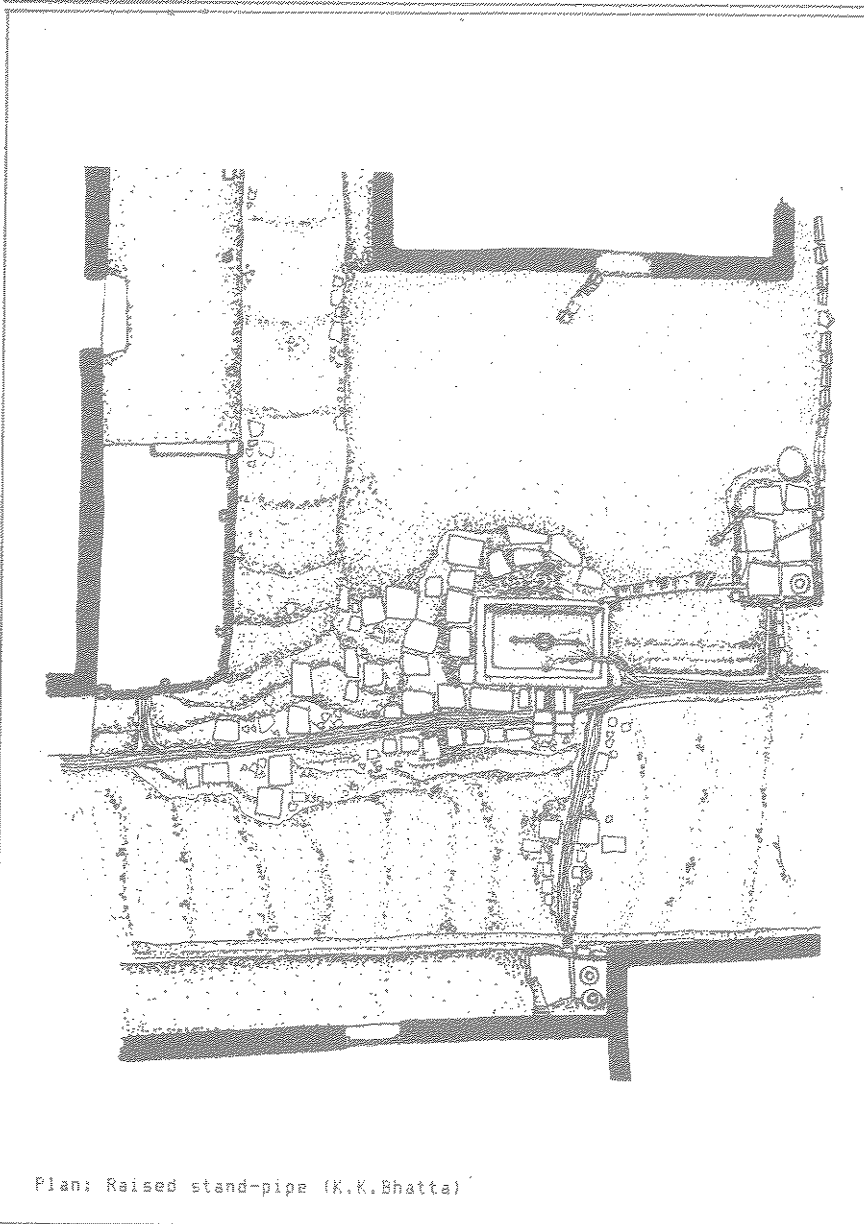


Plan: Shiva temple (K.K. Bhatta)

SHIVA TEMPLE AND PIPAL TREE (left)

This is a pleasant little square with a pipal tree that has a raised stone paved platform. The platform is high enough so that it is difficult to use it as a casual seat. On one side of the platform is an icon of Shiva with an earthen water container hung on top of it. Worshippers climb up on the platform using a small step at the other end of the platform. The space in the front of the icon is kept open and a bell is hung from the tree. The tree gives plenty of shade on a hot afternoon, and it was observed that people took advantage of it for sleeping; one craftsman had set up a temporary watch repair shop on one corner of the platform.





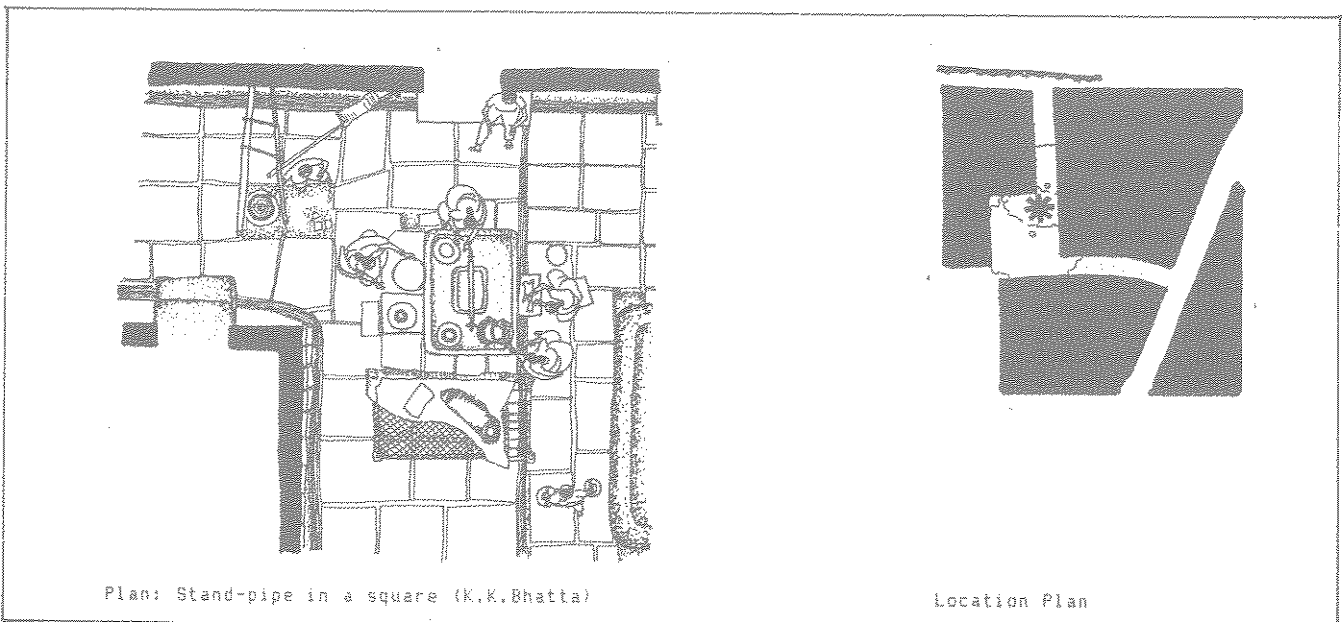
## RAISED STAND-PIPE (left)

This is a standard stand-pipe with two outlets and a 2m x 1m paved wash area. The stand-pipe is elevated above the road level and the surrounding area is covered with old pieces of stones to facilitate the drainage of water. The level is raised high enough to make the stand-pipe an integral part of a house extension.

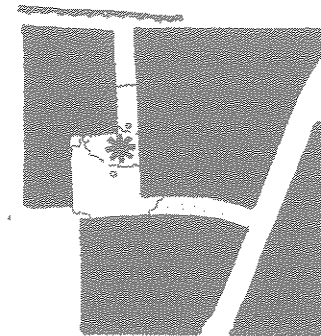
## STAND-PIPE IN A SQUARE (below)

An ideal location for a stand-pipe, within a square in a cluster of few houses. The washing-related functions blend well with other activities of the square. Besides the stand-pipe there are two trees in the space both with raised platforms creating a village square like atmosphere. Tree trunks are also used to stretch clothes lines--the colorful clothes adding a special character to this place. Unfortunately the stand-pipe does not have proper drainage therefore the surrounding area gets flooded--a small drain connection to the open channel could solve this problem.

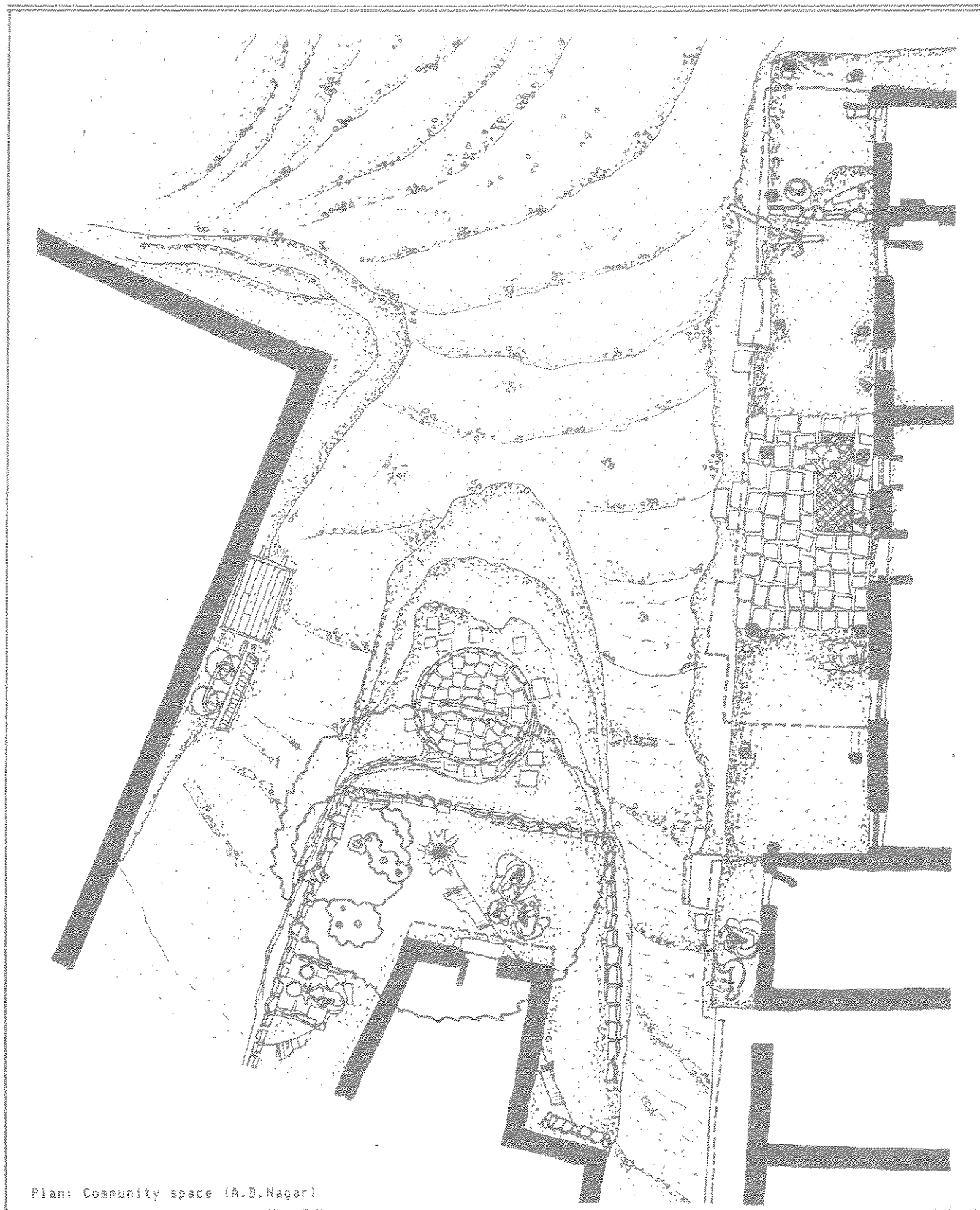
Plan: Raised stand-pipe (K.K.Bhatta)



Plan: Stand-pipe in a square (K.K.Bhatta)



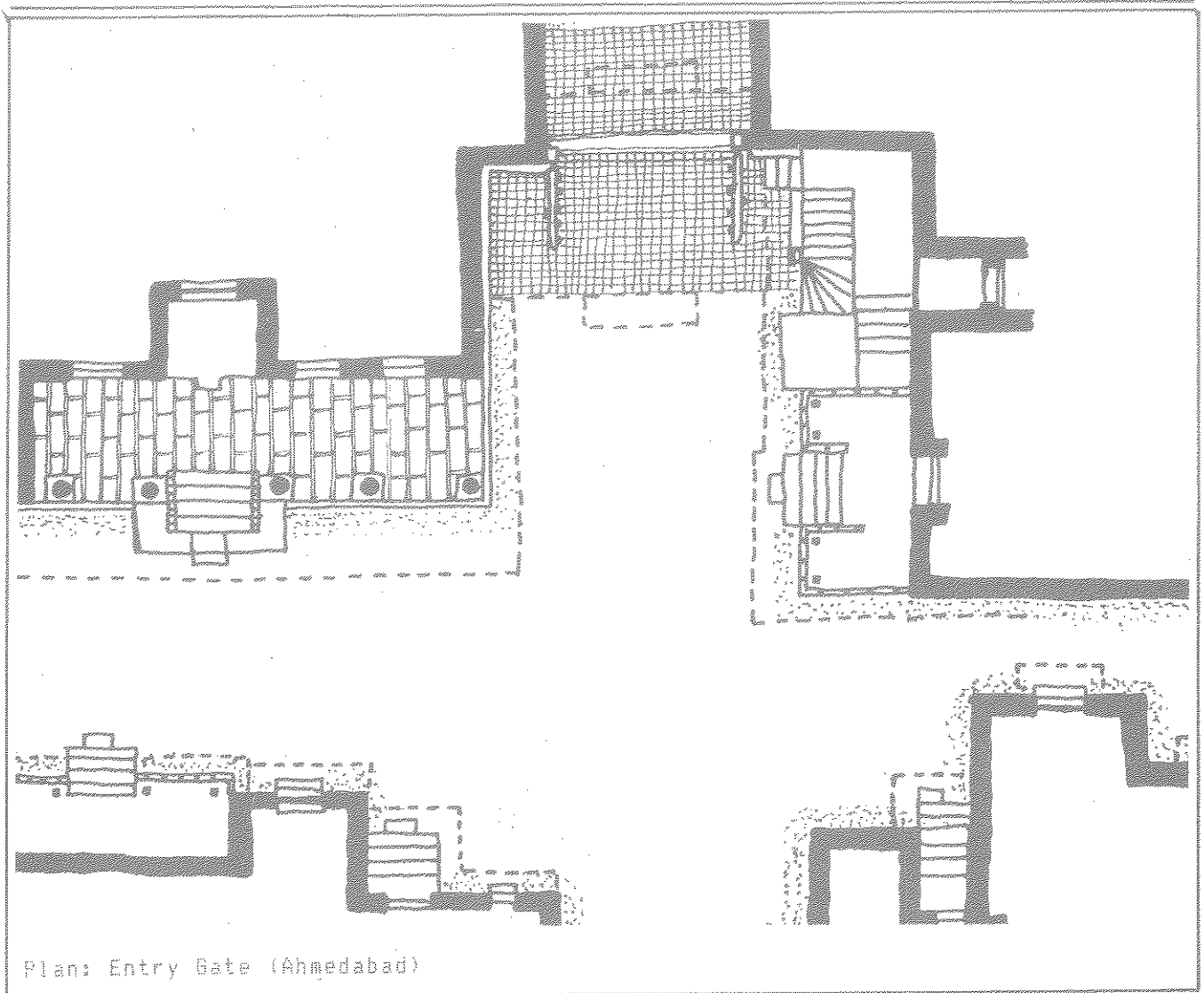
Location Plan



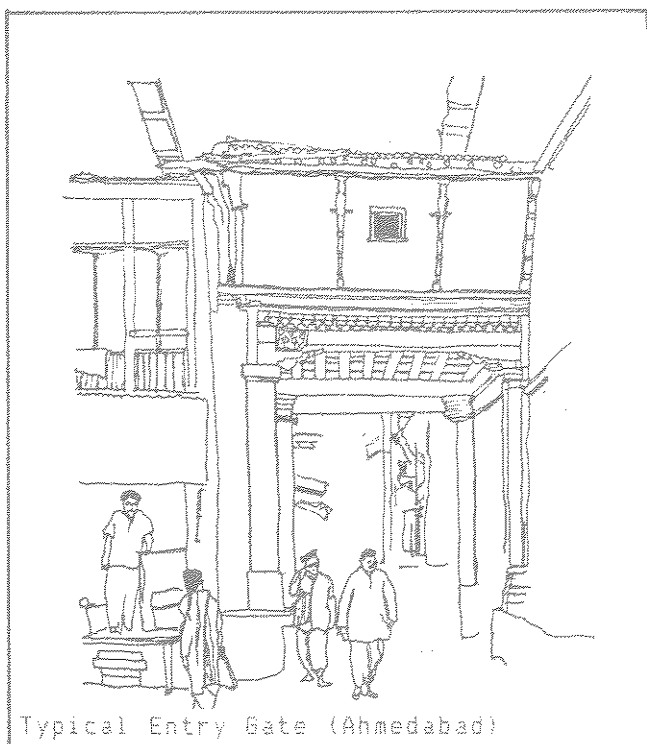
Plan: Community space (A.B.Nagar)

#### COMMUNITY SPACE (above)

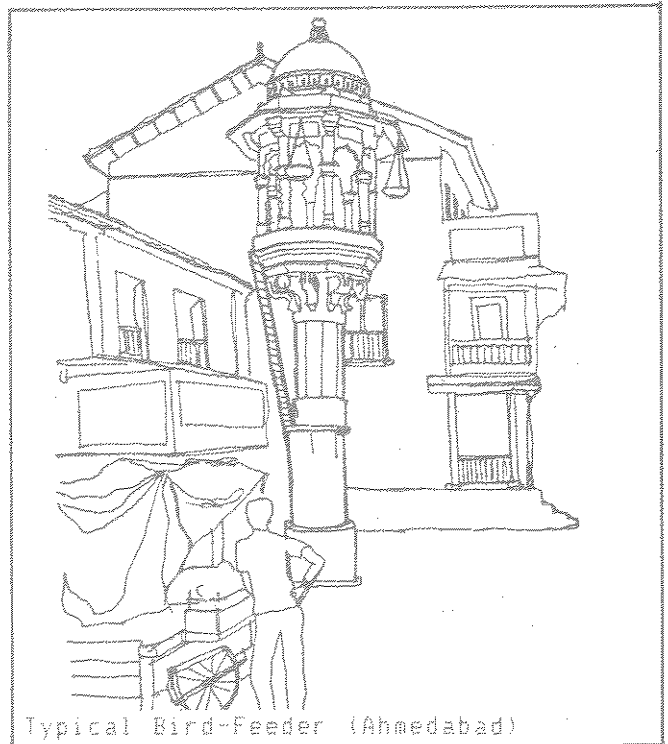
Here is a series of extensions near the main entrance to F.B.Nagar slum. A temple is located in this entrance area, as is a stand-pipe, making it into a community space.



Plans Entry Gate (Ahmedabad)

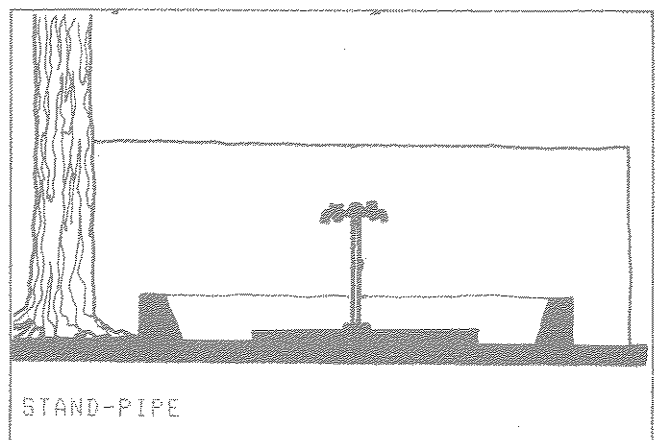
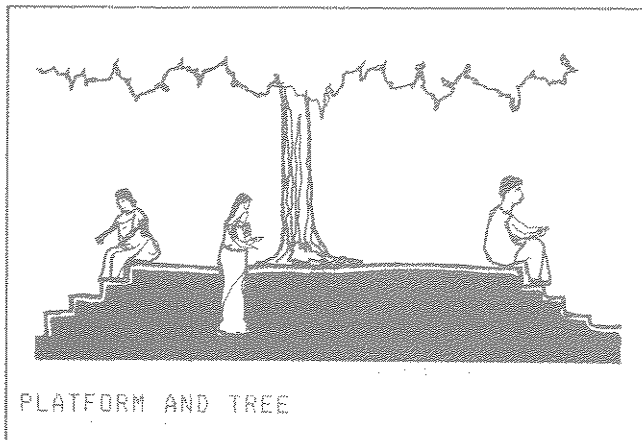
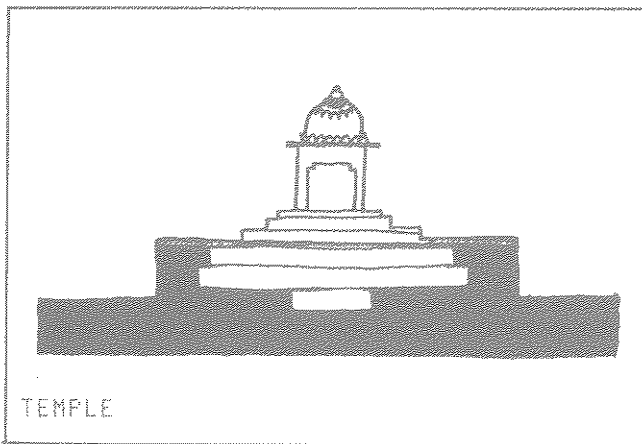
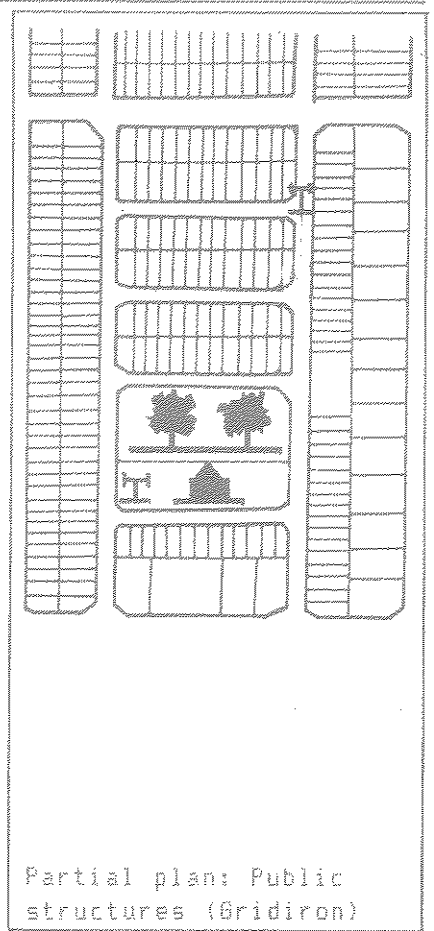
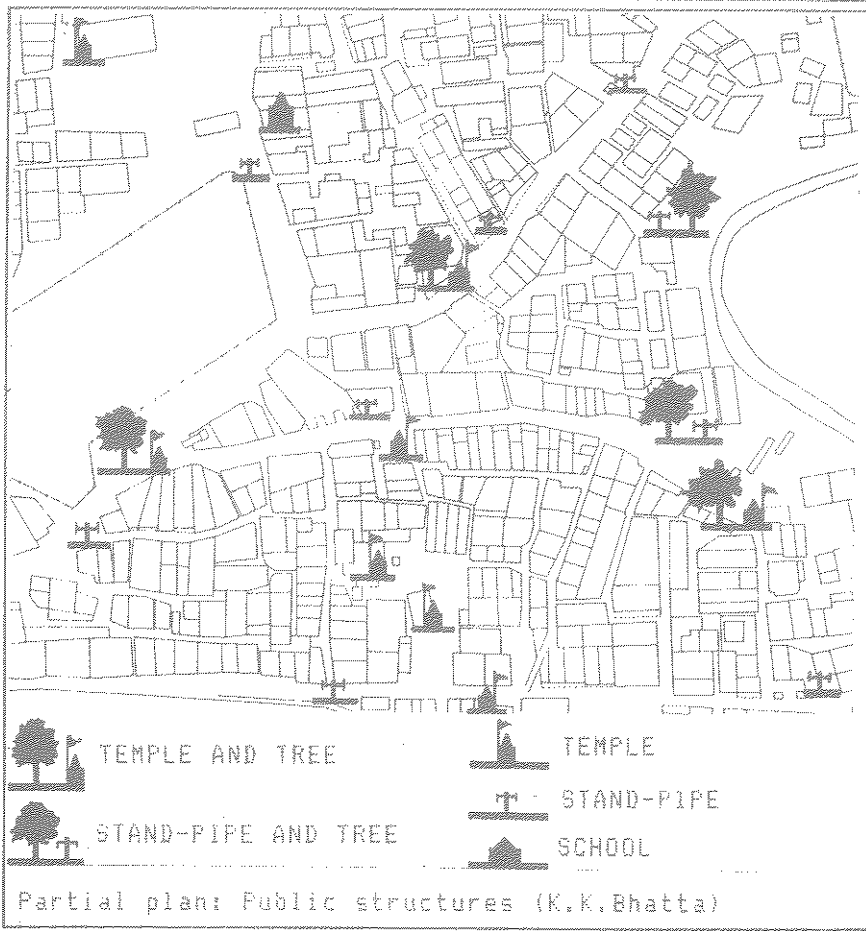


Typical Entry Gate (Ahmedabad)



Typical Bird-Feeder (Ahmedabad)







---

## 6. Vehicles

Automobile traffic in slums and squatter settlements is, naturally enough, extremely limited. The urban poor do not own cars, they cannot afford taxis, nor are they served by conventional delivery vehicles or buses. Ambulances, private cars or trucks are rare. This does not mean, however, that there is no vehicular traffic. If anything, there is a greater variety of vehicles in slums than in conventional housing.

The smallest vehicles include bicycles, mopeds, motor scooters and motorcycles. They are used for personal transportation; all the more important since the slum is usually some distance from the city. They require small clearances--less than 1 meter--and can be maneuvered almost anywhere. All of these vehicles, even bicycles, represent a large investment, and are highly valued. They are usually stored within the home.

A second type of vehicle found in slums is those that are used by the inhabitants for income generation. These include pushcarts, pullcarts, bicycle rickshaws, motorized rickshaws and motorcycle-powered three-wheelers. Motorized rickshaws, especially, are the most common type of mass transit system, and can be found in all parts of the slum. These vehicles, although highly maneuverable, require greater clearances--they are between 1.2 and 1.5 meters wide--and, except for pushcarts, they are relatively heavy.

In addition to being owned by slum dwellers, these vehicles are used to make deliveries, or for personal transportation. Pushcarts are also used by hawkers and vendors who sell various types of household items and foodstuffs in the slum.

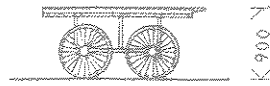
Another, larger type of vehicle is the animal-drawn cart. These are used to move heavy materials, and to transport goods from rural areas to the city. They require similar clearances to automobiles, although they can usually be driven over rougher roads.

Parking is a makeshift affair. Only the smallest vehicles can be stored inside houses, or in porches. The rest are simply left in the street, as close to the house as possible.

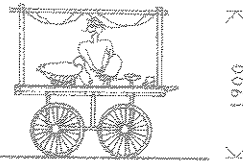
PUSH CART (right)

Push carts are the most commonly observed vehicle used for transporting goods, materials, medium size loads in popular settlements; they are also used as mobile shops. The top surface of the cart is made of wood. It is supported on a pair of crude metal springs attached to a set of standard bicycle wheels. Push carts are used by vendors selling fruits or vegetables, scrap and junk dealers and other hawkers who go from door to door. Push carts are also used as small shops. In such cases they have a sheet metal enclosure added to the flat-bed structure; bicycle repair shops, food stands, pan shops are such examples. When they find an appropriate street corner or a public meeting place, they shed their wheels and springs and slowly develop foundations and solid walls to transform them into permanent shops. To transport materials on this cart or to push the mobile shops around is easy--only one person can do the job.

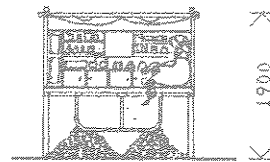
These vehicles are approximately 1.0m wide x 2.0m long and can be easily moved through narrow spaces.



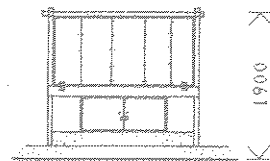
2200



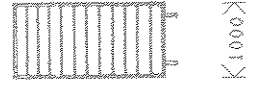
2200



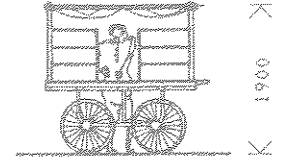
2000



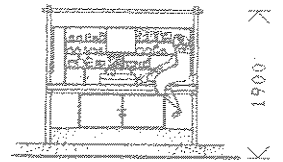
2000



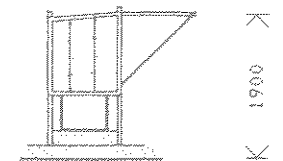
2200



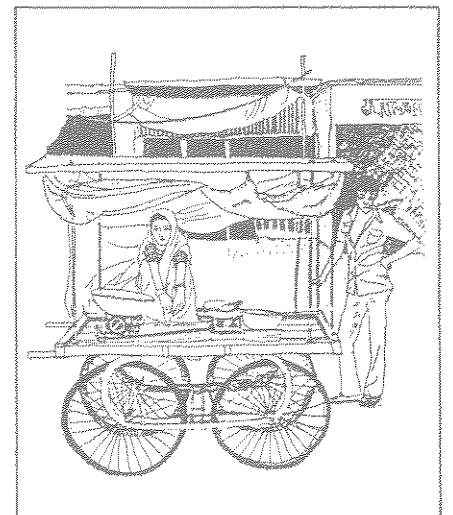
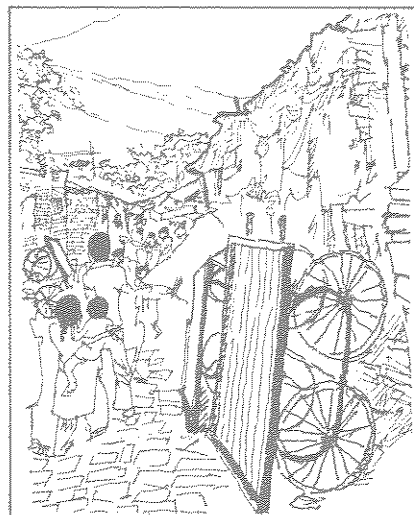
2200

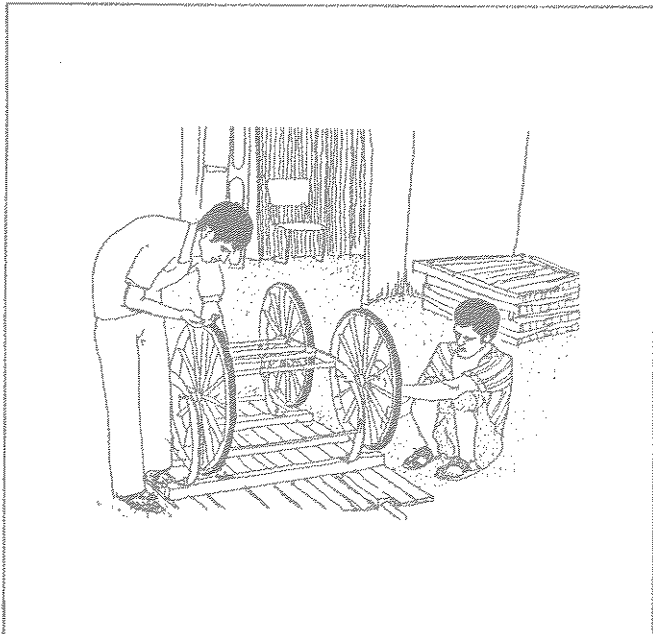
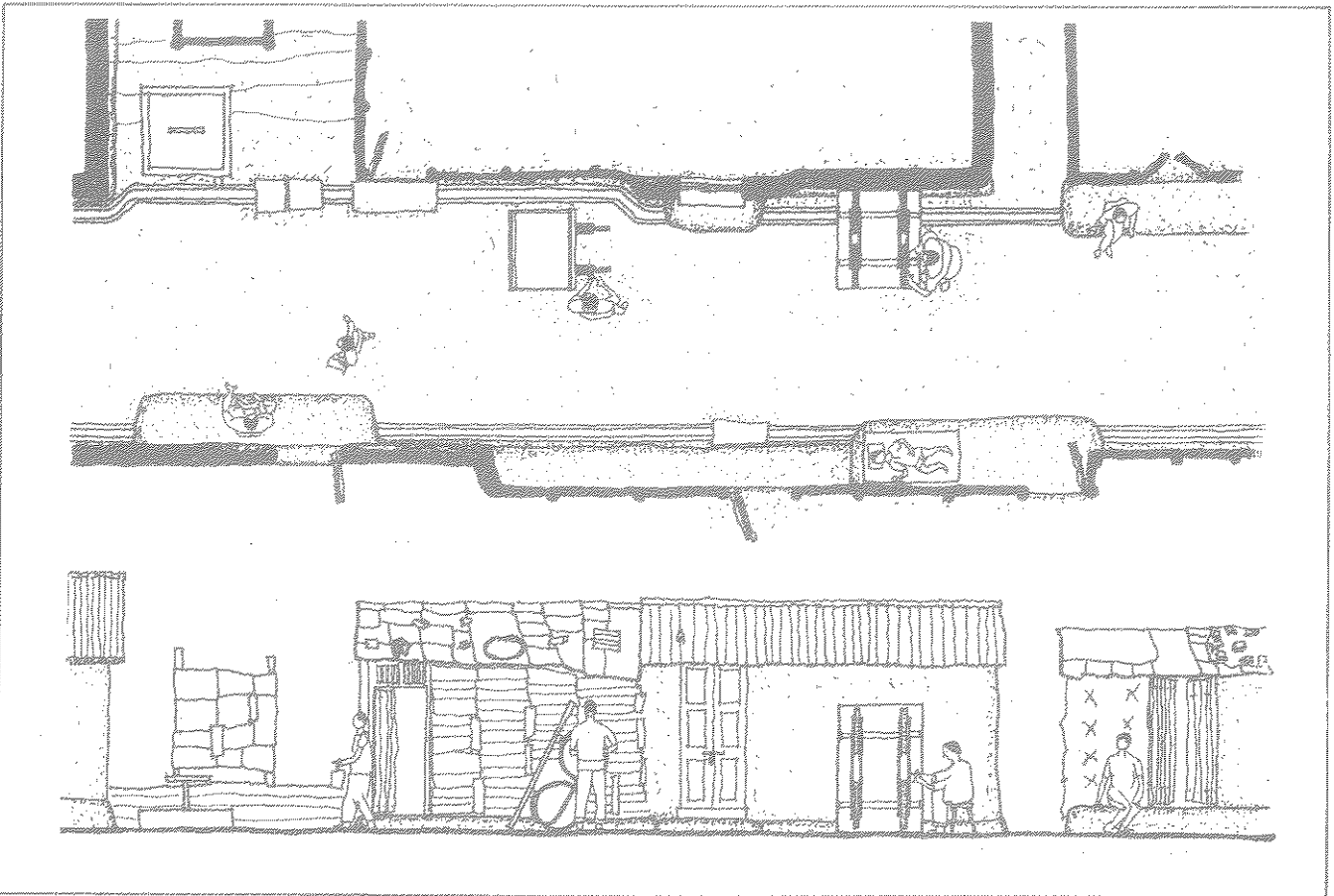


2000



1900

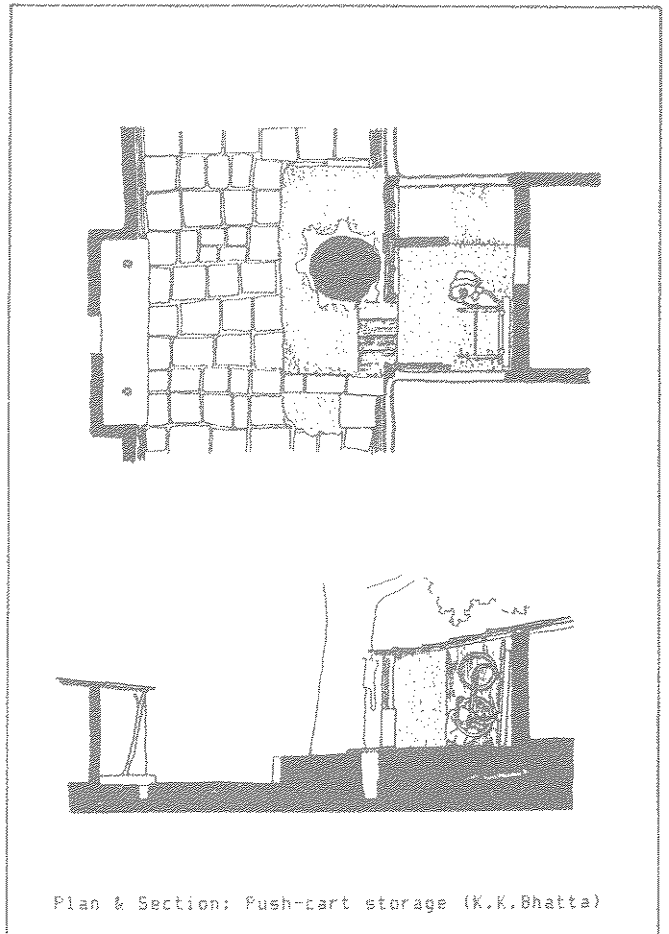




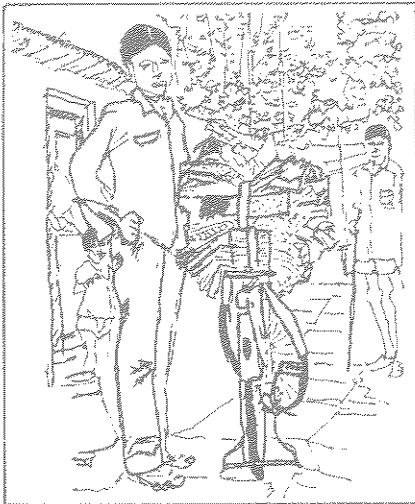
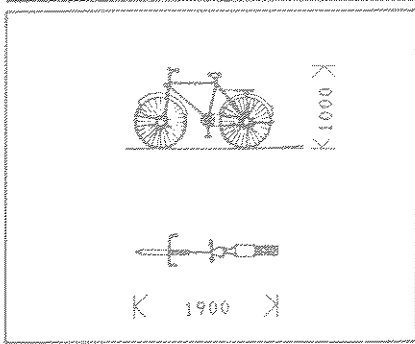
PUSH-CART STORAGE (right)

Privately-owned vehicles such as push-carts, bicycles and mopeds can be stored inside the house. In this case, the battered old push-cart is carefully protected from the weather, and from theft, by being kept in the front room of this house. This man uses the push-cart to hawk bananas and other fruits.

(₹1=Rs 10)

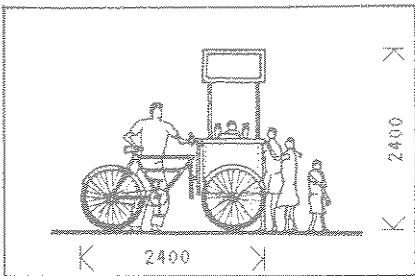


Plan & Section: Push-cart storage (K.K.Bhatta)



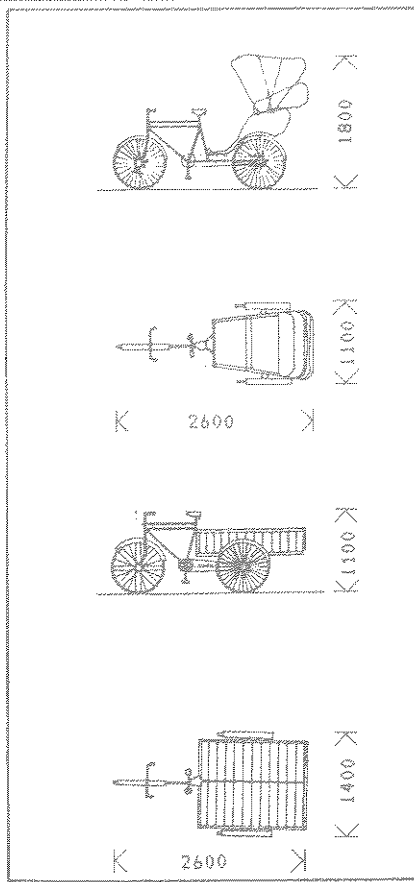
BICYCLES (above)

Bicycles are the most popular mode of personal transport in India as in many developing countries. Since the roads are not paved and bicycles are at times used to carry more than one person as well as the household goods the model that is most popular in India has slightly fatter tires and a stronger frame compared to touring models. They cost between Rs.400 - 800 (US\$40-80) and are sold by retailers; it is also possible to rent them from bicycle repair shops on an hourly basis. Repair and rental shops are usually located at the intersection of major streets.



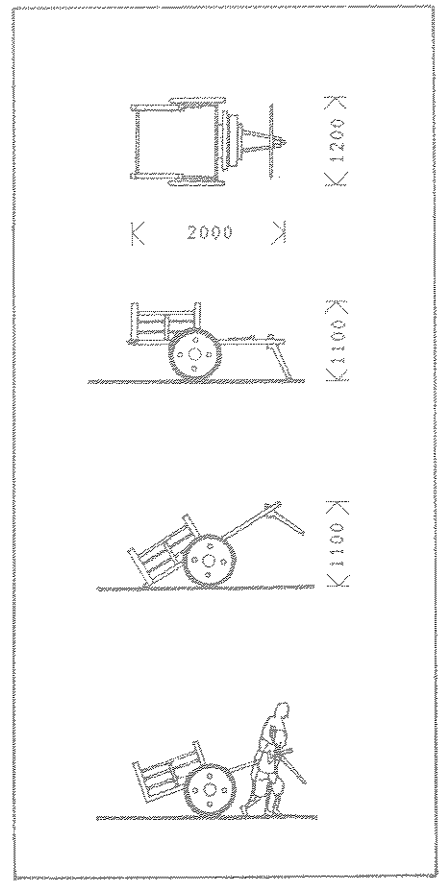
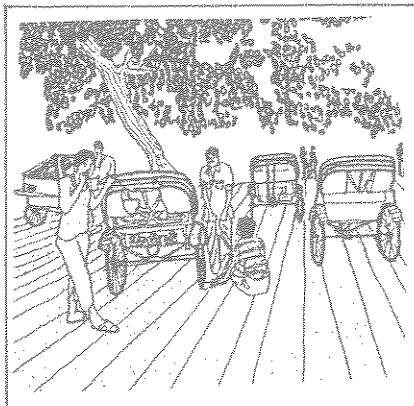
ICE-CREAM CART (above)

Ice-cream carts are a very common site in slums, usually surrounded by children. These small push-carts can be easily maneuvered in the narrowest lanes.



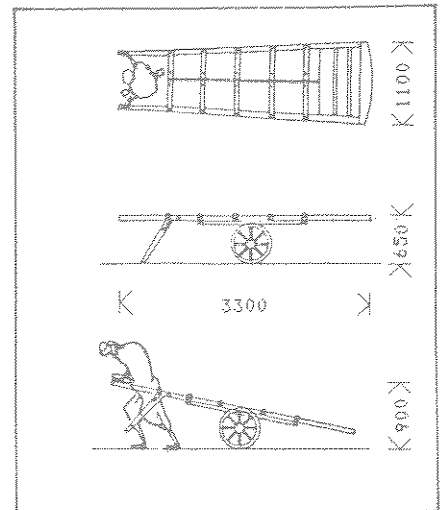
CYCLE RICKSHAWS (above)

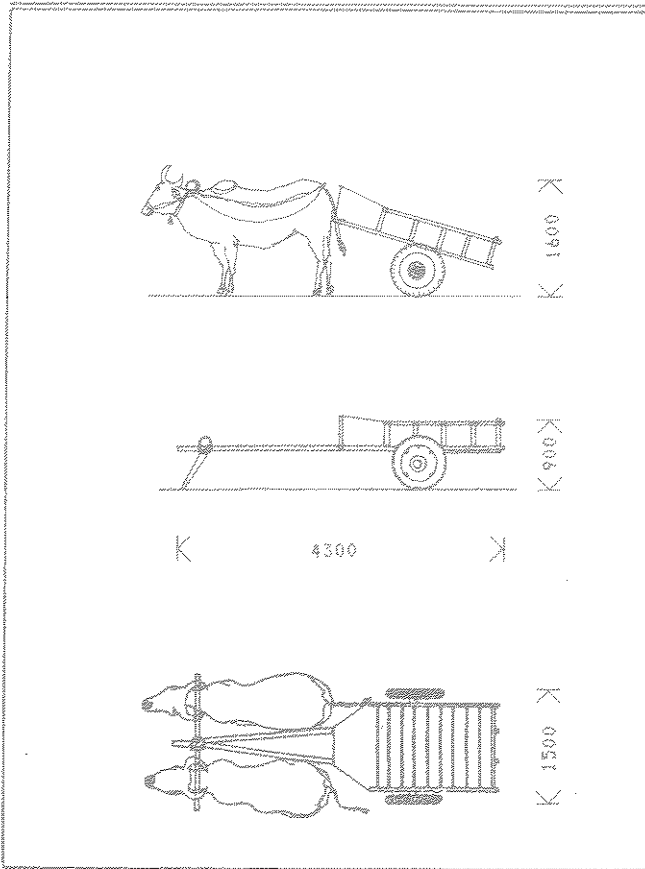
Cycle rickshaws are manufactured locally in small shops using standard bicycle frames and other locally-available materials. They are driven by a person in the front and have a seat with a cover for protection from the sun and rain for two people at the back. Most of these rickshaws run for short distances, up to 5 km, and are hired on a trip basis. They are even used for taking children to school and transporting household goods; one can find them near markets, shopping areas and bus or railway stations. Different versions of bicycle rickshaws are used as mobile shops to sell items like ice-cream, textiles and kerosene or to carry light loads.



PULL CARTS (above,below)

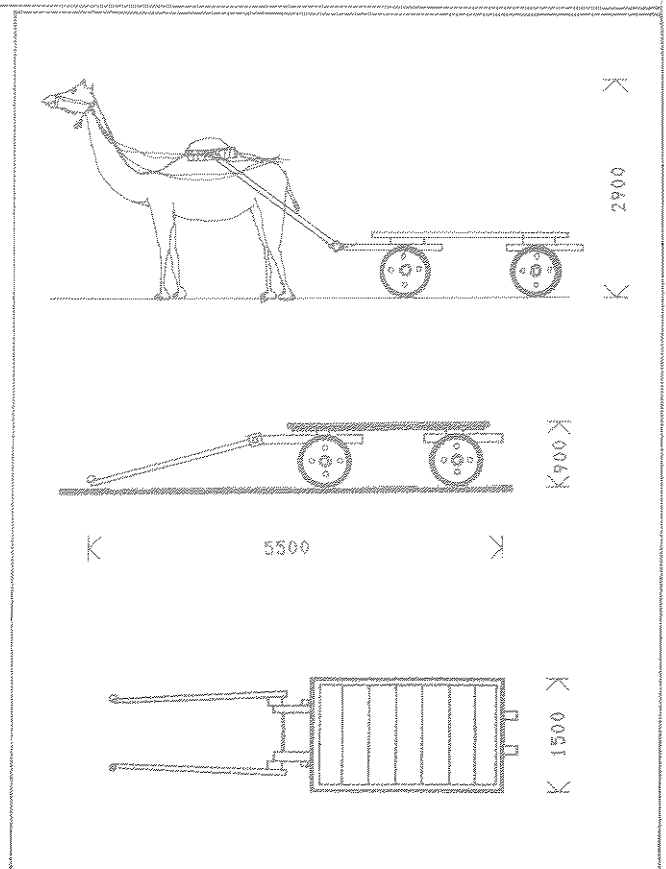
Pull carts are used to transport heavy loads. They are pulled by two persons--often a husband and wife. The wheels on these carts are made from old automobiles. Normally they are owned by a wealthy merchant in the city and can be hired through an agent for a specified period of time. The flat bed of the cart is used as a sleeping or resting platform, while it is parked under a tree during a hot afternoon. There is a popular version of this vehicle that can be pulled by only one person.





BULLOCK CART (above)

Depending on their size, bullock carts can be pulled by either one or two animals. They are found primarily in rural areas. Since rural roads do not have adequate clearance the carts have oversized wheels with heavy wooden spokes and a steel rim. More recently, carts with recycled automobile wheels and pneumatic tires have become popular. Carts are used to transport produce from rural to urban areas; in the urban areas they are also used for moving heavy items such as building materials and large furniture.

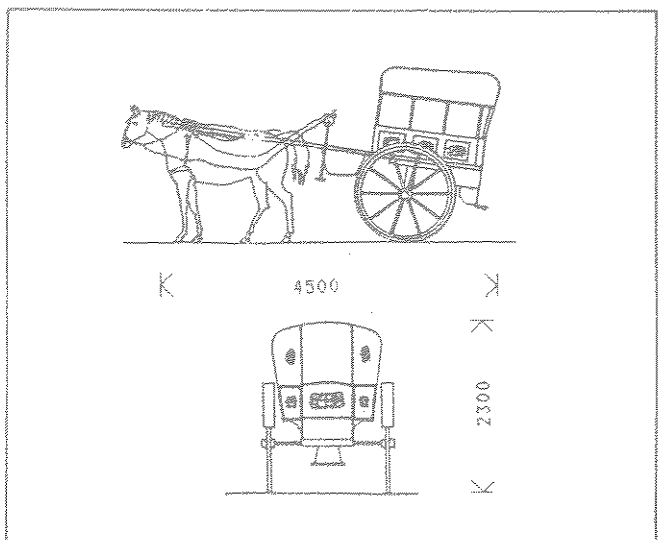
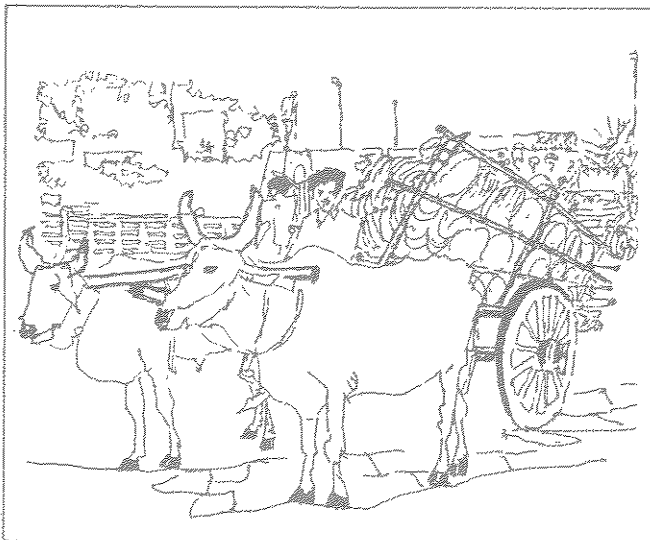


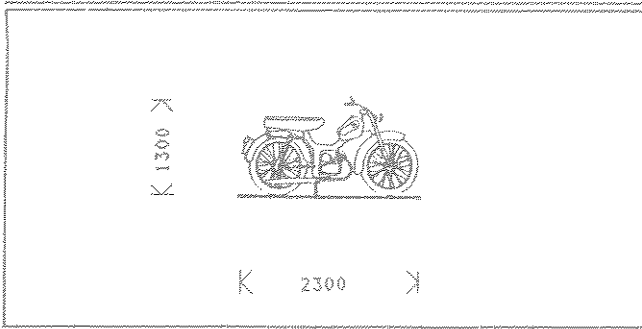
CAMEL CART (above)

Camel carts are becoming very popular in urban areas for transporting very heavy loads. The flat bed carriage hitched behind the (male) camel is made of wooden planks and four recycled automobile wheels. If old wheels are not found new rias are made and old tires and tubes are put on them.

HORSE CART (below)

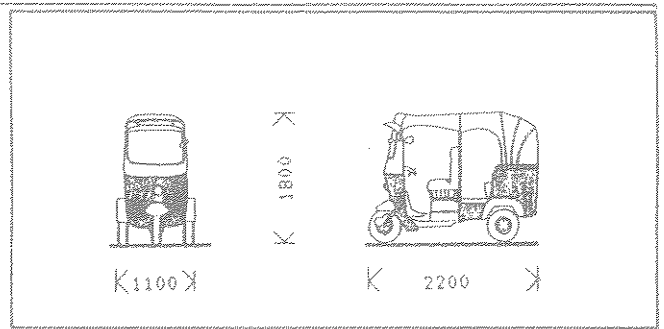
Horse carts are usually crafted out of wood. Because of their light weight, these wooden carts can carry four passengers plus the driver with only one animal pulling. These carriages are being replaced rapidly by auto-rickshaws.





MOPED (above)

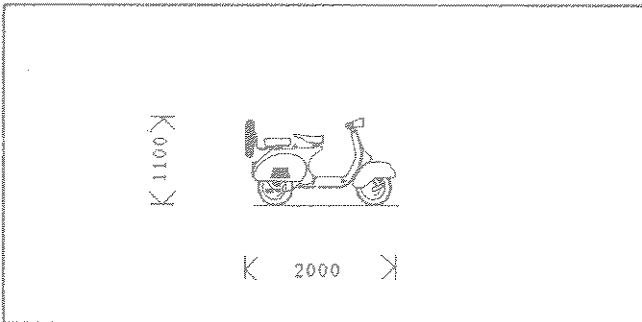
The moped is an excellent compromise between the bicycle and the motorcycle. It has a two-stroke engine of about 50 cc. It has become increasingly popular because of its low cost and fuel efficiency. It carries two persons and can achieve a maximum speed of 45-50 kph. It has the added advantage of being able to function as a bicycle, should the engine fail or run out of fuel.



AUTO-RICKSHAWS (left, above)

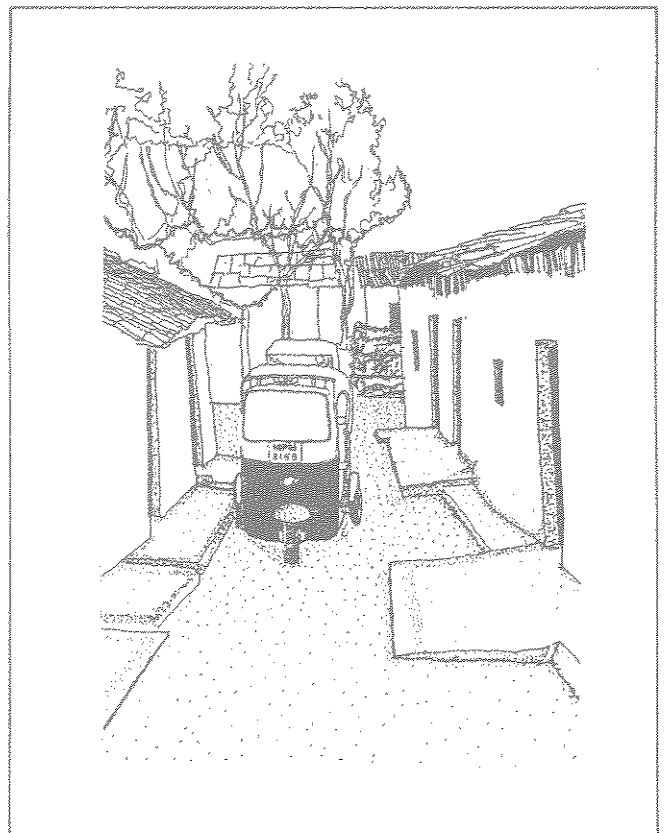
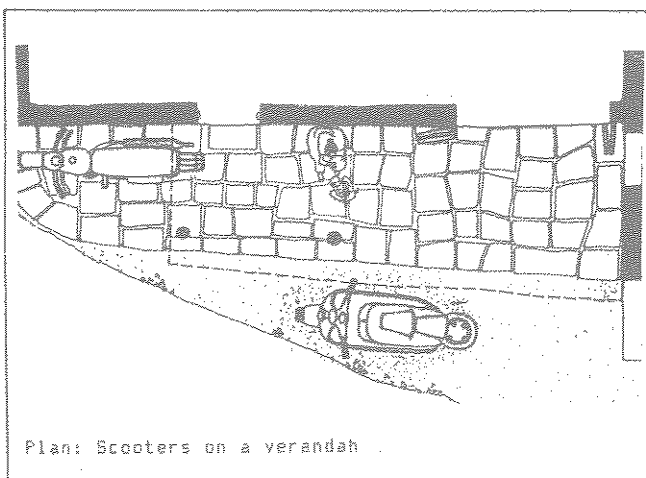
Auto-rickshaws use the front of a scooter or a motorcycle as a power unit; the rear wheel is replaced by a carriage or box with two wheels. A driver sits at the front of the auto-rickshaw and the rear box accommodates up to three persons. The passenger compartment is made up of steel tubes and is fabricated in small work-shops. Auto-rickshaws are extremely fuel-efficient and give more than 30k m/liter. Besides the passenger transport model these rickshaws are available in different versions to carry other materials and supplies.

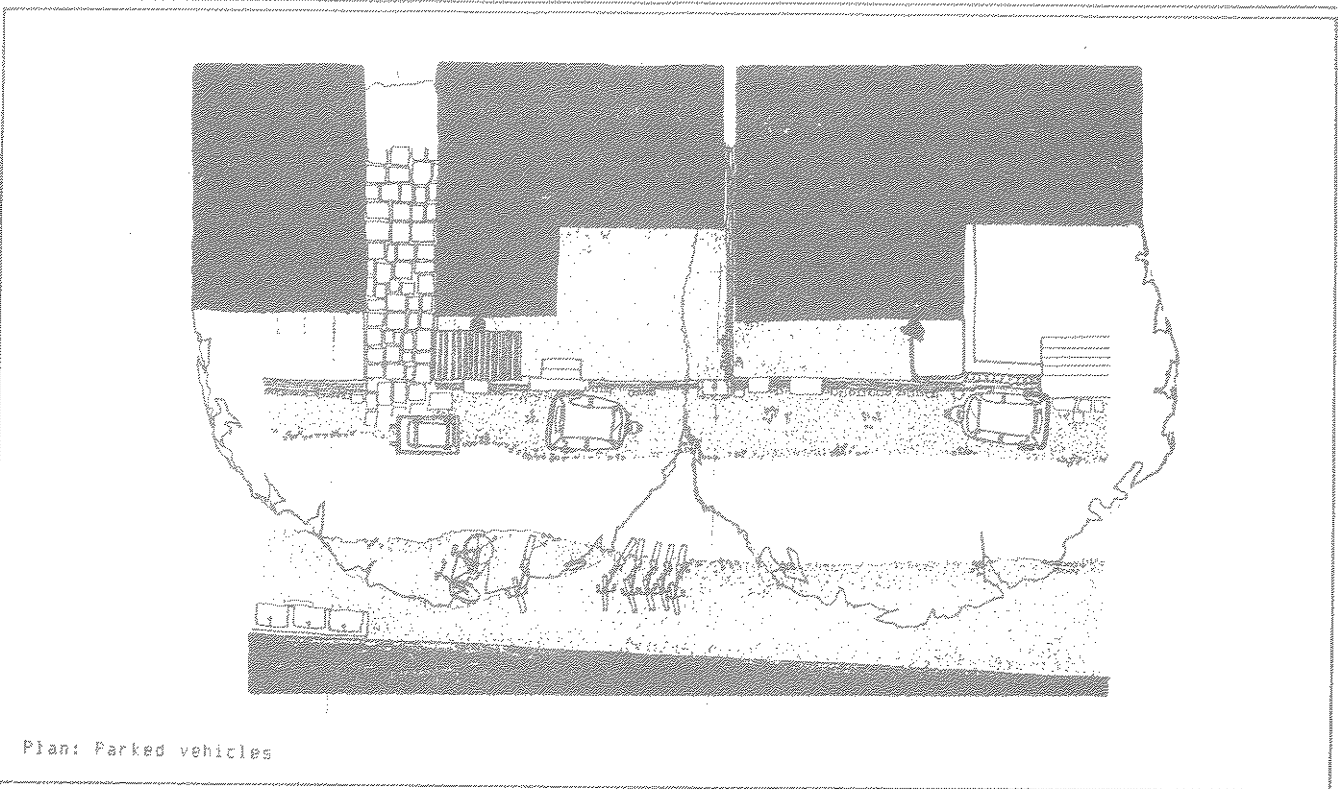
These vehicles are small enough to negotiate almost any narrow street or alleyway--their turning radius is just under 2.5m. Auto-rickshaws are the most commonly used mode of transport in large urban centers. They are equipped with meters and operate as a regular taxi service.



SCOOTER (above)

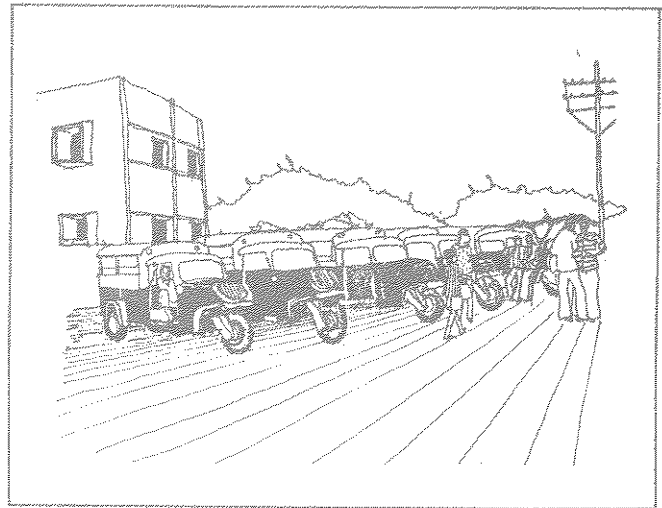
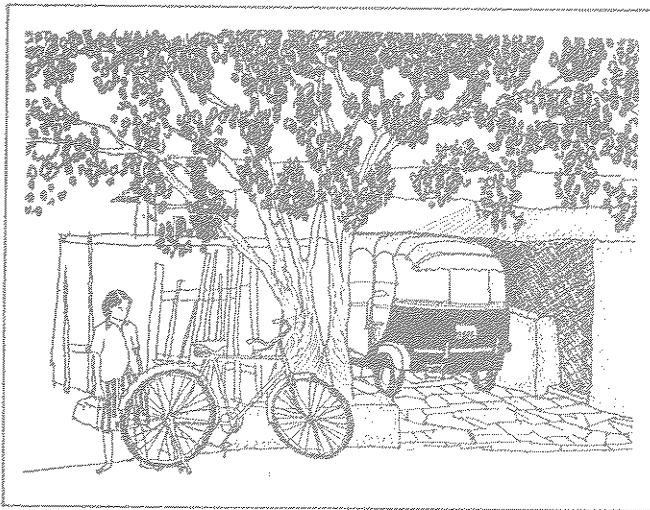
Very few slum-dwellers can afford a motorized vehicle other than a simple moped. Those who own a motor scooter must be fairly well off; scooters cost about 8,000 rupees, have a two stroke engine and give about 30Km/litre. This family owns not only a scooter, but also a motorbike. Not surprisingly, the head of this household of 10 persons operates two grain shops and cloth stall, and his older children have well-paying jobs. The vehicles are parked alongside the verandah during the day, and within it at night.





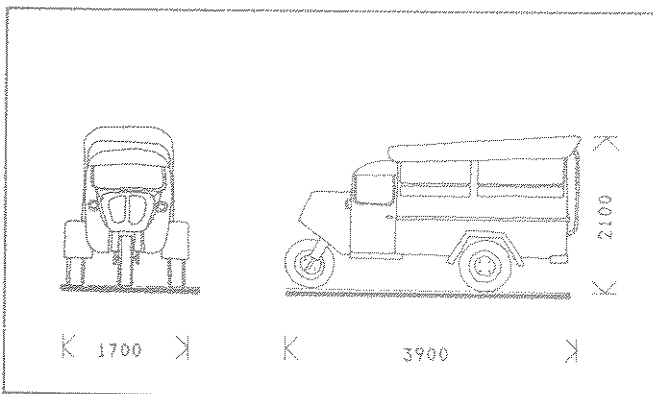
Plan: Parked vehicles

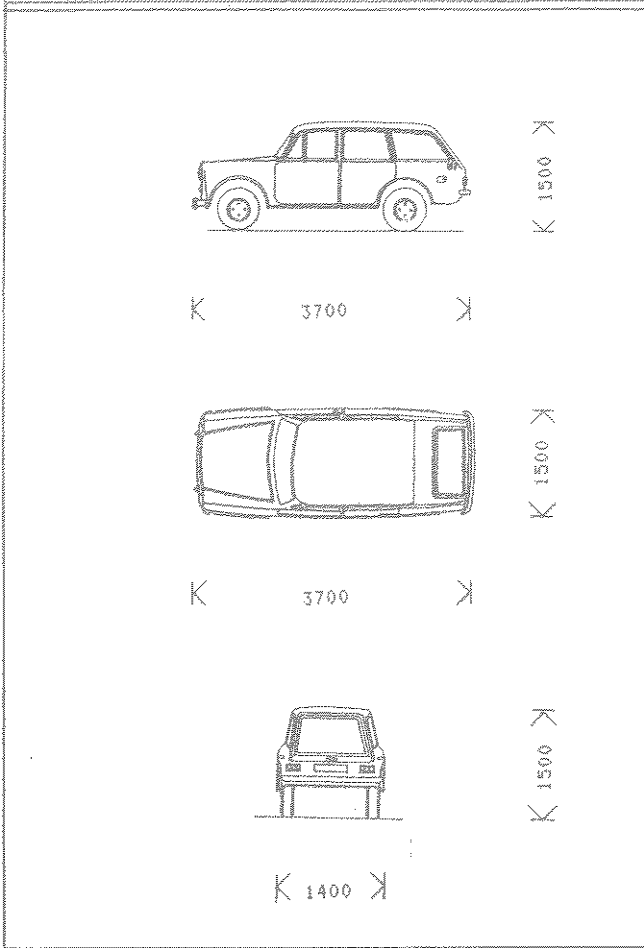
A variety of vehicles is parked outside a shop that repairs bicycles. Pushcarts and motor-rickshaws also come here for repairs. The bicycles belong to the shop and are for hire.



DIESEL AUTO-RICKSHAWS (left, above)

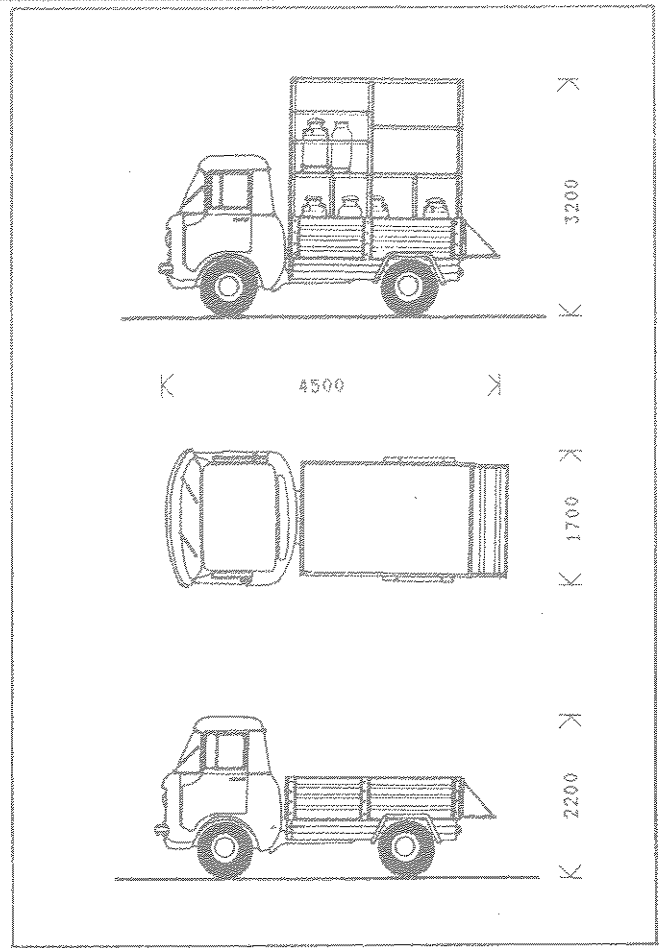
The "Tempo" is a larger, diesel-powered version of the auto-rickshaw, that is capable of carrying larger and heavier cargoes. With two parallel benches in the rear it can carry up to ten passengers, with two additional riders in the front next to the driver. "Tempos" are used like buses in the city, and run on fixed routes between railway stations, bus stops, markets, and so on. They are also used to transport goods from one part of the city to another.





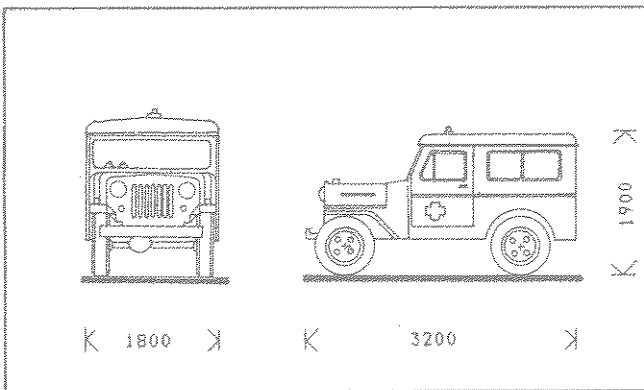
STATION WAGON (above)

This station wagon is an altered version of the 1100 cc "Premier" which has had the bodywork altered by a local workshop. It is generally privately owned.



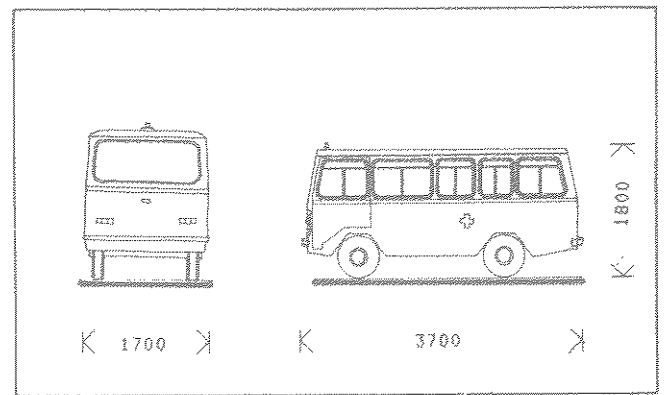
PLATFORM TRUCK (above)

The platform truck is a smaller version of the 3-ton vehicle. It is powered by a four-stroke engine with an average capacity of 3000 cc; cruising speed is 60-80 kph. Platform trucks are used for transporting milk cans, barrels of oil, and so on. They are suitable for distances of up to 500 km and are commonly used between urban centers and the countryside. A waterproof tarpaulin protects the cargo from sun and rain.



AMBULANCE (above)

A different body on the same chassis as the minibus, using the diesel Peugeot engine, it can carry two patients.



MINIBUS (above)

This factory-built bus can carry about 14 passengers, and so stands between the "Tempo" and a conventional 35 passenger bus. Minibuses are privately operated and have fixed routes between inter-city bus stations and railway stations, and the city center. They share stops with regular buses, but offer a faster service, at an increased price.



---

## 7. Access Streets

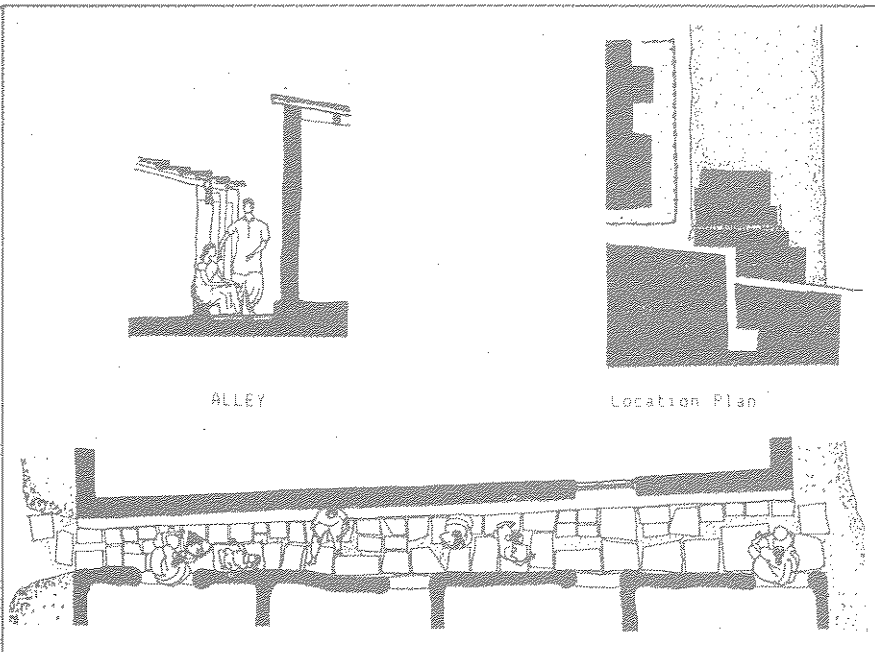
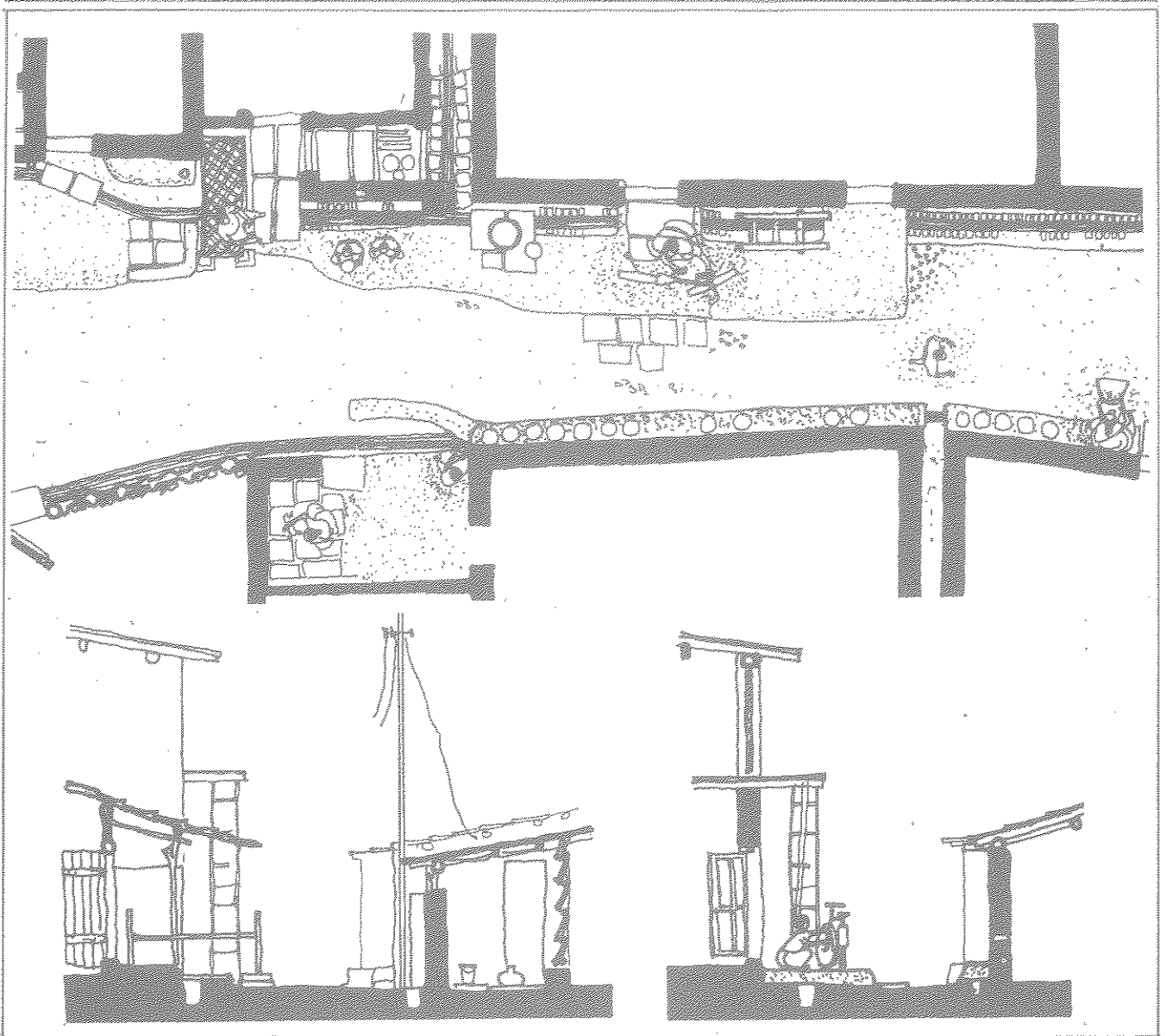
Standards for the widths of streets vary considerably from place to place, but in most developing countries they are historically related to European codes. Many critics have pointed out that the standards of transplanted British garden suburbs are not appropriate in the context of Indian towns, where climate, types of vehicles and population densities are different.

The general observation is often made that streets in planned housing areas tend to be extremely wide, considering the size and frequency of wheeled vehicular traffic. In planned low-income settlements, where plot areas can be as small as 25 square meters, wide access streets can result in disproportionately large portions of the site being used for circulation, as compared to plots, with consequent higher land development costs.

We were interested to see if we would discover more realistic, indigenous street standards, in the informal sector settlements that we visited. Are circulation areas minimized? Does one find extremely narrow streets, compared to conventional norms? Or is circulation simply reduced to an absolute minimum.

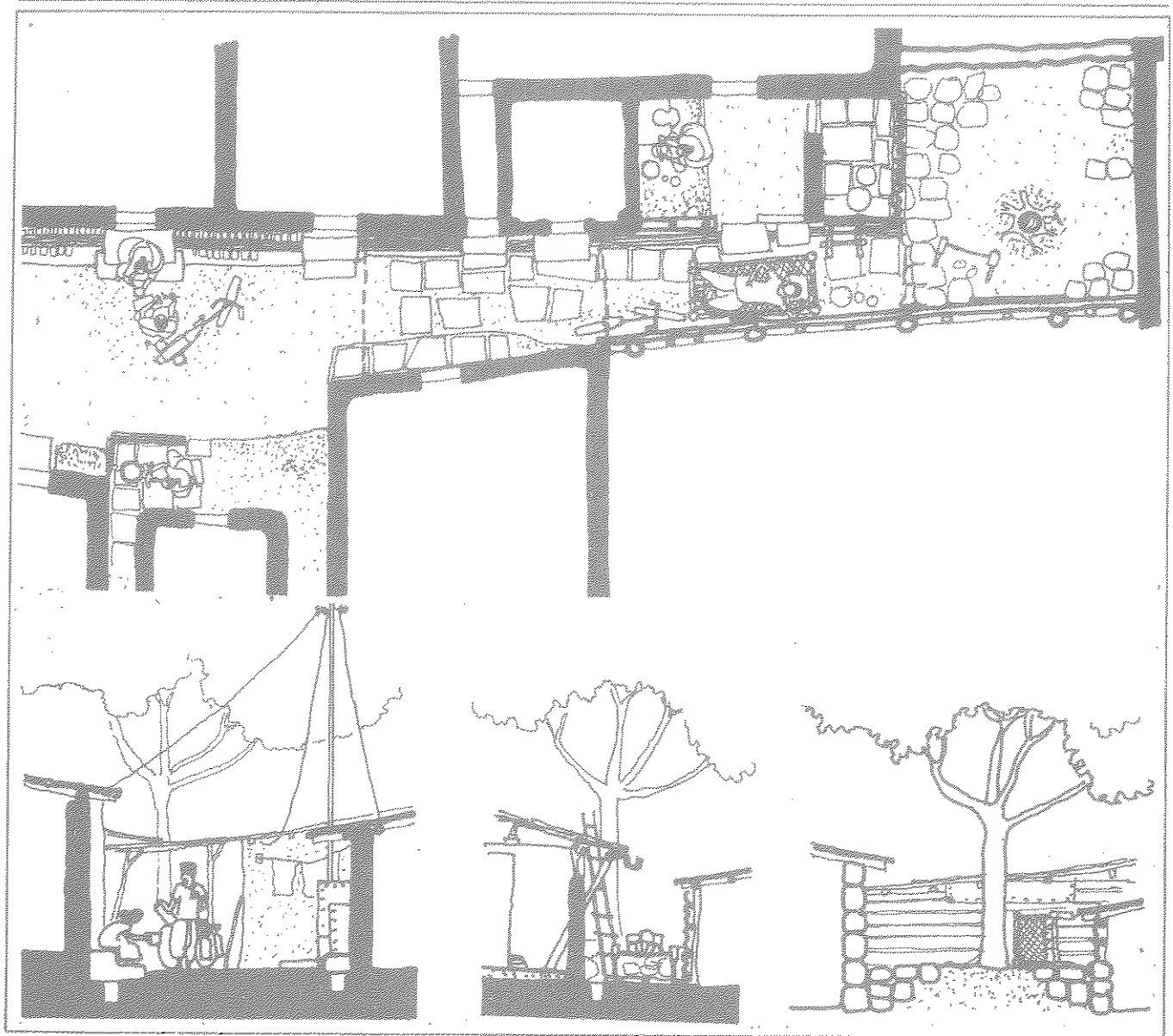
Streets are generally narrower than streets with similar functions (shopping, for example) in planned housing areas. While a main feeder in a planned project might be about 7m wide, the same street in the slums we surveyed was rarely wider than 3.5m. We have been able to categorize access streets into three groups: Lanes (less than 1.5m wide), Narrow Streets (1.5 - 3.0m wide), and Main Streets (over 3.0m wide).

One should not imagine, however, that the widths of streets in informal sector housing settlements are simply minimized. If they were, slums would consist primarily of extremely narrow lanes; that is not the case. The largest number of the access streets (in linear terms), are not the Lanes, as one might have expected, but rather the Narrow Streets. This reflects the large amount of social, work and domestic activity that takes place in the street, and the need for streets wide enough to accommodate them. However, in the newer, less-established slums, it is the wider Main Streets that predominate. This suggests that larger standards are established in the early life of the settlement, and that streets become narrower as house extensions grow larger.



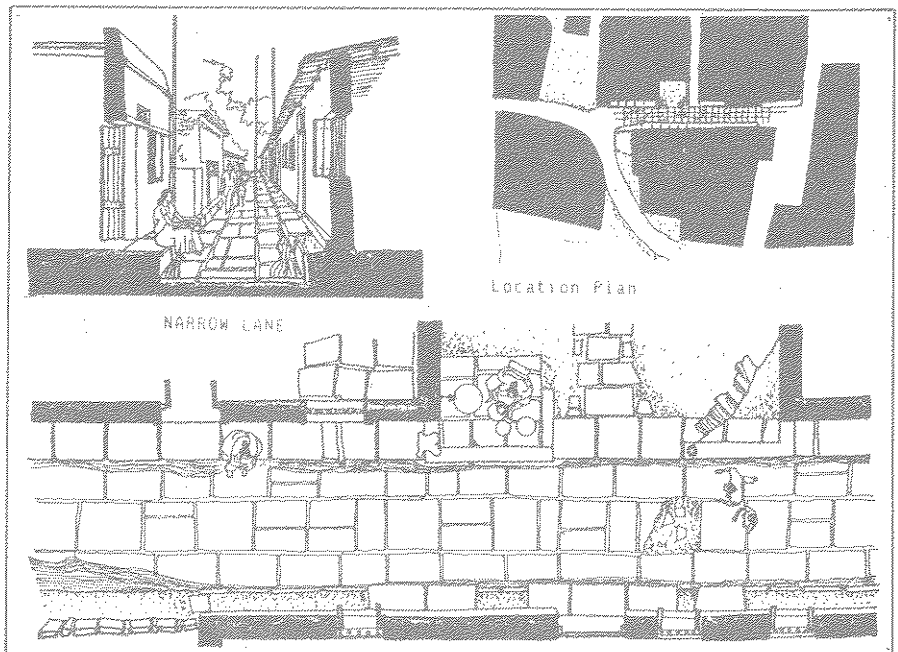
NARROW ALLEY (left)

This narrow alley has an average width between one half and one meter. It provides access to a series of one room dwellings and is also used as a long open verandah. Since only one side of the lane has houses facing onto it (the other side consists of the backs of another row) this alley functions as an extension. The daily activities that occur in house extensions, such as washing, cooking, and so on, also take place here.



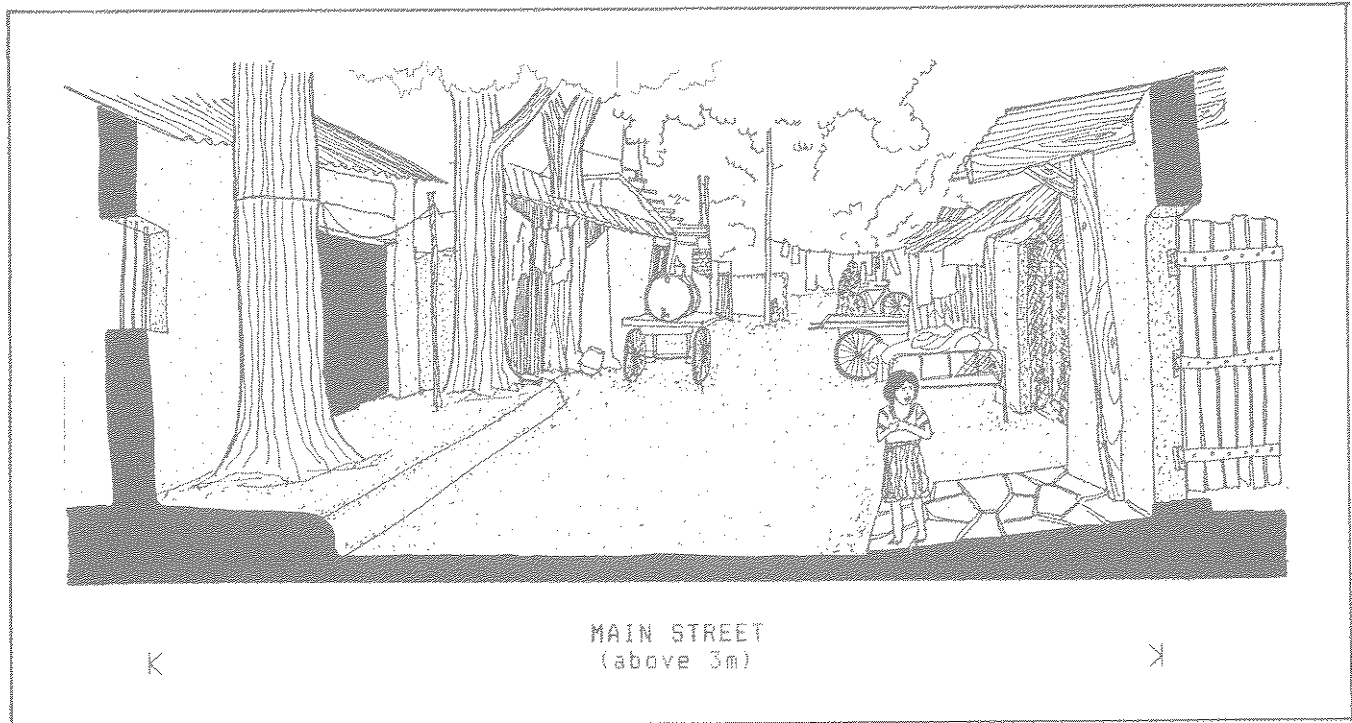
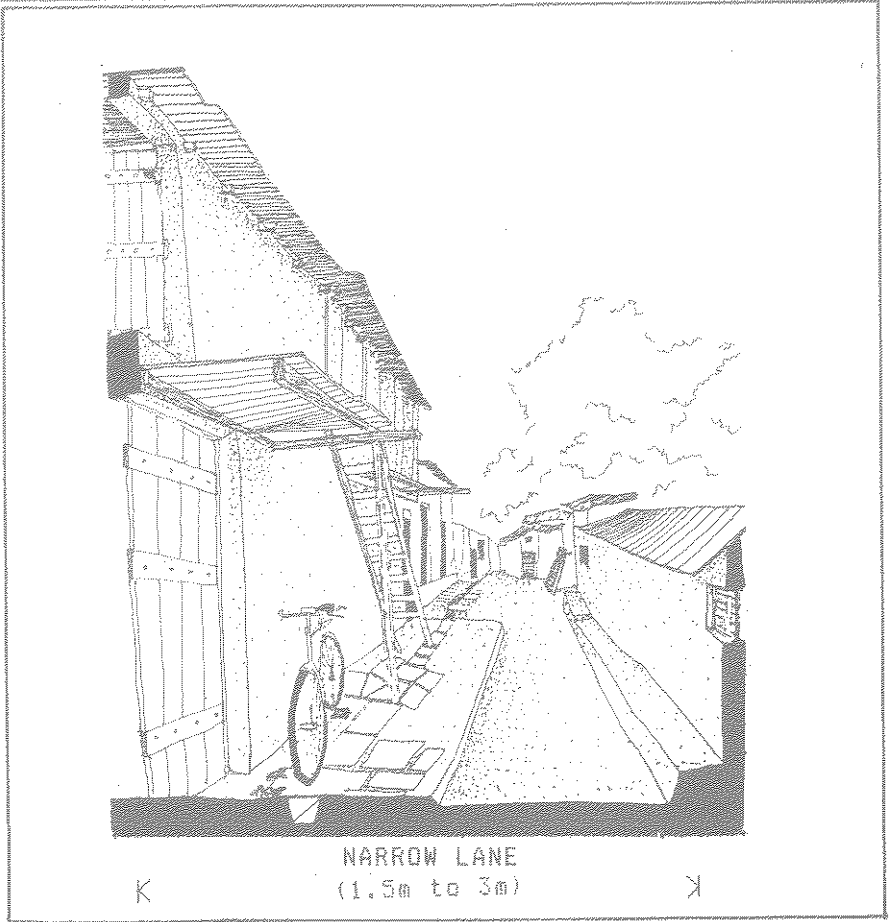
#### NARROW STREET (right)

This street has a uniform width of 1.75m. The plinth extensions in front of each dwelling form a continuous band of seats with varying heights. The street is narrow enough so that people sitting on either side can talk. This public sitting area has given the street the character of an outdoor room. Old *katras* (multiple dwellings around a large courtyard) observed in Old Delhi have a similar character.



#### DEAD END STREET (above)

Dead end streets are used extensively for outdoor activities. In this case, the street width reduces towards the dead end, which is used by the last dwelling to create an extra large house extension. Traditional housing uses a similar pattern of *cul-de-sacs*, which are popularly known as *mahollas* or *pois*.

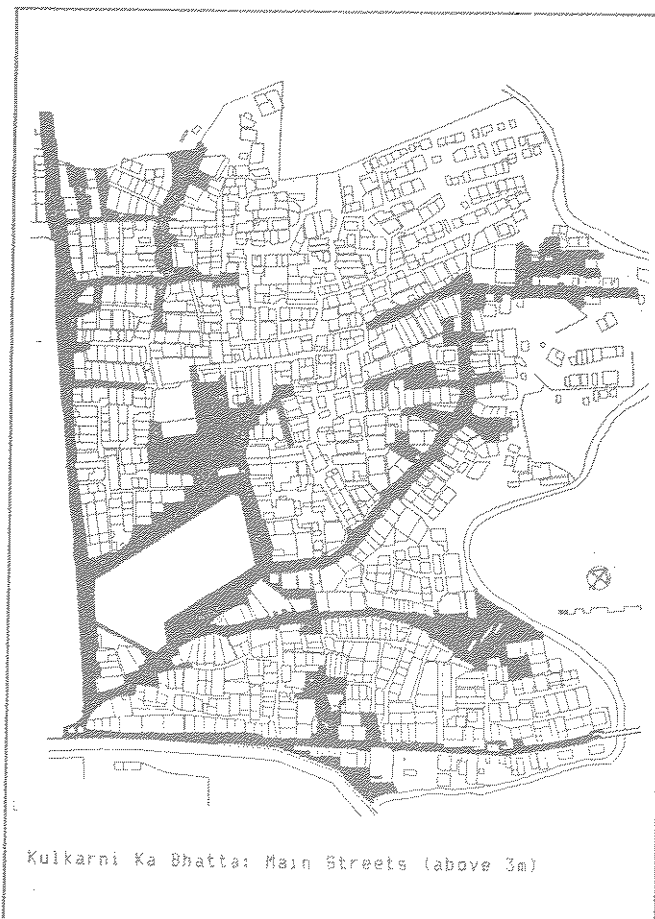
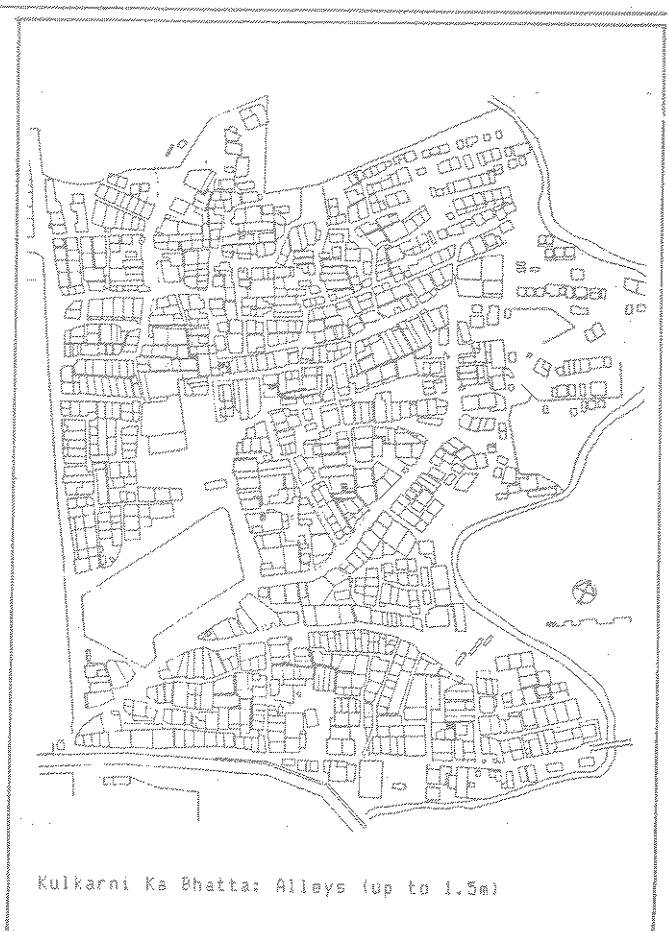
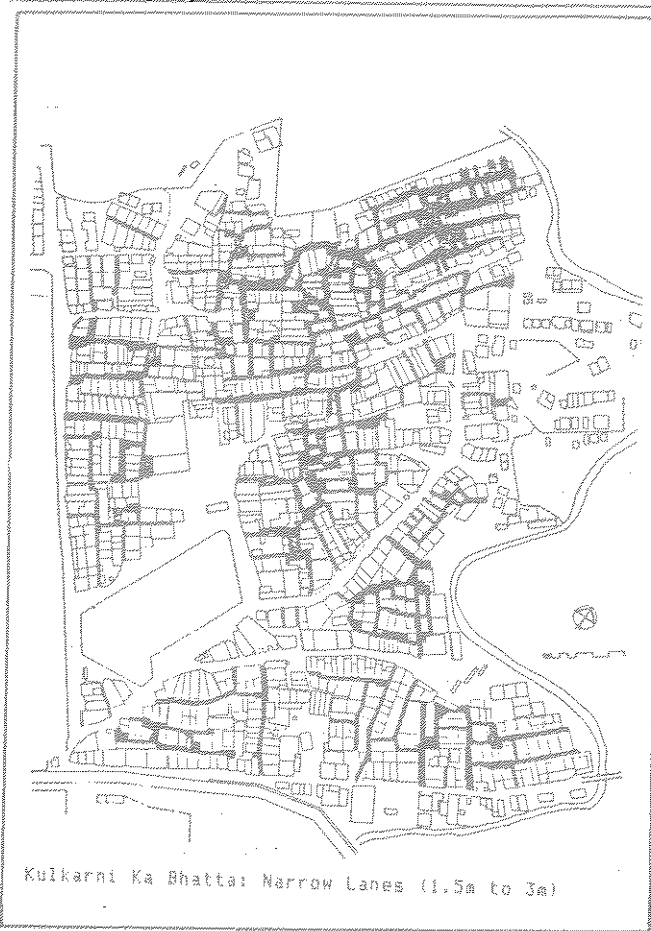


TYPICAL STREET WIDTHS (above)

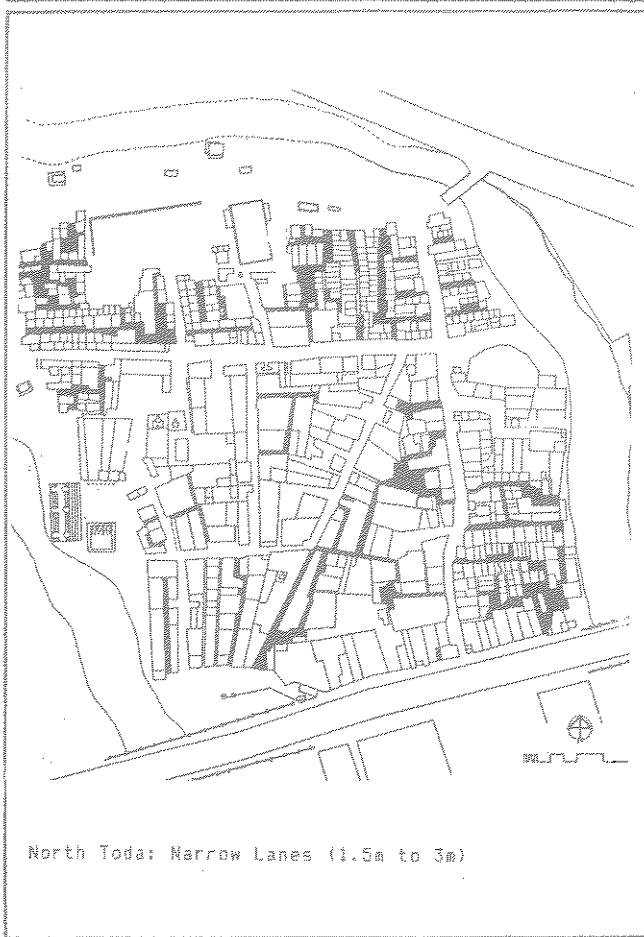
Informal sector housing does not have very wide streets. Typical widths vary between 2m and 3m. The above examples, all from K.K.Bhatta, show three types of public rights of way. Lanes up to 1.5m wide, narrow streets up to 3m wide and main streets, which are wider

than 3m. It was observed that invariably, these streets are narrower compared to streets in planned developments, but nevertheless seem to function well.

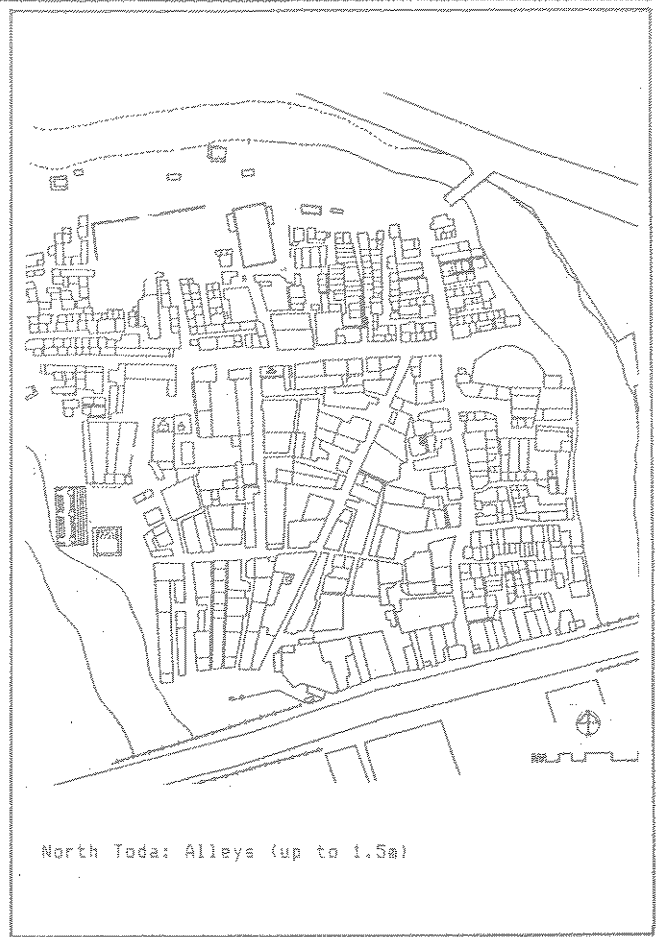
Using the same three categories (Lanes, Narrow Street, Main Streets) five different settlements were analysed: three from Indore and two from Ahmedabad. The findings are tabulated in the following pages.



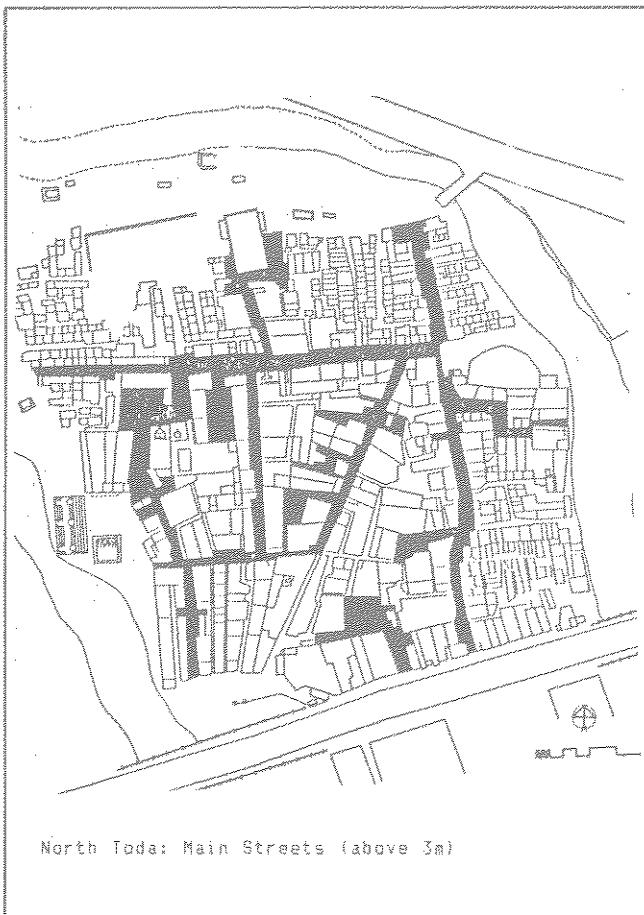
KULKARNI-KA BHATTA		
	LENGTH METERS	%
MAIN STREETS	2746	28%
NARROW LANES	6144	62%
ALLEYS	990	10%
TOTAL	9880	100%



North Toda: Narrow Lanes (1.5m to 3m)

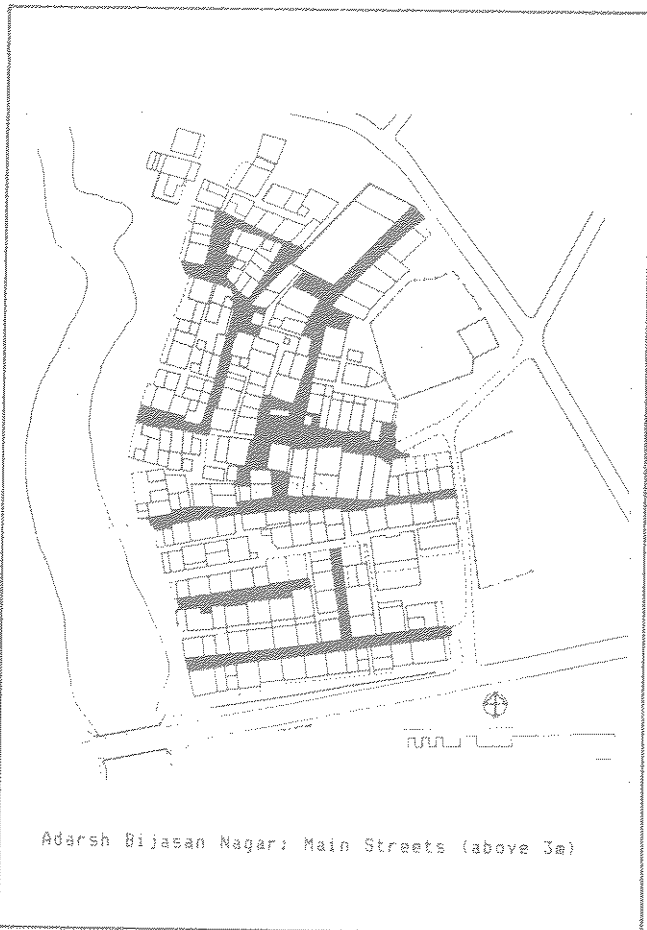
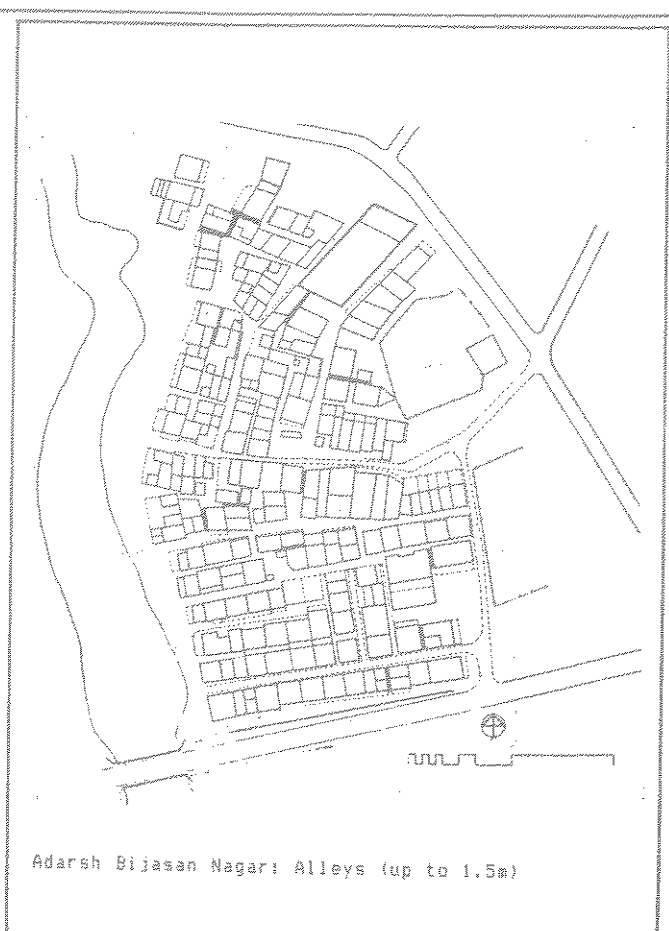
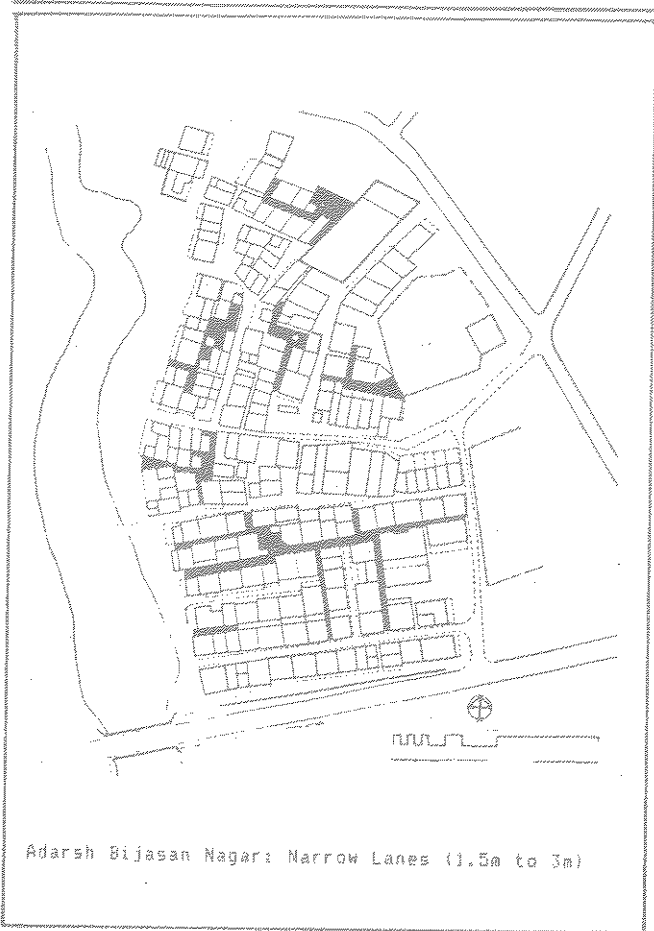


North Toda: Alleys (up to 1.5m)

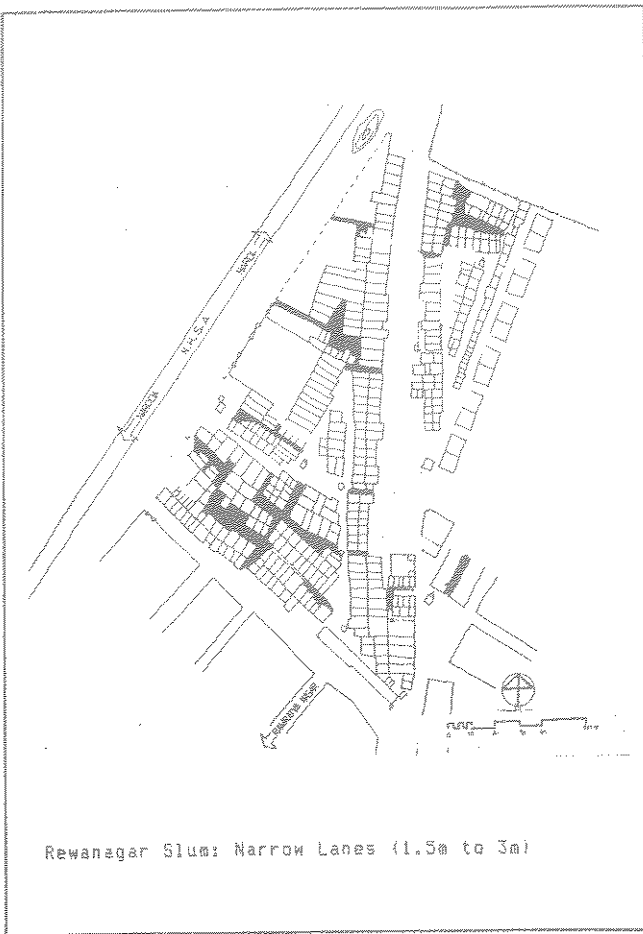


North Toda: Main Streets (above 3m)

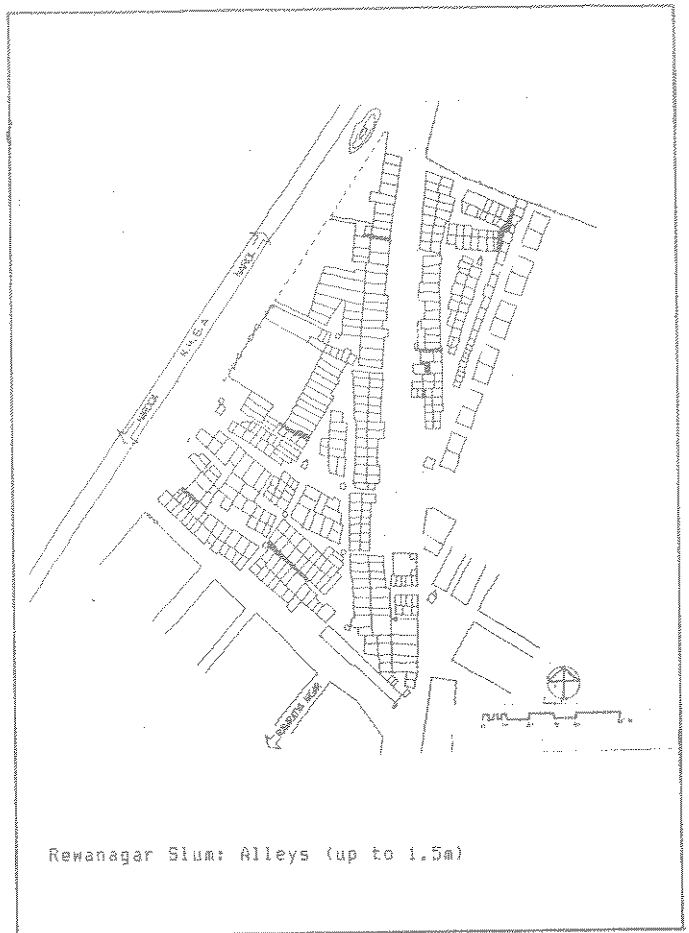
NORTH TODA		
	LENGTH METERS	%
MAIN STREETS	1005	42%
NARROW LANES	1243	50%
ALLEYS	205	8%
TOTAL	2455	100%



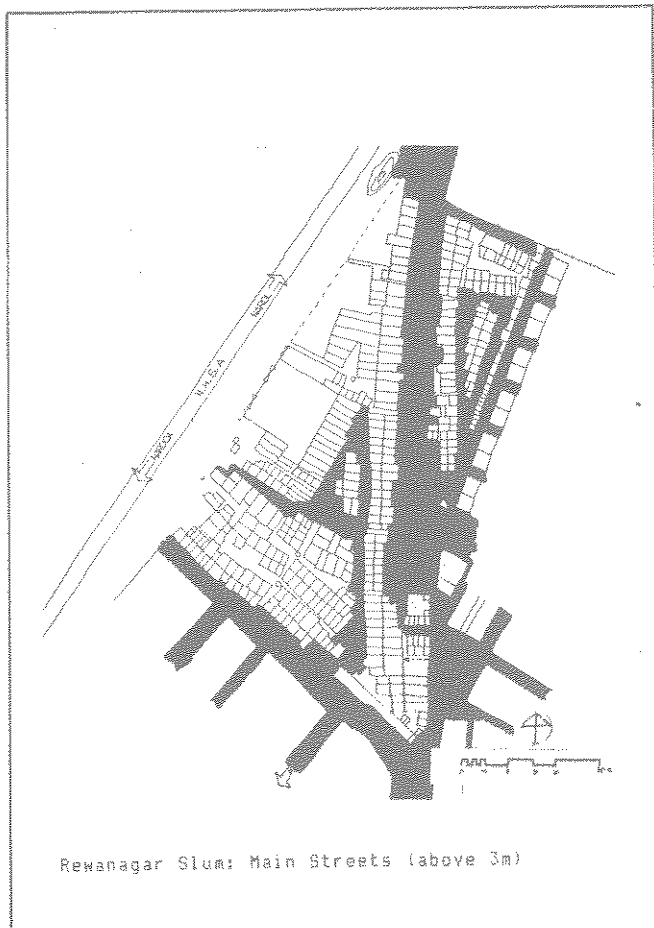
ADARSH BIJASAN NAGAR		
	LENGTH METERS	%
MAIN STREETS	540	58%
NARROW LANES	341	36%
ALLEYS	65	6%
TOTAL	948	100%



Rewanagar Slum: Narrow Lanes (1.5m to 3m)



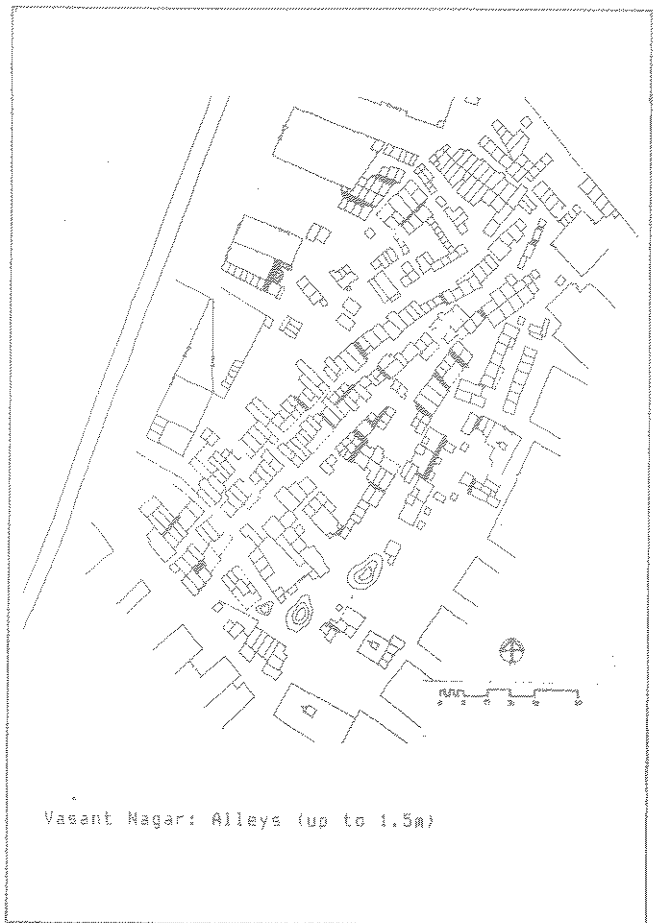
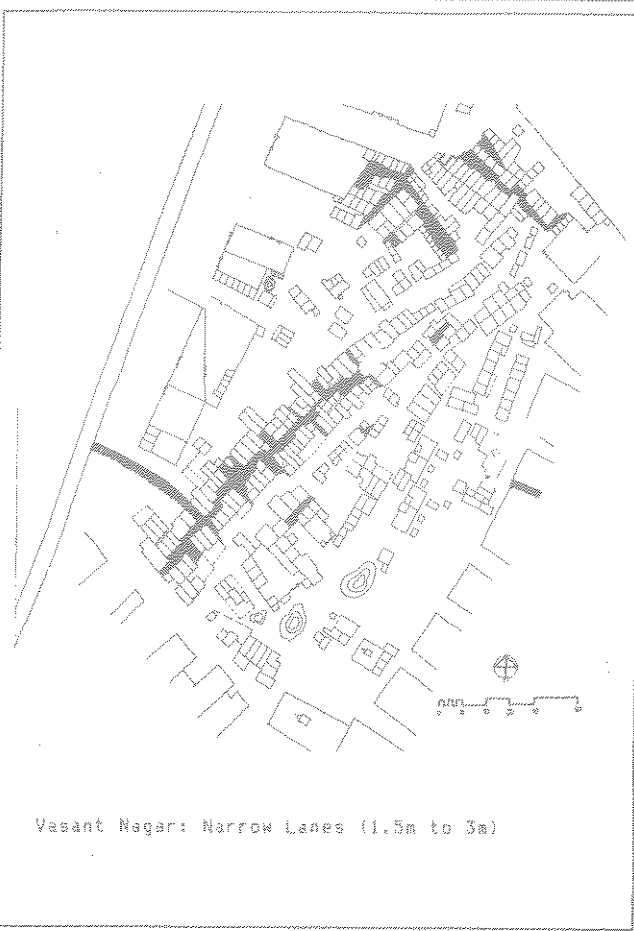
Rewanagar Slum: Alleys (up to 1.5m)



Rewanagar Slum: Main Streets (above 3m)

REWANAGAR SLUM		
	LENGTH METRES	%
MAIN STREETS	1248	68%
NARROW LANES	455	25%
ALLEYS	110	7%
TOTAL	1813	100%





VASANT NAGAR		
	LENGTH METERS	%
MAIN STREETS	1789	71%
NARROW LANES	540	21%
ALLEYS	187	8%
TOTAL	2516	100%

TYPE OF STREET		WIDTH	VEHICLES	USE
ALLEY		<p style="text-align: center;">K 500 X 1500</p>	<p>Pedestrian Animals Bicycles Mopeds</p>	Residential
NARROW LANE		<p style="text-align: center;">K 1500-3000 X</p>	<p>Cycle rickshaws Pull carts Push carts Animal carts Auto-rickshaws Diesel Auto-rickshaws</p>	<p>Residential Temporary Commercial</p>
MAIN STREET		<p style="text-align: center;">K 3000-over X</p>	<p>Pedestrian All vehicles</p>	<p>Residential Permanent Commercial</p>

SITES AND SERVICES NARROW STREET		<p style="text-align: center;">K 4500 X</p>
SITES AND SERVICES MAIN STREET		<p style="text-align: center;">K 9000 X</p>

## 4. Trees

At first glance, landscaping seems an extraneous, if not an irrelevant issue in the context of low-income urban shelter. If landscaping is considered as a frill in most conventional building projects, it is little wonder that it plays such a minor role in what is mistakenly referred to as "basic" housing. Perhaps this is why tree-planting programs are absent from most sites and services projects. However, in existing slums and unplanned settlements, trees are conspicuously maintained, protected and planted by the inhabitants--without official assistance, and with some considerable labor. Why is this the case?

Trees, especially large species like Gul Mohur, Banyan and Pipal not only provide shade but play the role of public buildings, and become a substitute for the arcades, porches and covered outdoor spaces that are a part of the normal urban fabric, but that are absent in most slums. Where large trees exist, they become the focus of public gathering places; where they do not, they are planted and cared for.

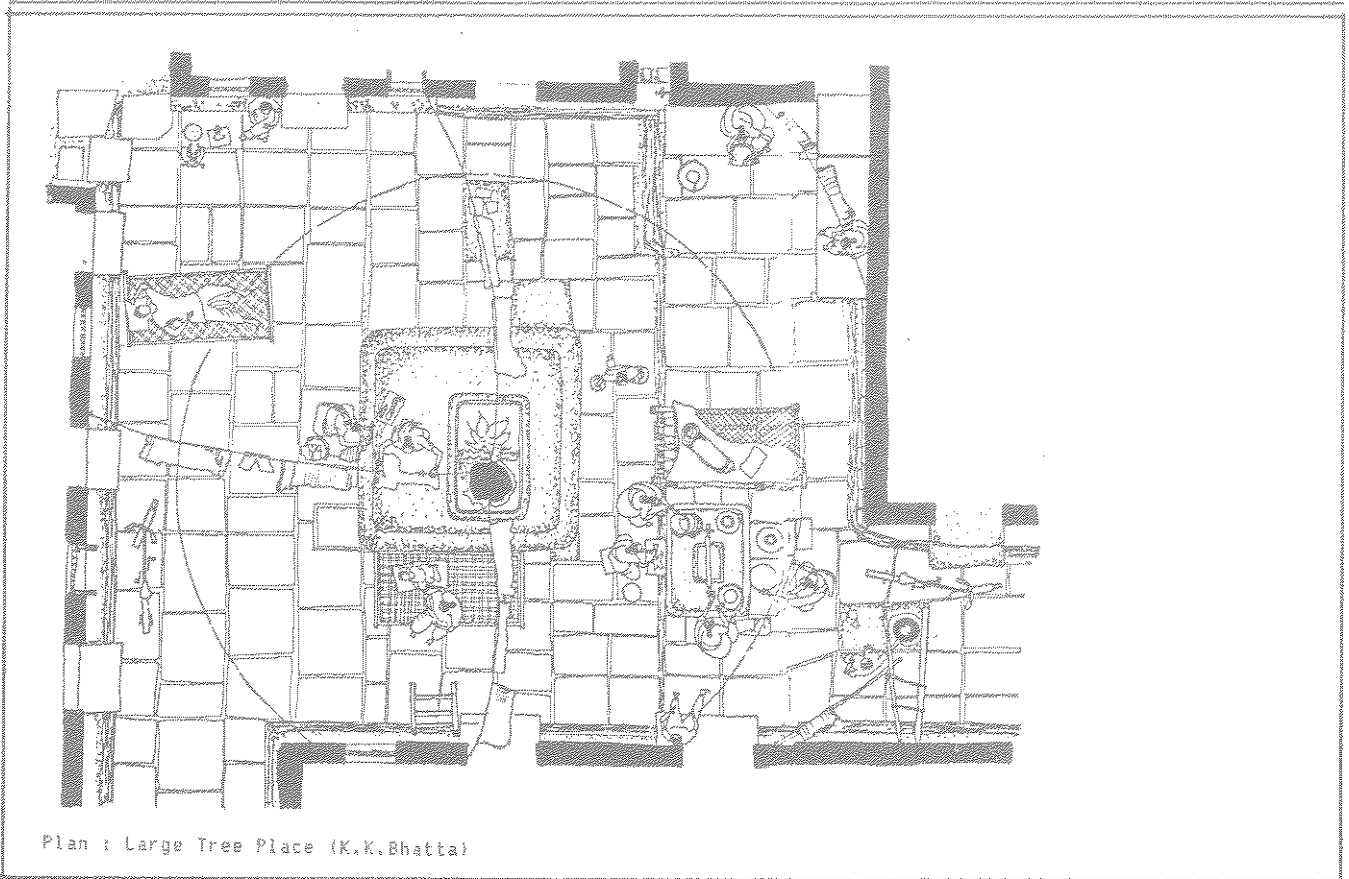
Public squares, whose overall dimensions have been clearly dictated by the spread of the large trees located in their center, are a common feature of the slums we visited. In almost all cases the public square has grown up around, and chronologically later than, the tree. The space beneath such shade trees is variously used as an outdoor classroom, a meeting place, a work space or a covered market. The central "meeting tree," which originates in the village (and not only in India), also reminds the urban immigrants of their rural roots. The religious role of certain species of tree reinforces this public function.

Trees become landmarks and visual reference points in a built environment that is otherwise characterized by an extreme uniformity, both of building materials and forms. Frequently, the only vertical elements, and modulators of space, in slums are trees.

Trees not only provide shaded shelter beneath, but also cast shadows on adjoining houses, which are almost always built of lightweight materials that offer minimal resistance to solar radiation.

Shade trees are the most common species we found in public areas. Ornamental trees are less frequent, and are usually planted by individuals in front of houses, or in spaces that are immediately adjacent to the dwelling, what we have called house extensions. Fruit-bearing trees, such as Mango or Coconut are sometimes found alongside streets and alleys but are more common in private yards since individuals maintain, and harvest, the produce. The food value of such trees is not negligible. A single mango tree, for example, can be expected to yield 75-100 kg annually; the common chiku will produce about 50 kg of fruit per year.

In the humid tropics, trees grow quickly. They provide shade, shelter, identity, food and, not the least, beauty.



LARGE TREE PLACE

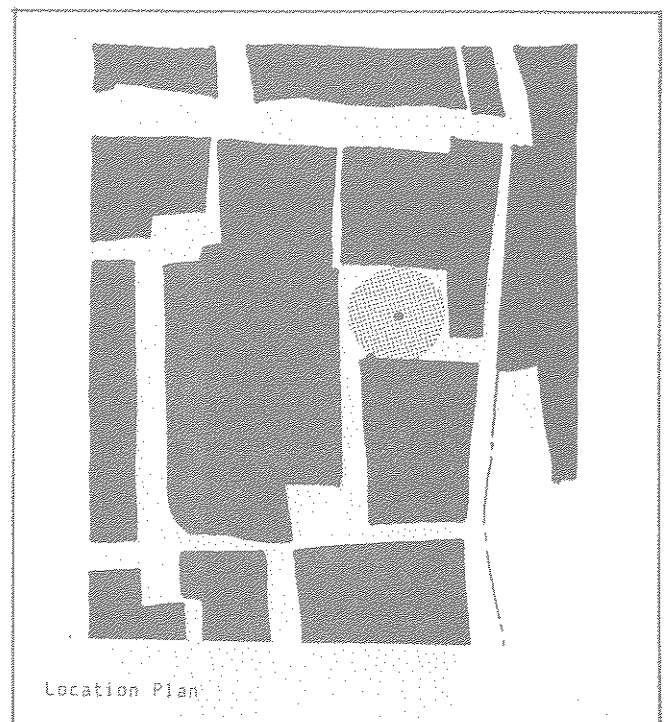
A narrow passageway off a principal street leads into the public square (see above), and becomes a dead end. As a result this square acquires a private character. A large pipal tree located centrally provides the focus of the square, and is likely to have established the limits for the arrangement of the buildings around.

The tree provides shade all year around, and also serves as a central support to which clothes lines and roof-supporting guy-ropes are attached. A mud-brick stepped platform has been built around the tree. It serves as a sitting and resting place for the people who live around the square, and is also used by passers-by and hawkers. Generally, the elderly people of the community can be seen sitting on the platform, which also serves as a kind of stage during community functions--marriages, birthdays, festivals and other religious ceremonies. The pipal tree, like the banyan, is also an object of worship, and lends sanctity, as well as shade, to this place.

The houses which form edges to the space all open and extend towards the square in different ways. Some have platforms of their own, and overhangs, others simply use the space as an extension for domestic activities. The activities that take place in these house extensions are of a more private nature than those in the center of the square. They include various household chores such as cooking, drying food and clothes. People sit and recline on wood and coir cots (khatiya). A few vehicles such as bicycles and pushcarts (lari) are also to be found parked against the house walls, where they are safe and secure under their owner's eyes.

Several of the houseowners are self-employed and have set up small manufacturing activities outside their homes. These typically consist of making food products, cigarettes, clothing and carpentry, all of which are carried out in the shade of the large pipal tree.

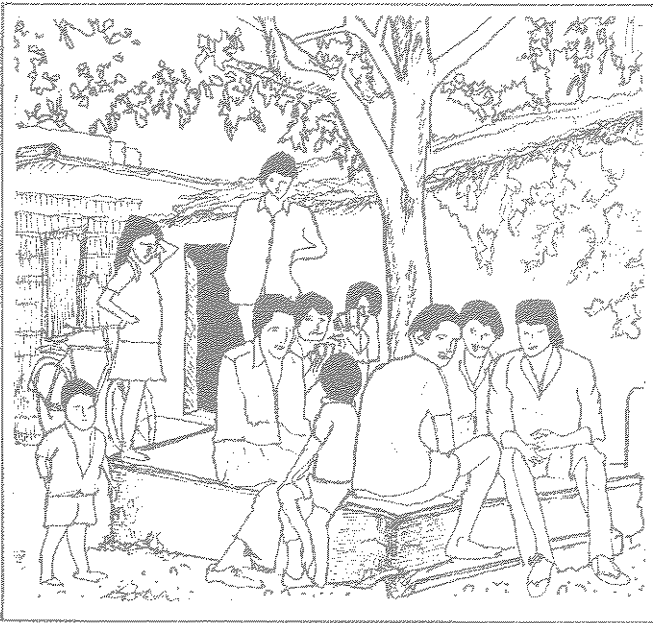
Recently, this square has been paved with stone tiles, and a public water standpipe has been added, due to the efforts of the municipal authorities. Since the water standpipe is the only water source, it has become a public meeting place where washing and clothes cleaning is carried on, which also help to encourage and support the public nature of this square.



## PUBLIC SQUARE WITH TREE AND TEMPLE

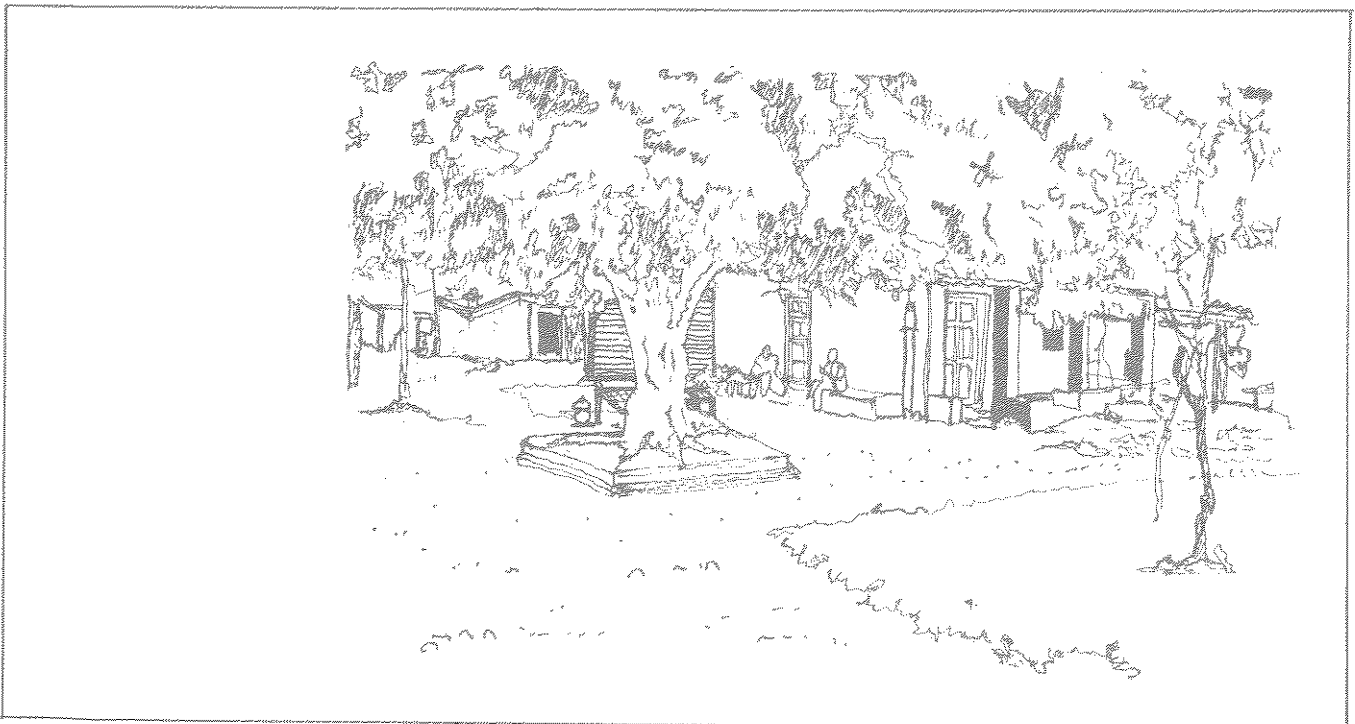
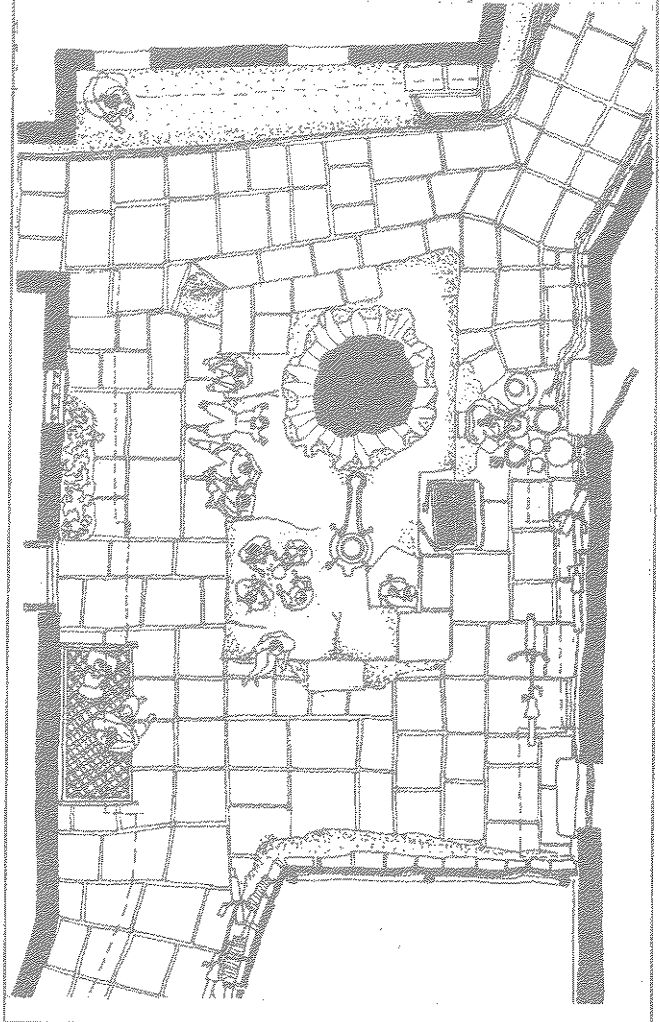
(Right) This second, smaller square is typical of the public open spaces in popular settlements. Walking through a narrow street one suddenly enters into a fairly large open area which has a spreading tree centrally located within it. Another narrow street continues from the diagonally opposite corner, and thus what is actually a widening of the street acquires a private and secluded character.

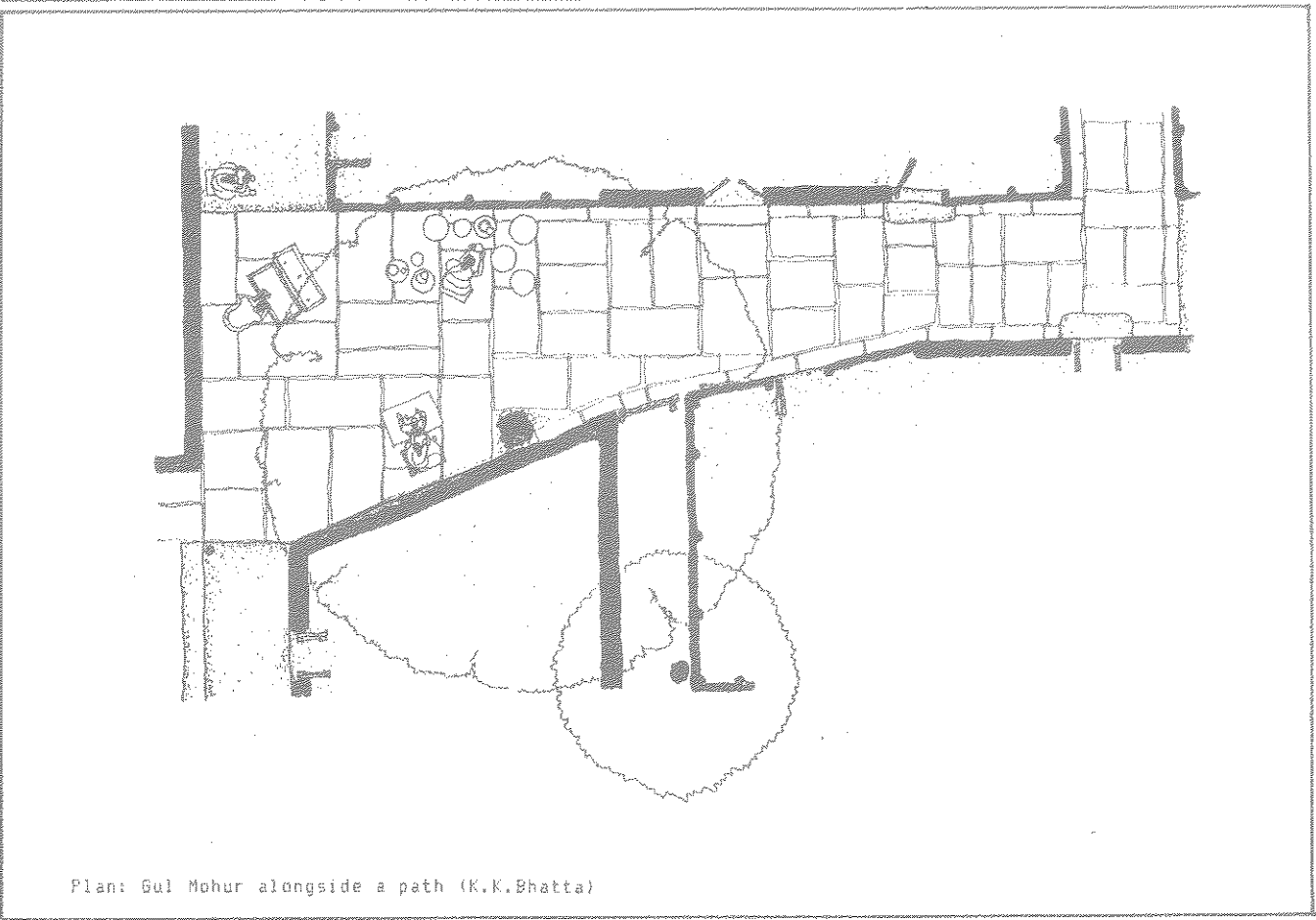
A large, mud-brick platform is built around the tree, and serves as a sort of stage for community activities; at the edges of the space, the activities become more private. People living around the square also use it as an extension of their homes. A shiva shrine just below the tree--typical for such locations--gives the site a special sanctity. The platform serves to slow down the pedestrian traffic--which flows around it--and becomes a shady pause in the street pattern.



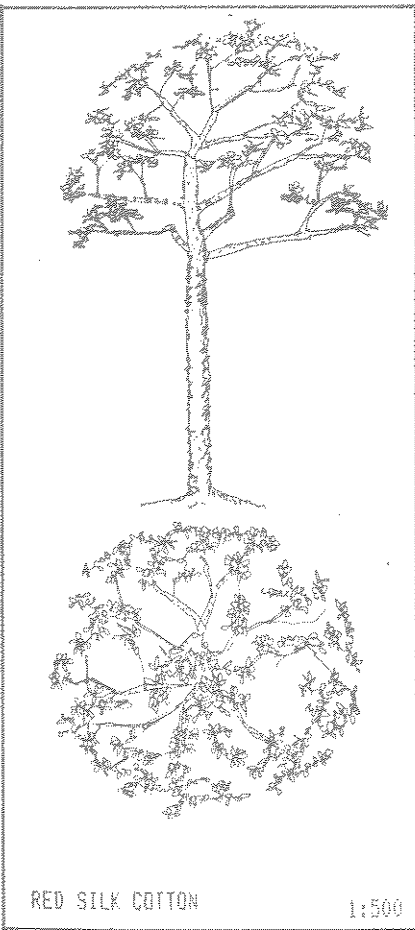
Plan : Public Square with Tree and Temple.

(K.K.Bhatta)



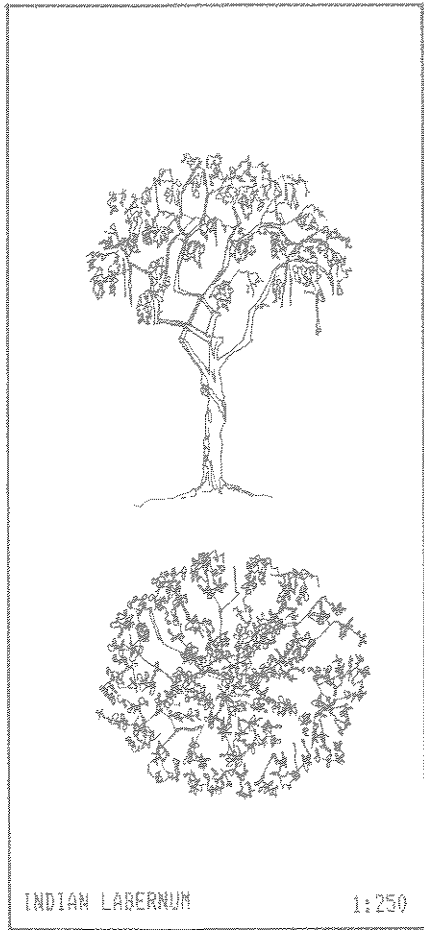


Plan: Gul Mohur alongside a path (K.K.Bhatta)



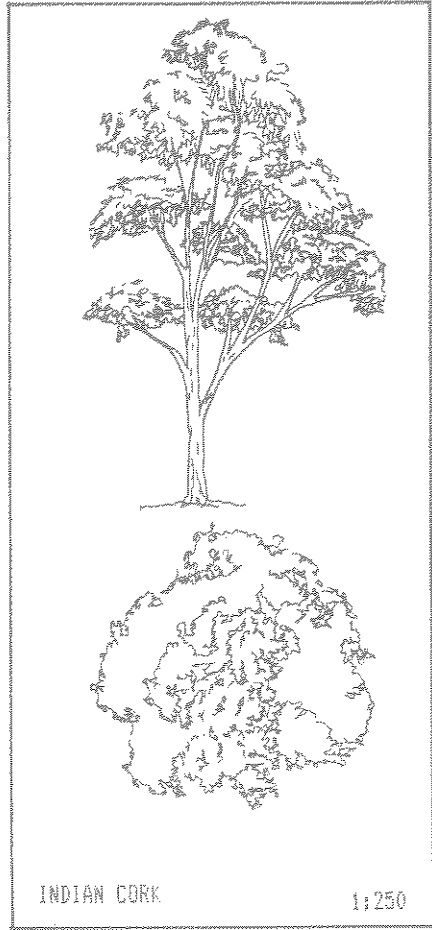
RED SILK COTTON

1:500



INDIAN LABERNUM

1:250

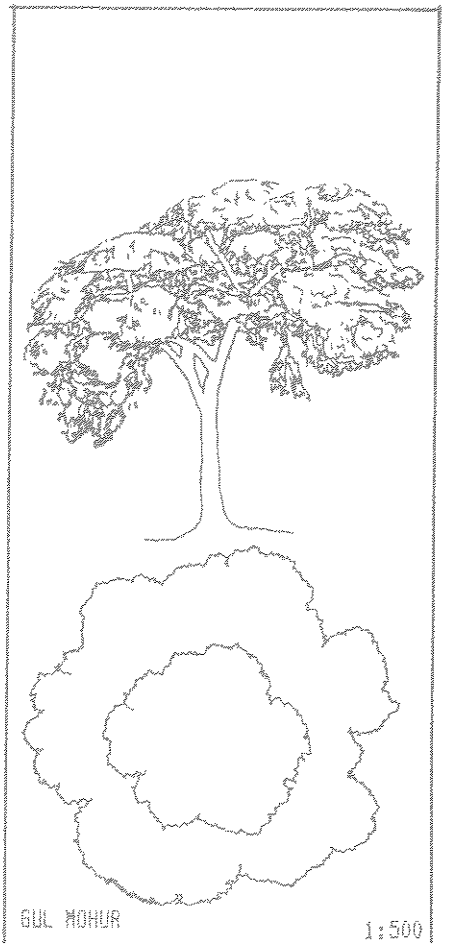
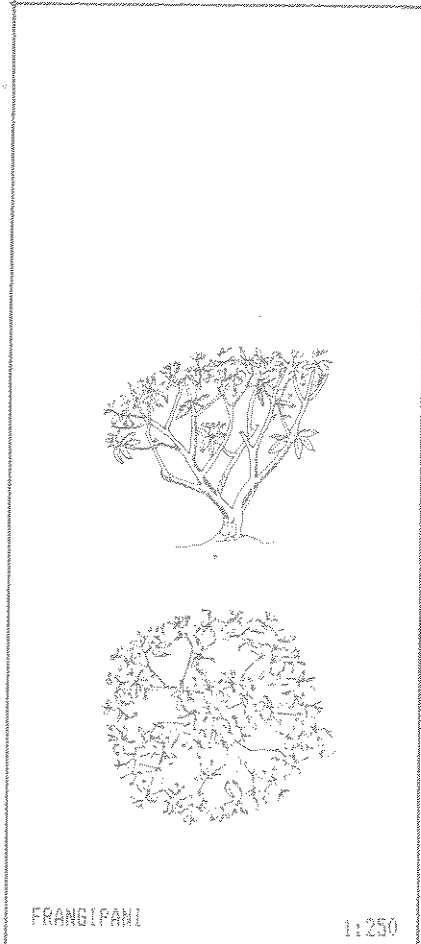
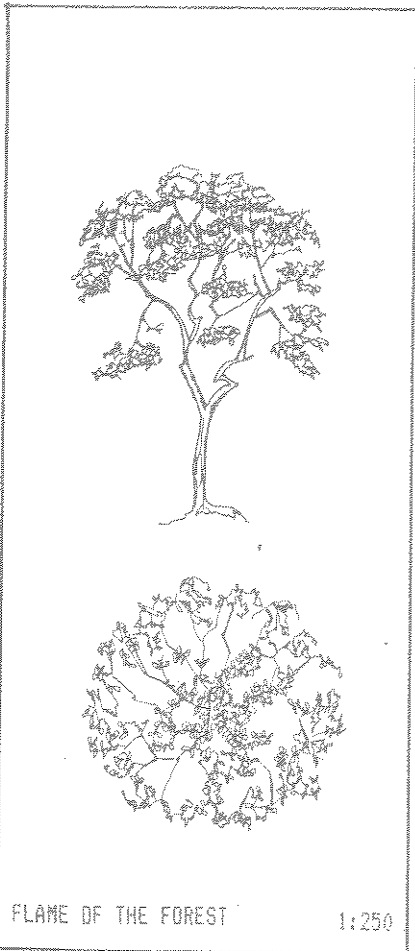
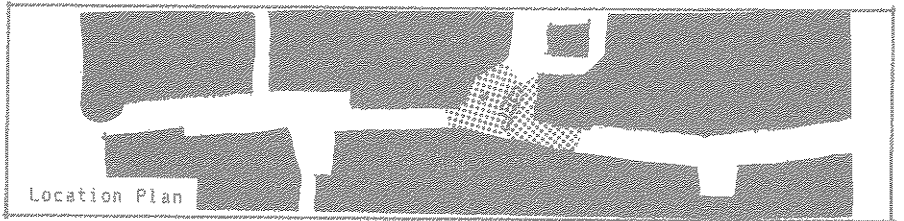
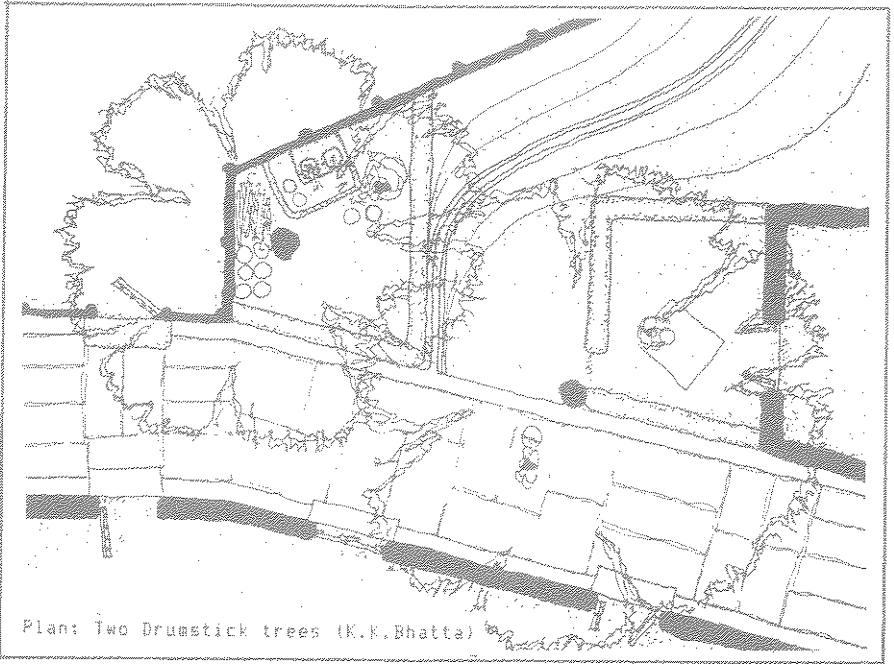


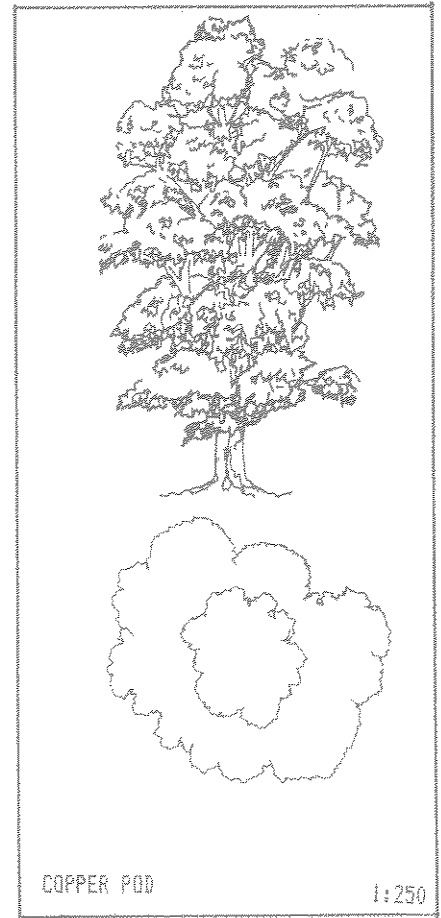
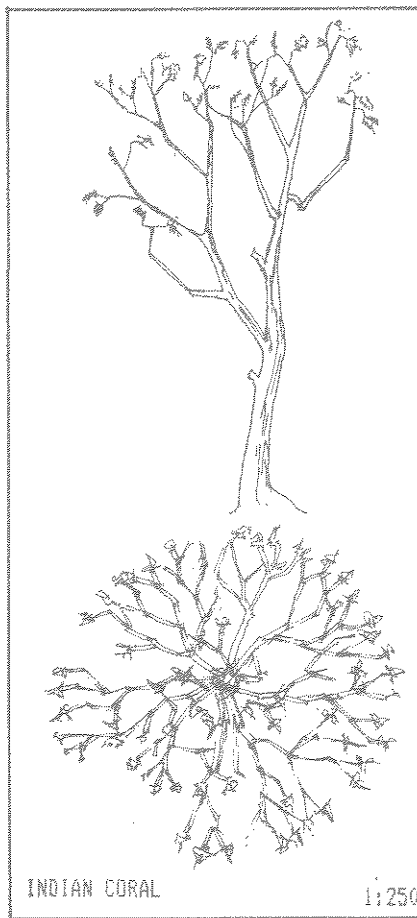
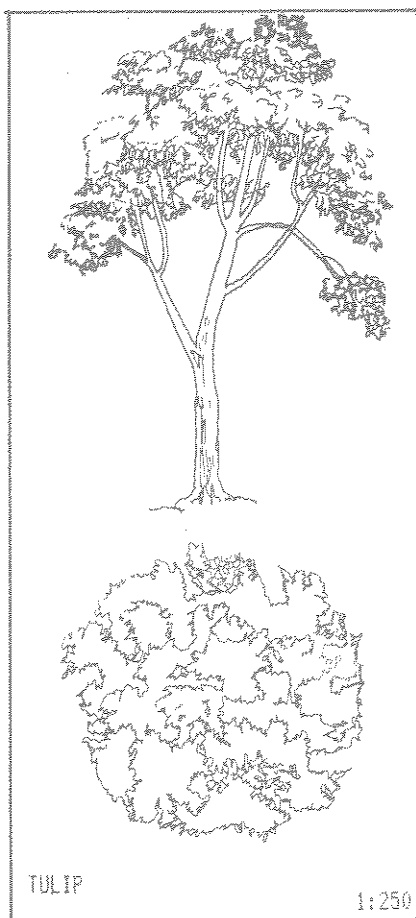
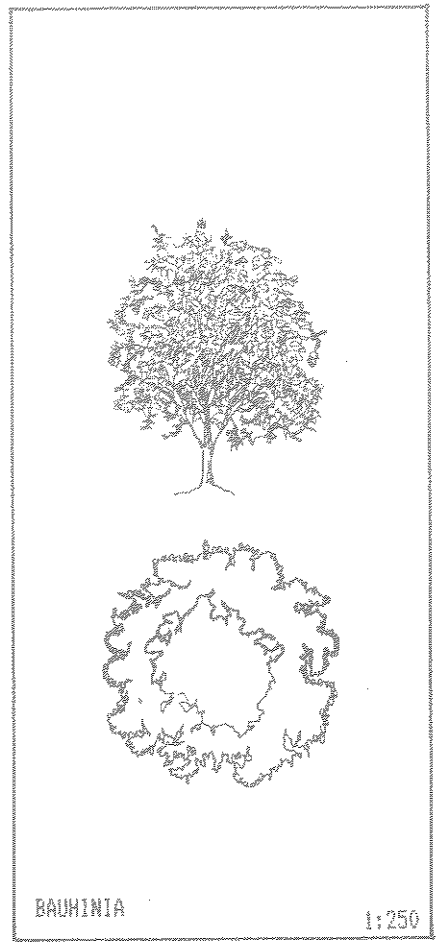
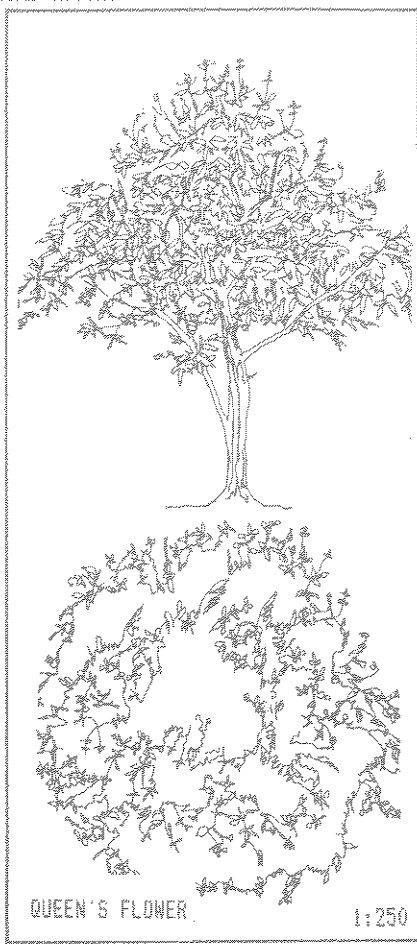
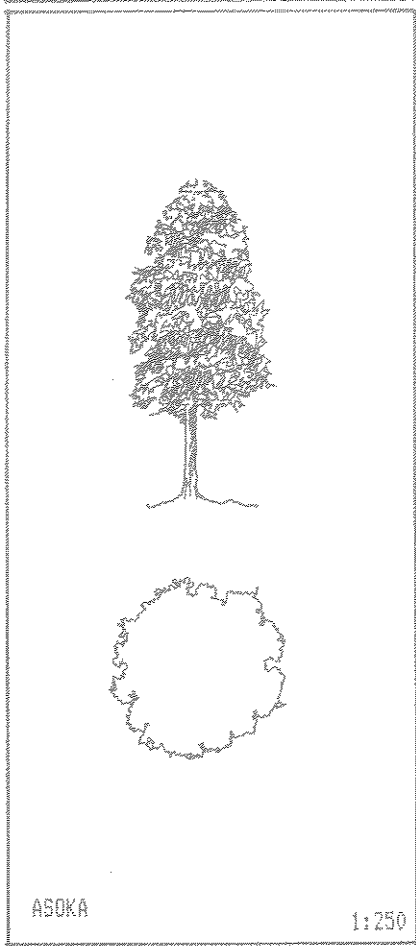
INDIAN CORK

1:250

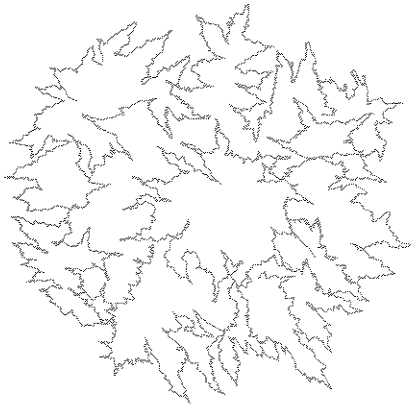
(Left) The Gul Mohur (*Delonix regia*), which has a wide spread, pleasing appearance and good shade, has been planted on one edge of a public open space. The outdoor community space is used by families as an open living space to carry out daily activities such as washing clothes and utensils, cleaning grains, combing hair of children, fixing bicycles and other objects, and so on. This tree place functions well because the area is paved with stones and the entrance to the open space within which the tree is planted is narrow enough to make the open area look almost like a private courtyard.

(Right) These two Drumstick trees are planted on marginal land which was difficult to build on because of a steep slope. The slope was filled up and the leveled area is now used as an extension to the house. It is a common practice to plant trees in areas where the construction of dwellings may be difficult. The selection of tree types is also important, most trees are fruit bearing (for example the Drumstick fruits are used for making curry). The other consideration in the selection of the trees is their maturity period--fast growing trees that can bear fruits within a year are preferred.



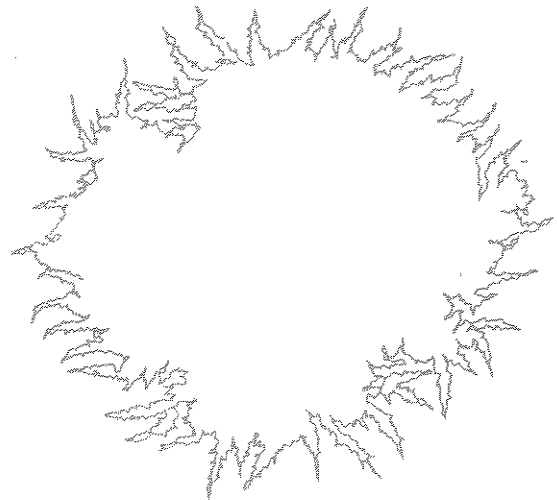






JACARANDA

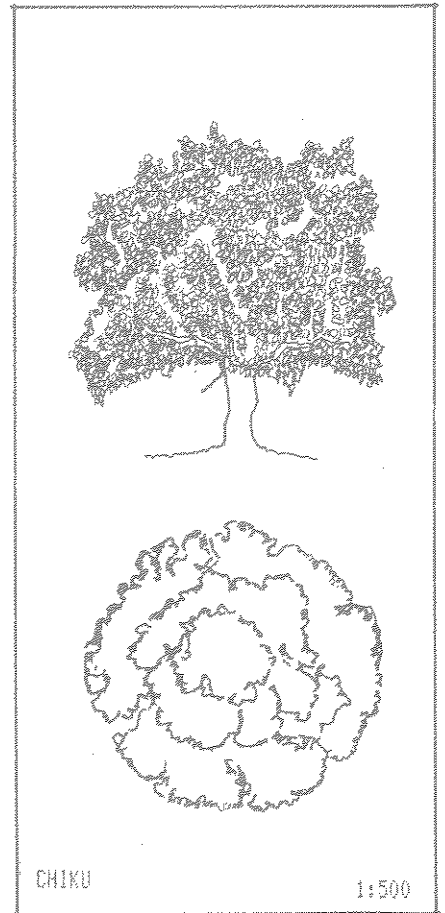
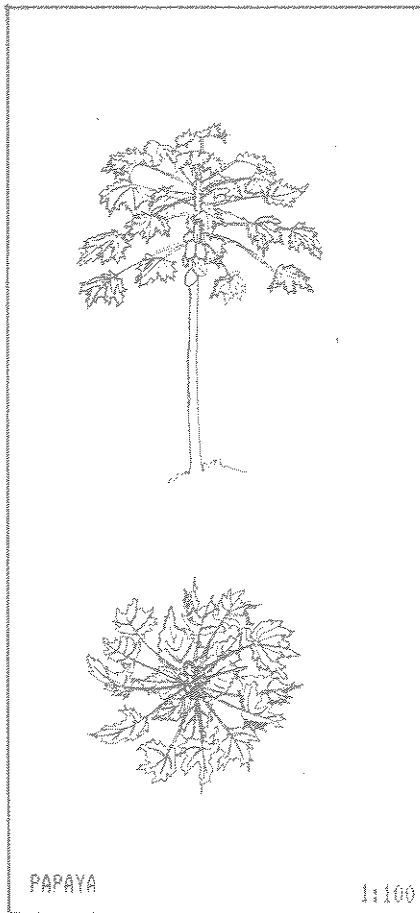
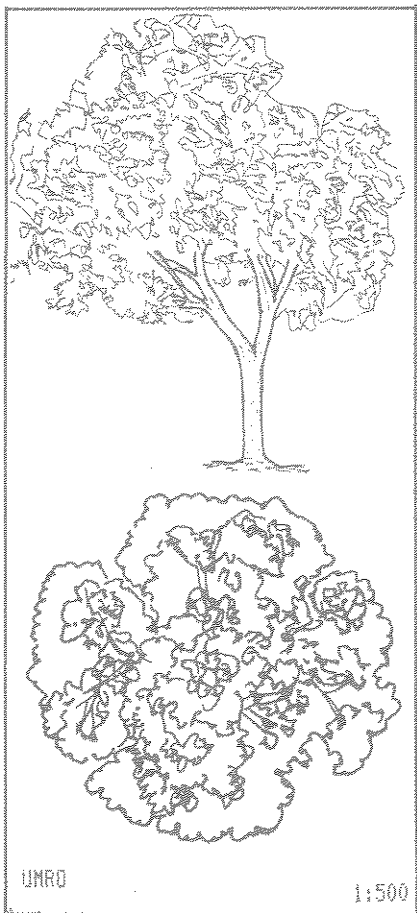
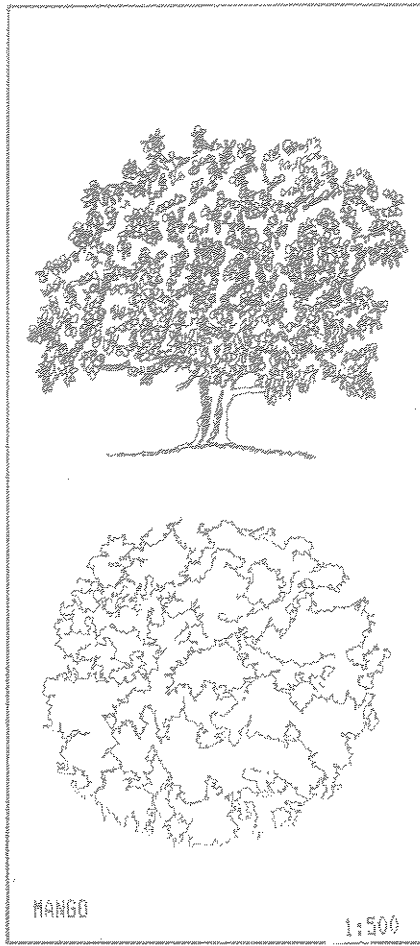
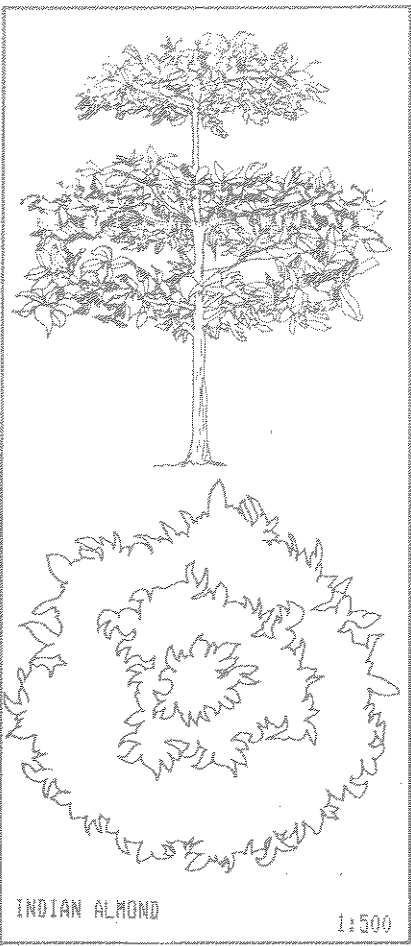
1:250



CASSIA

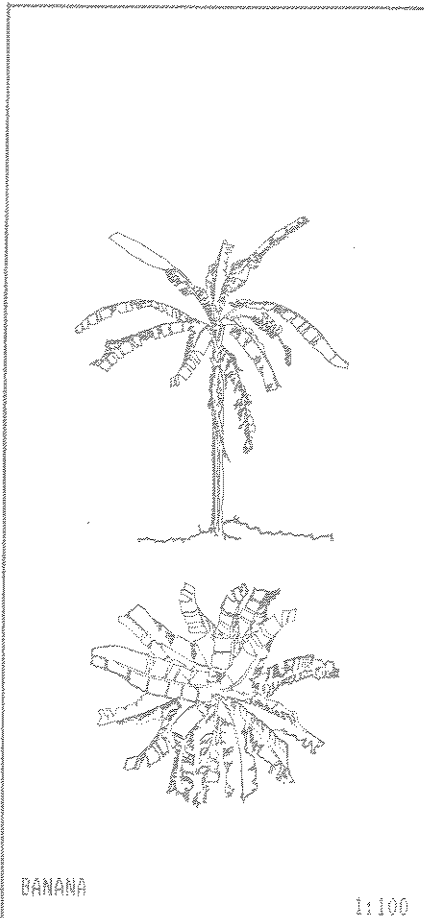
1:250





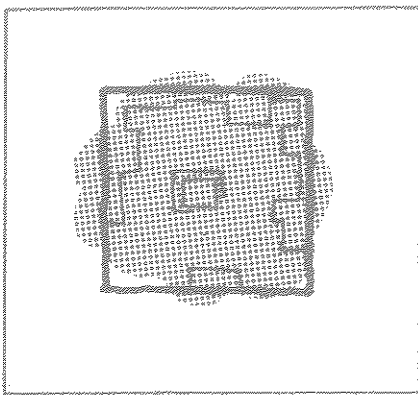


Fruit-bearing trees are often found alongside streets and alleys but are more common in private yards, since individuals maintain and harvest the produce. Chiku, mango, umro and Indian almond are large trees and should be planted in relatively spacious gardens. They are started as grafts and need good drainage as well as regular watering; they start bearing fruits in about three years and are excellent shade trees. The drumstick is a medium-sized tree which is common in the settlements we visited. Its fruits and leaves are used in preparing curry and the roots are used as a substitute for horse-radish. It is planted as a large branch cutting and starts bearing fruits in a year or so. Banana and papaya are small trees that yield fruits in 14 to 16 months; they do not have any foliage on their trunks and prefer large quantities of water. Since they tolerate some salinity they are conveniently planted within private yards, near water drains flowing out from wash-places and kitchens. Coconut palms were also observed in private yards.



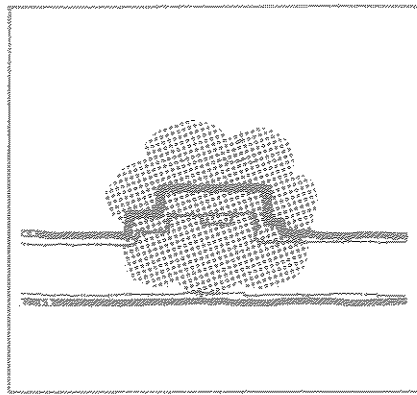
Common Name	Maturity Period	Height	Spread	Shape	Flowers/Fruits
<b>S H A D E</b>					
<b>BANYAN</b> <i>Ficus bengalensis</i>	20 years	30m+	30m+	Umbrella	Bright red figs Dec & Jan
<b>CASURINA</b> <i>Casurina equisetifolia</i>	7-8 years	25-30m	12-15m	Conical	Small brown cones
<b>KARANJ</b> <i>Pongamia glabra</i>	5-6 years	12-18m	12-15m	Flat dome	Small white sprays May-June
<b>NEEH</b> <i>Azadirachta indica</i>	10-15 years	24-36m	3-12m	Irregular	White/yellow flowers Dec-Feb
<b>PALMIRA</b> <i>Dreodxa regia</i>	10-20 years	10-30m	3-5m	Tall with crown	n/a
<b>PIPAL</b> <i>Ficus religiosa</i>	7-12 years	18-24m	12-21m	Irregular	n/a
<b>RAIN TREE</b> <i>Samanca saman</i>	6-7 years	20-25m	18-21m	Umbrella	Pink puffy flowers Mar-May & Dec-Jan
<b>F L O W E R I N G</b>					
<b>ASOKA</b> <i>Saraca indica</i>	5-6 years	5-10m	5-6m	Conical dome	Red clusters Jan & Feb
<b>COPPER POO</b> <i>Peltiphorum roxburghii</i>	6-7 years	20-25m	9-12m	Conical dome	Yellow flowers May-June & Sept-Nov
<b>FLAME OF THE FOREST</b> <i>Butea monosperma</i>	12-15 years	10-15m	9-12m	Irregular	Orange clusters Jan-Mar
<b>FRANGIPANI (TEMPLE TREE)</b> <i>Plumeira auclifolia</i>	4-5 years	6-9m	6-9m	Irregular	White flowers Mar-June
<b>GUL MOHUR</b> <i>Delonix regia</i>	6-7 years	15-18m	18-21m	Umbrella	Reddish orange bunched Feb & Mar
<b>MORSE CASSIA</b> <i>Cassia grandis</i>	5-6 years	15-18m	18-21m	Conical/flat dome	Pink clusters May-June
<b>INDIAN CORAL</b> <i>Erythrina indica</i>	6-7 years	18-21m	15-18m	Irregular	Large scarlet Feb-May
<b>INDIAN CORK (JASMINE)</b> <i>Millingtonia hortensis</i>	6-7 years	20-25m	9-12m	Elongated irregular	Small white flowers Apr-June & Nov-Dec
<b>INDIAN LABERNUM</b> <i>Cassia fistula</i>	6-7 years	9-12m	6-9m	Conical dome	Bright yellow April-June
<b>JACARANDA</b> <i>Jacaranda mimosaefolia</i>	6-7 years	18-21m	15-18m	Dome	Purple flowers Mar & April
<b>QUEEN'S FLOWER</b> <i>Largestroemia speciosa</i>	5-6 years	15-18m	15-18m	Dome	Purple flowers May & June
<b>RED SILK COTTON</b> <i>Salweenia malabrica</i>	7-8 years	24-30m	15-18m	Irregular	Large red flowers Jan & Feb
<b>TULIP TREE</b> <i>Spathodia campanulata</i>	6-7 years	18-21m	12-16m	Irregular	Large orange flowers Mar & April
<b>VARIEGATED BAUHINIA</b> <i>Bauhinia variegata</i>	5-6 years	9-12m	12-15m	Irregular dome	Purple & white flowers Feb-April
<b>F R U I T</b>					
<b>BANANA</b> <i>Musa species</i>	1 year	3-6m	2-5m	Tall with crown	Fruit almost all year
<b>CHIKU</b> <i>Minusops sapota</i>	5-7 years	12-18m	12-18m	Dome	Fruit almost all year
<b>COCONUT</b> <i>Cocus nucifera</i>	---	12-24m	3-6m	Tall with crown	Fruit almost all year
<b>DRUMSTICK</b> <i>Moringa pterygosperma</i>	---	8-12m	10-15m	Irregular	Fruit at end of monsoon
<b>INDIAN ALMOND</b> <i>Terminalia catappa</i>	7-8 years	20-25m	8-12m	Layered	Fruit at end of monsoon
<b>MANGO</b> <i>Mangifera indica</i>	3-10 years	12-18m	12-18m	Dome	Fruit in summer
<b>PAPAYA</b> <i>Carica papaya</i>	1-3 years	3-6m	2-5m	Tall with crown	Fruit in winter

Leaf shape	Soil type	Remarks	
Long, broad Evergreen	Sand-loam-clay	Hardy and quick-growing gigantic tree, throws out aerial roots. Good for avenues.	BANYAN
Long needles Evergreen	Loam-clay	Can be pruned to make hedge. Tolerates salinity. Hardy tree.	CASURINA
Compound	Loam-clay	Tolerates salinity and wetness. Seeds used medicinally.	KARANJ
Small	Sand-loam-clay	Hardy and quick-growing shade tree. Leaves used as mosquito repellent.	NEEM
Long, thin	Loam-clay/loam	Slow-growing ornamental; often started indoors.	PALMIRA
Medium pointed	Sandy loam-clay	Hardy tree that can be propagated by planting seeds and cuttings.	PIPAL
Compound	Loam-clay	Fast-growing, splendid shade, needs well-drained soil. Fosters growth of lac insects.	RAIN TREE
Long drooping Evergreen	Loam or clay	Used medicinally. Considered sacred by Hindus and Buddhists.	ASOKA
Compound	Sandy loam or rocky	Hardy and quick-growing; tolerates salinity. Used for furniture-making.	COPPER POD
Trifoliate	Loam	Hardy forest tree; slow-growing. Sweet-smelling flowers.	FLAME OF THE FOREST
Long pointed	Loam	Needs little water; leafless for long periods. Sweet-smelling flowers.	FRANGIPANI
Tiny leaflets	Sandy loam	Graceful and pleasing tree.	GUL MOHUR
Compound	Sandy loam	Cattle do not eat the brittle branches of this hardy tree.	HORSE CASSIA
Trifoliate	Loam-clay	A spiky tree which is leafless before and after flowering.	INDIAN CORAL
Compound Evergreen	Loam	A delicate softwood tree.	INDIAN CORK
Long drooping	Sandy loam	A fast-growing tree.	INDIAN LABERNUM
Feathery leaflets Evergreen	Loam	Prefers cooler weather; grows poorly in hot climates.	JACARANDA
Medium elliptical	Loam or clay	Needs care and watering; flowers twice yearly.	QUEEN'S FLOWER
Compound digitate	Loam-clay	Forest tree flowers when leafless.	RED SILK COTTON
Compound	Loam-clay	Good for avenues, needs plenty of water.	TULIP TREE
Rounded bi-lobed	Loam	Delicate tree.	VARIEGATED BAUHINIA
Large long	Loam-clay	Cultivated through root grafts; lasts only two years.	BANANA
Medium Evergreen	Clay loam	Needs care and water; good shade tree.	CHIKU
Very large	Sandy loam	Suitable for hot-humid climates; tolerates salinity. Needs plenty of water.	COCONUT
Small	Loam	Very fast-growing. Fruit cooked and eaten as vegetable.	BRUNSTICK
Large roundish	Loam-clay loam	Attractive tree that tolerates some salinity; very fast-growing.	INDIAN ALMOND
Large	Loam-clay	Good shade tree; many varieties exist.	MANGO
Very large	Loam	Bears fruit for about three years; good for kitchen gardens. Very short life.	PAPAYA



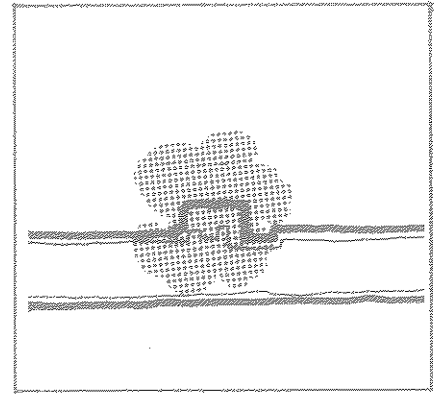
PUBLIC SQUARES

Trees planted in public squares should be large enough to provide shade over the entire area. The familiar pattern of a single, large tree in the center of a roughly square public space is a successful one. The public square should not be less than 10 meters and not more than 20 meters across. This size will allow activities to take place below the tree, without interfering with traffic around the perimeter. Trees which are sufficiently large for such a space include *Banyan*, *Pipal*, *Neesa* and the *Gul Mohur*, *Rain Tree*. Additional benefit will be achieved if a low platform or plinth is constructed around the tree.



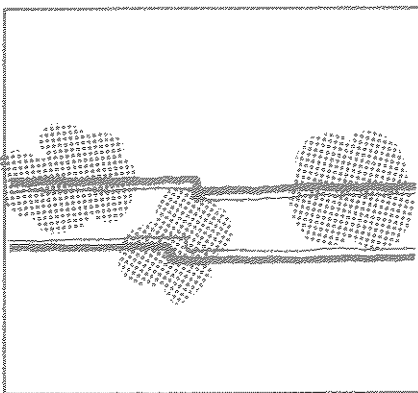
MAJOR STREET WIDENING

Where narrow streets are widened to create a 3-5 meter space beside the main circulation, a fairly large shade tree can be planted. It will provide shade to the space, without obstructing the road. Several species are suitable for such locations, especially if properly trimmed: *Pipal*, *Neesa*, *Jacaranda*, *Copper Pod*, *Fig* and *Almond*.



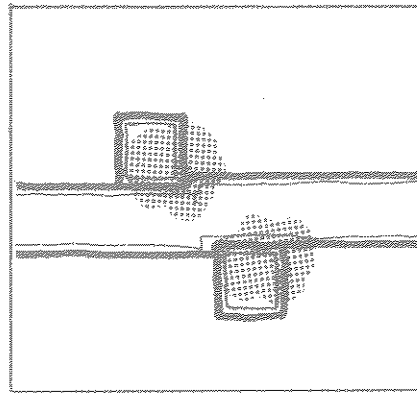
MINOR STREET WIDENING

If a street is increased in width to create a small 2-3 meter side-space, smaller trees can be planted to provide shade. *Flame of the Forest*, *Jacaranda*, *Frangipani*, *Karanj*, *Almond* and *Cassia* would all be suitable, although some would have to be trimmed annually to prevent them from encroaching on the right-of-way.



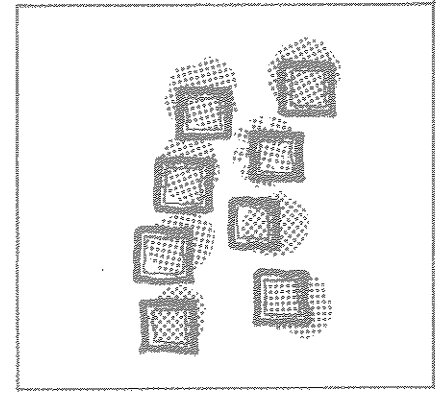
STREETS

If streets are less than 5 meters wide, trees can only be planted along one side; along streets wider than 8 meters, double rows may be planted. Care must be taken to ensure that foliage begins at least 3 meters above the ground. Trees with tall trunks are suitable for streets, they include: *Casurina*, *Tulip*, *Karanj*, *Bauhinia*, *Indian Labernum*, *Indian Coral* and the *Indian Cork Tree*.



PRIVATE COURTYARDS

Front yards that face the street and are at least 5 meters square are sufficiently large to accommodate fruit trees such as *Mango*, *Drumstick* and *Chiku*, or flowering trees such as *Frangipani* and *Ashok*. Fruit trees would be chosen for their food value, while flowering trees would provide a sweet fragrance. Care should be taken that the trees are at least 3 meters from the house foundations.



PRIVATE FRONT YARDS

Small, private courtyards, at least 3 meters square, can accommodate small fruit trees such as *Banana*, *Papaya* and *Coconut*, all of which have a tall trunk and a high crown. Water drains flowing from the kitchen are a good source of water for trees planted in courtyards.